Towards Cost-Effective Enrichment of EPUB3-Compliant eBooks

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Abstract. The topic of cost-effective enrichment of eBooks with both multimedia content and highly interactive content is currently of high interest to publishers. In this position paper, we outline an approach that addresses this challenge. Specifically, we propose a novel authoring environment, focusing on reusability and EPUB3 compliance of eBook enrichments.

1 Our Interest

At Ghent University - iMinds, we are currently participating in a four-year research project entitled "Publisher of the Future", bringing together stakeholders from both the Flemish ICT and book publishing industry. This project aims at keeping track of the technological advances in the field of eBook publishing. In addition, this project aims at developing novel solutions that address the ICT needs of the Flemish book publishers in the long term. One of the research tracks we are currently exploring within the "Publisher of the Future" project is cost-effective enrichment of eBooks with both multimedia content (e.g., audio and video) and highly interactive content (e.g., personalized exercises), a topic that is currently of high interest to publishers.

In this position paper, we discuss our approach to addressing the challenge of cost-effective enrichment of eBooks. To that end, we organized our position paper as follows. In Section 2, we present a review of already existing environments for authoring eBooks. In Section 3, we outline our problem statement. In Section 4, we detail our approach towards building a novel authoring environment, introducing a reference architecture as well. In Section 5, we discuss two example use cases. Finally, in Section 6, we present our conclusions and directions for future work.

2 Review of Authoring Environments

Conversations with Flemish book publishers made clear that authoring EPUB3-compliant eBooks with advanced multimedia and interactivity features is currently a topic of high interest, given the high cost of app development and fears for vendor lock-in [1]. This high interest in EPUB3 motivated us to conduct a review of thirteen environments for authoring eBooks that are currently available, taking into account the following criteria:

- *full* support for open (interoperable) formats like HTML5 and EPUB3 [4];
- extensible support for reusable enrichments (this is, extensible support for enrichments that can be easily added to different (types of) eBooks);
- support for a user-friendly interface (this is, support for an interface that can be easily used by non-ICT experts).

The preliminary results of our review, shown in Table 1, indicate that no popular authoring environment (AE) is currently available that *simultaneously* supports the aforementioned criteria. However, we do have to note that each AE has its own strengths and weaknesses. For example, if

support for EPUB2 or EPUB3 is the most important criterion, then BlueGriffon EPUB Edition[3] is currently the best option. However, while BlueGriffon EPUB Edition supports interactive scripts, no *widget libraries* are at present available for adding enrichments to eBooks in a user-friendly way. When the latter is the most important criterion, then iBooks Author[4] and Adobe InDesign[5] are currently the better options, in combination with widget libraries such as Bookry[6] and Aquafadas[7], respectively. However, a number of these AEs makes use of proprietary formats or EPUB3 "flavors", resulting in *vendor lock-in*.

	BlueGriffon EPUB Edition	iBooks Author	Adobe InDesign
ability to import/open EPUB files	x	x*	
EPUB3-compliant output	x	x*	x
widget libraries available		x	x**
support for interactive scripts	x	x	x

Table 1: Preliminary results of our AE review ('x' = feature supported; '*' = vendor-specific adaptation of EPUB3; '**' = not on all platforms).

3 Problem Statement

Given the widespread availability of touchscreen devices, consumers expect eBooks to come with highly interactive multimedia content. In addition, given the use of a digital production process, consumers expect eBooks to be available at a cheap price. In order to meet the aforementioned expectations, publishers currently have a high interest in cost-effective enrichment of eBooks. To that end, AEs are needed that allow adding enrichments to eBooks in an EPUB3-compliant way, through a user interface that can be operated by non-ICT experts (this is, through a user interface that can be operated by people that do not have programming skills). As indicated by our review, such an AE is currently not available yet.

4 Our Suggestions

To investigate the feasibility of a user-friendly AE that is able to output enriched eBooks that are compliant with EPUB3, we are currently designing and implementing a proof-of-concept, paying particular attention to the management of the enrichments, the possible role of current and future standardization efforts, and the possible role of the Semantic Web.

4.1 Management of Enrichments

Incorporating multimedia and interactive enrichments into the current workflow of publishers is not an easy task. Indeed, as it currently stands, publishers have to make use of multiple AEs in order to obtain the desired result, or they have to make compromises, resulting in deviations from the EPUB3 specification. Furthermore, publishers often need to rely on external partners with the necessary ICT expertise in order to develop enrichments and add these enrichments to eBooks. This is mostly done on a book-per-book basis, limiting the reusability of the enrichments developed, thus making enrichment an expensive endeavor. It is therefore our goal to design and implement an authoring environment that makes it possible for publishers to easily add customizable enrichments to eBooks in an EPUB3-compliant way, and to store (or even share) these enrichments for future reuse in other eBooks. This would result in an extensible library of enrichments that are guaranteed

[3] http://www.bluegriffon-epubedition.com/
[4] http://www.apple.com/benl/ibooks-author/
[5] http://www.adobe.com/products/indesign.html
[6] http://bookry.com/
[7] http://www.aquafadas.com/en/digital-publishing/book/

to be usable in all EPUB3-compliant authoring and reading environments. This would also allow publishers to locate enrichments before the process of designing and creating an eBook. In Fig. 1, we outline a possible reference architecture of such a system.

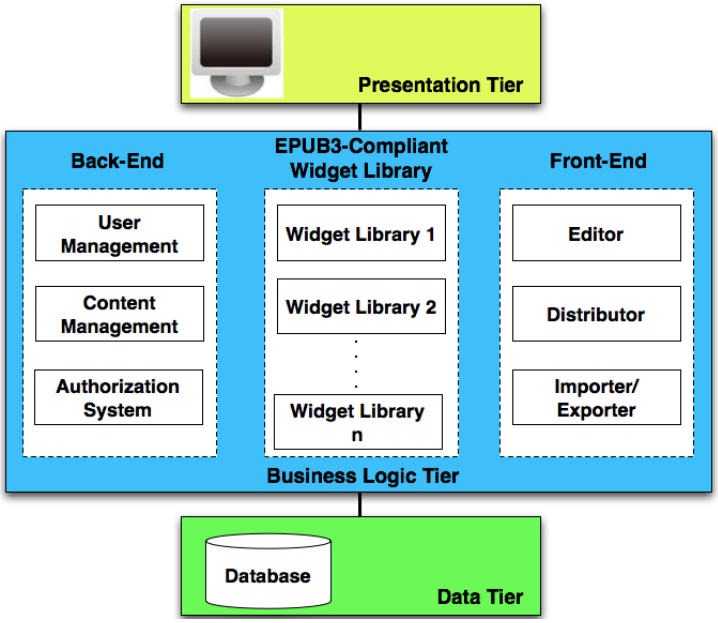

Fig. 1: Reference architecture of the proof-of-concept.

4.2 Possible Role of Standardization Efforts

As EPUB3 allows for the extensive use of HTML5 and JavaScript constructs, it seems obvious that these technologies will be used to build our enrichments. However, it might also prove interesting to consider synchronizing with other standardization efforts, such as the W3C Packaged Web Apps (Widgets) Recommendation [2] and the W3C Widget Interface Proposed Recommendation [3], in order to allow for interoperability between different authoring environments and third-party developed enrichment/widget libraries.

4.3 Possible Role of Semantic Web Technologies

In order to provide generic (this is, eBook-agnostic), yet easily customizable and personalizable enrichments, we will also investigate the role of Semantic Web Technologies applied to eBooks. As stated by Hugh McGuire in [5], a good *API* (Application Programming Interface) is the key to the next generation of eBooks. Machine-interpretable annotations and metadata are essential components to facilitate the automatic adaptation of generic scripts and widgets. For example, if all characters in an eBook are semantically annotated and linked to a machine-readable resource, it would be possible for an application to find images on the Web, corresponding to these characters, and integrate them into the eBook as an enrichment. A vast number of scenarios using this kind of automatically interpreted data are conceivable, as we illustrated during the previous workshop [6].

5 Example Use Cases

To make our ideas more tangible, we will illustrate the concept of generic enrichment with two example use cases that we plan to incorporate in our proof-of-concept.

5.1 Jigsaw Puzzle

In this scenario, the generic enrichment consists of a script that makes an interactive puzzle out of any image (e.g., for use in children's books). As illustrated by Figure 2, the author selects an appropriate image, and subsequently drags and drops it in the placeholder in the AE. The author is allowed to apply a number of customizations, such as selecting the difficulty level of the puzzle. This interactive enrichment is then added to the library, and can then easily be reused in any desired EPUB3 publication.

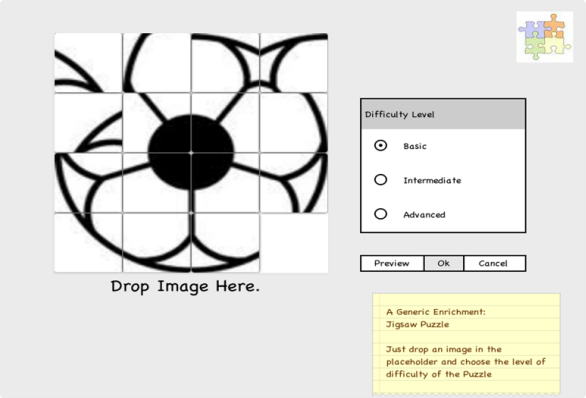

Fig. 2: Puzzle result.

5.2 E-Learning

With this scenario, we aim to illustrate the possibilities regarding client-server communication and local storage of data in EPUB3 publications.

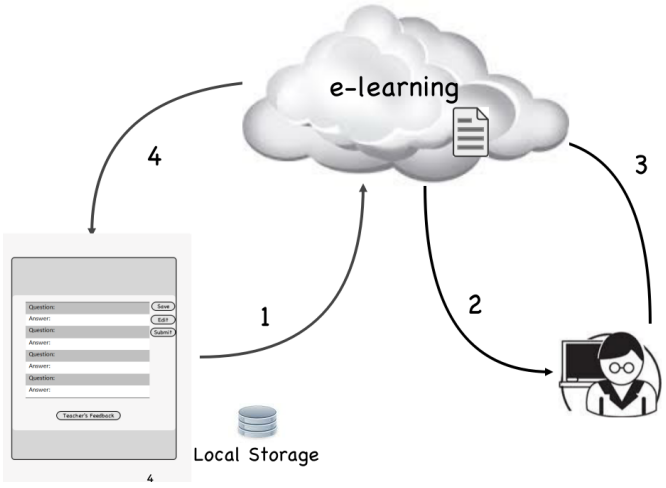

Fig. 3: Illustration of the e-learning scenario.

1. The student submits his/her answers to the e-learning platform. These answers are also stored locally in the eBook.
2. The teacher is informed that the student's answers have been submitted.
3. The teacher submits his/her evaluation and/or feedback to the e-learning system.
4. The student is informed of this, and is able to see the feedback in his/her eBook.

A common example of interactivity in educational books, and a much sought after feature by publishers, is the addition of exercises and chapter review questions. Thanks to the HTML5 and JavaScript capabilities of EPUB3, it becomes possible to establish a flexible means of communication between different parties. In an e-learning scenario, this could mean that students' answers could be stored in the EPUB3 file on the reading device (e.g., using an HTML5 IndexedDB) and/or even sent to an e-learning environment, where teachers could evaluate their answers and provide feedback. We illustrate such a scenario in Figure 3.

6 Conclusions and Directions for Future Work

Although authoring environments are currently incorporating more and more enrichment options, we can observe there is still a lack of support for interoperability and reusability. We therefore believe that a Web-based AE with an extensible library of EPUB3-compliant enrichments would provide a substantial added value to the sector. For this purpose, we aim to build a proof-of-concept AE, focusing on cost-effective enrichment of eBooks, making use of standard formats and Semantic Web technologies.

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