

# Introducing an Intelligent E-learning Content Constructor Engine

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**Abstract.** E-learning authoring tools are employed to provide a framework in order to create indexing and to integrate multimedia components (text, image, audio, video and animation). To produce a smart and intelligent e-learning content through these tools, some features must be added to them. In this paper we intend to present the capabilities of an intelligent e-learning content and furthermore we are going to introduce an intelligent content constructor engine designed in our workgroup. In this way, we will portray the engines component based architecture and describe the components which are capable to make the content smart and intelligent.

**Keywords:** intelligent content, metadata, e-learning content, reusability

## 1. Introduction

Intelligent e-learning content is content which is not limited to one purpose, technology or output. It is content that is structurally rich and semantically aware, and is therefore discoverable, reusable, reconfigurable and adaptable. It is content that helps users (learners, instructors, managers) get the job done. It is content that is limited only by our imaginations.

With intelligent content you can:

- Automatically deliver to multiple channels
- Personalize content
- Enable users to easily find the information they need no matter how complex their requirements
- Let your users build their own unique information products
- Manage content throughout its lifecycle
- Rapidly adapt information to changing needs

To enable intelligent content you:

- Develop user personas
- Design the content with those users in mind
- Structure the information before you create the content ( based on the storyboard which the expert domain provides)
- <sup>2</sup>Create metadata that supports search, for users
- Apply metadata to content at a level of granularity that supports its final use
- Manage the information so that it remains up-to-date and relevant

## 2. What is intelligent content and is our engine able to produce intelligent content?

Intelligent content is structurally rich and semantically aware, and is therefore automatically discoverable, reusable, reconfigurable, and adaptable. Let's explain more about the features and compare it with our engine.

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## 2.1. Structurally rich

“Structurally rich” means the content is structured content, and more importantly it is semantically structured content. For example, we can look at the structure and know what type of content it contains (steps contain chronological action-oriented information).

Following figure (fig. 1) demonstrates the structure of the content which is produced through the engine we designed. This image specifies components, the method of communication and the type of classification in e-learning process. So, the generated content possesses strong and rich structure.

An example of a rich structure is the one based on XML (the same as our engine). This structure is able to provide components communication and classification of types in order to give better access in e-learning process. In addition the structure of our produced content helps us to determine how to publish it to multiple channels automatically (print, web, help, etc), and besides we can filter out some content as well.

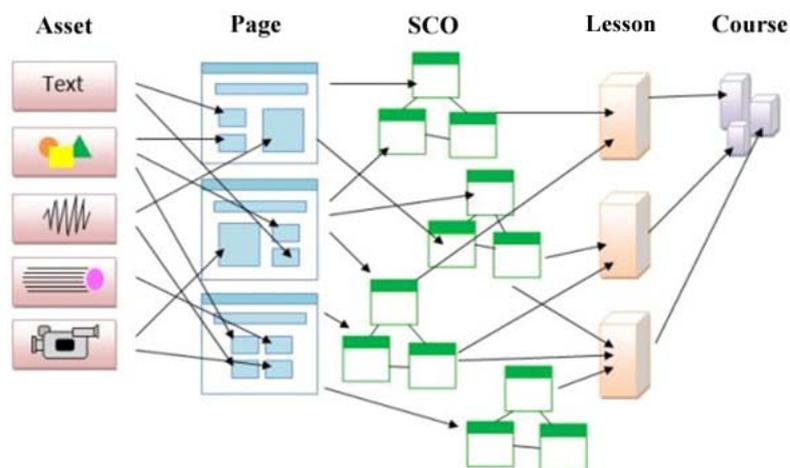


Fig.1: an overview of the engines structure

Also, if the content is structurally rich we can perform searches and narrow our search to the particular type of information we are interested in (e.g., look for all occurrences of the word metadata in conceptual information).

## 2.2. Semantically aware

The word semantic refers to “meaning.” Semantically aware content is content that has been tagged with metadata to identify the kind of content within it. If the content is tagged with semantic metadata, it is possible to build customized information sets based on users' requirements.

Our engine makes the user able to tag on assets that exist on pages. Tags are semantic metadata which cause the assets meaningful and employ wikis to make relationship between assets and other components.

## 2.3. Discoverable

This engine produces contents which have semantic tags and are structurally rich, and this will help us to find exactly what we are looking for.

## 2.4. Reusable

Reusability refers to content we frequently use. If content is structured for reuse, and I know what type of content it is, I can either easily retrieve it for manual reuse or automatically retrieve it for systematic reuse (automatic reuse).

According to fig. 1, reusability is available in each part of our content

## 2.5. Reconfigurable

Knowing the structure of the content, we can output it to multiple channels, reconfiguring it to best meet the needs of the channel, or we can automatically mix and match content to provide us with the information

the user's needs. We can even transform content (reconfigure it) from one structure to another, but only if we know what the structure is in the first place.

Indexing ability on different parts of the produced content is based on XML which its structure is completely specified. So the changes will be easily imposed in order to provide the users requirements. By introducing the architecture of automated produced XML components in the following, the ability of being reconfigurable will become more obvious.

### 2.6. Adaptable

We frequently create our content for a particular need or audience, but content can be adapted (used in a different way), often without our knowledge, to meet a new need.

The framework intended for produced content by our engine, helps us not to depend on a special subject but to adapt with different topics in various contents.

## 3. The architecture of the intelligent e-learning content constructor engine

This engine is established upon a collection of standard components in order to employ reusability and add or delete a component from the content or customize it easily depending on needs. For this purpose we will introduce the main components of this engine (shown in fig. 2) and describe each of them briefly.

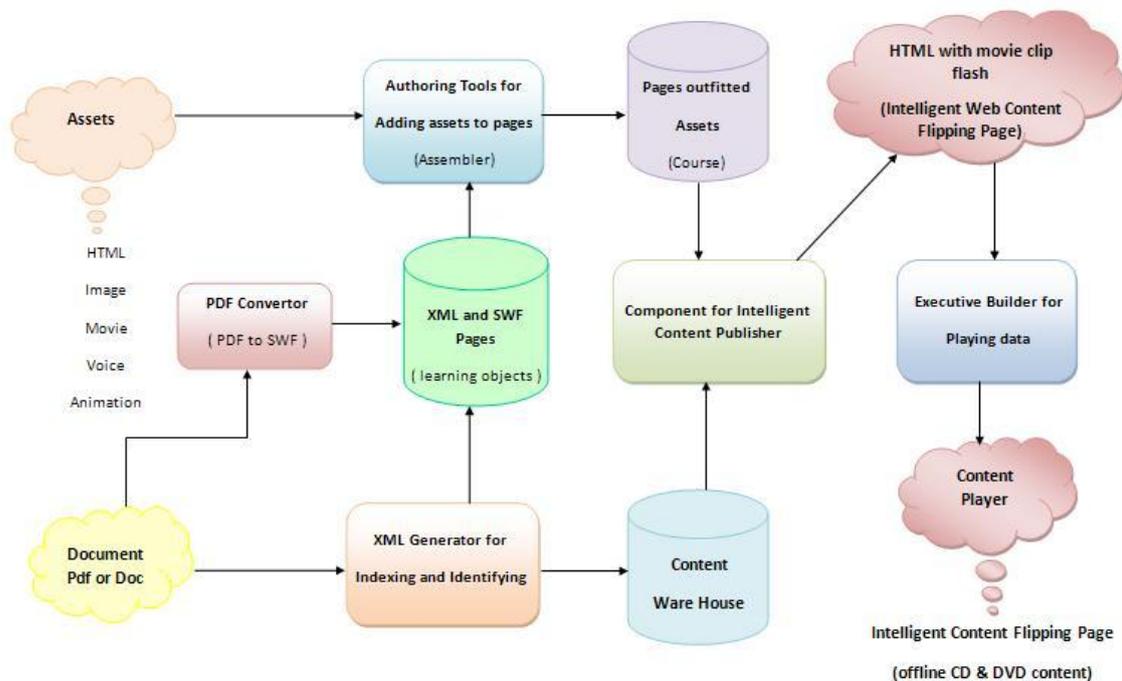


Fig.2- the architecture of intelligent e-learning content constructor engine

### 3.1. PDF convertor

Source of produced content through this engine is based on PDF (adobe portable document format). With the use of a PDF convertor we change the pages containing PDF to SWF format so that we could place them in a Flash movie clip in the form of flipping page.

### 3.2. XML Generator for indexing and Identifying

To provide indexing for educational content on the basis of defined pages, different parts in a page as assessments, texts being able to search on, semantic metadata for assets and making SCO, a XML generator component is used. This component receives necessary information about these parts (as mentioned above) in order to produce XMLs and yield indexing and identifying for each part. In fact, learning objects which include XML and SWF pages are produced via this component. In addition, XML generator module makes the content warehouse ready so that it could be exploited in content publisher module.

### **3.3. Authoring tools for adding assets to pages**

This module is provided to assemble assets to different pages. In fact, assets as HTML pages, images in the form of bitmap or vector, videos in the form of .FLV or .MOV, audios in the form of .mp3 or .wav and animations in the form of .SWF or .gif (having the ability of being interactive) can be added to indexed learning objects and make the pages filled by assets ready to use in courses.

### **3.4. Component for intelligent content publisher**

This component is able to publish HTML docs and the result will be an HTML document containing Flash movie clip. By having the ability of flipping pages, the user will be able to turn over the pages and besides, different ways of accessing the produced content will be provided. It must be mentioned that the produced content in this format could be presented on web.

### **3.5. Executive builder for playing data**

In most cases, the assets need high volume of storage. Because of this fact, providing the pages on the web is not possible for those not having appropriate bandwidth. This component is set to make HTML and its accessories executable so that these users could also perform the content on CD and DVD in the form of auto run and offline.

## **4. Introducing the features of produced content through the engine**

For preparing this software, we have been scrutinized about the end user requirements, dominant attributes to compete with similar software and time, financial and technical restrictions and finally the fundamental features were recognized. Some of the influential features in this software are mentioned bellow:

- Registration for each content
- Searching ability
- Adding note on any part of a page
- Adding sign in any part of a page concluding texts
- Marking a page
- Having access to contents via contents index
- Having access to contents pages through thumbnail
- Printing pages
- Zooming in and out on any page
- Providing selective tests
- Providing reports according to users performance
- Having simulated tests

## **5. Conclusion**

The most basic and valuable characteristic of e-learning content authoring tool is to provide abilities such as indexing and integrating assets in the content. Employing these capabilities help user to experience different ways of access and choose the best one to control and interact with the content. By adding intellectual abilities, we can provide required knowledge in different levels of teaching an learning process for various users. To reach this goal and have an intelligent e-learning content we should respect abilities such as rich structure, conscious semantic, discoverability, reusability, being reconfigurable and adaptable in our content. To prepare these attributes an appropriate architecture for e-learning content authoring tools is inevitable.

In this paper authors have put their outcome effort on introducing and describing a sample of component based architecture in order to produce an e-learning content constructor engine having the mentioned attributes. The next step of investigations in this academic group will be focused on employing knowledge management in content so that to improve the produced engine further.

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