

# Libraries of Interactive Books as Tool for Information Communication

Hermann Maurer  
Institute of Information Systems and Data Systems  
Graz University of Technology, Graz, Austria  
hmaurer@iicm.edu

Namik Delilovic  
Institute of Information Systems and Data Systems  
Graz University of Technology, Graz, Austria

Bilal Zaka  
COMSATS, Islamabad &  
Austria-Forum, Graz, Austria

**Abstract:** In this paper we argue that by using software that allows to add all kinds of interactions and media to digital books we can create what we will call interactive books (IBs for short). Collections of such books are attractive to use for many purposes of information communication, be it as guide-book, handbook, manual or instructional material like in e-Learning systems. Yet the systems developed are easier to maintain than complex environments: changes usually do not require any programming but just HTML-like editing.

## Introduction

Since the 1960 there have been numerous attempts to use computers to support communicational and instructional tasks and learning. Early terminology like CAI (computer aided instruction) or CBT (Computer Based Training) have developed into e-Learning environments (Ebner 2011), (Huber et al 2008) and (Scerbakov 2015), often in connection with modern cloud services (Ebner et al 2014), or learning management systems like (Taraghi et al 2009), or the fairly wide-spread use of Moodle, <https://moodle.org/?lang=en>.

Also, there have been attempts to combine the contents of Websites and digitized books to build libraries useful for communicational and instructional purposes (Maurer et al 2013). In this paper this idea is extended by making digitized books that are supplemented by different media and interactivities the main tool.

We describe in the next section (“A basic prototype for IBs”) the kind of minimal software we believe is needed, explain our concepts with a few samples based on a rudimentary system that we have used for first experiments but with a body of over 2.300 digitized books.. In the following section “From prototype IBs to standard-based systems” we explain some shortcomings of the prototype system and how we believe they can and should be overcome. In the important section to follow, “Further functionalities making IBs fairly universal”, we introduce a number of additional functions that result in a system which has all functions of a complex system that can be tailored for the requirements of different groups, including elegant e-Learning applications. Despite the possible complexity, changes of contents or functionalities can often be handled easier than in powerful but closed systems. We finish with a section on “Conclusions” and “References”.

## A prototype system and first experiments

Our prototype system consists of a system we have called Web-Books (<https://austria-forum.org/web-books/>) (when opening the site, the symbol below the magnifying class allows to choose as interface language German or English) and has been implemented “on top” of a Wiki system that allows creating pages that can be used for presentation or

discussion facilities. Note that the same software, developed at a team at Graz is also in use in other places like in Serbia (<https://serbia-fourm.org>) with interface language Serbian, Russian or English. Again, large collections of books are “sitting on top of” a Wiki system. Note that such a Wiki system is convenient, since users can be made easily familiar with simple editing features, but the Wiki system need not be closely tied to the Web-Book systems, but can be quite a separate system as long as it allows the creation of pages with text, pictures and links. If the system does not provide a discussion facility (with at least a list of annotations that can be expanded as might be desired) then another software supporting such features and annotations is required.

The main idea of Web-Books is that they are digitized books whose pages can be viewed in a variety of modes as explained a bit later. One can use full-text search, but most important, one can link from any spot on a book page to another book page, or Web page, or some application program or to some material gathered on purpose to expand the book at issue: And this is why an added Wiki systems where suitable material is gathered and possible discussion carried out is important. This allows to incorporate additional material, video-clips, tests, quizzes, experiments or anything else, thus enriching a book to the extent that it becomes a shell, leading to a huge set of material.

It is best to demonstrate this by means of an example. Consider the small 16-page book Franz Weiss found at (<https://austria-forum.org/web-books/en/melodiederfarben01de2018isds/ev0001>), entry shown in Fig.1. Follow the suggestion “read the book now”.

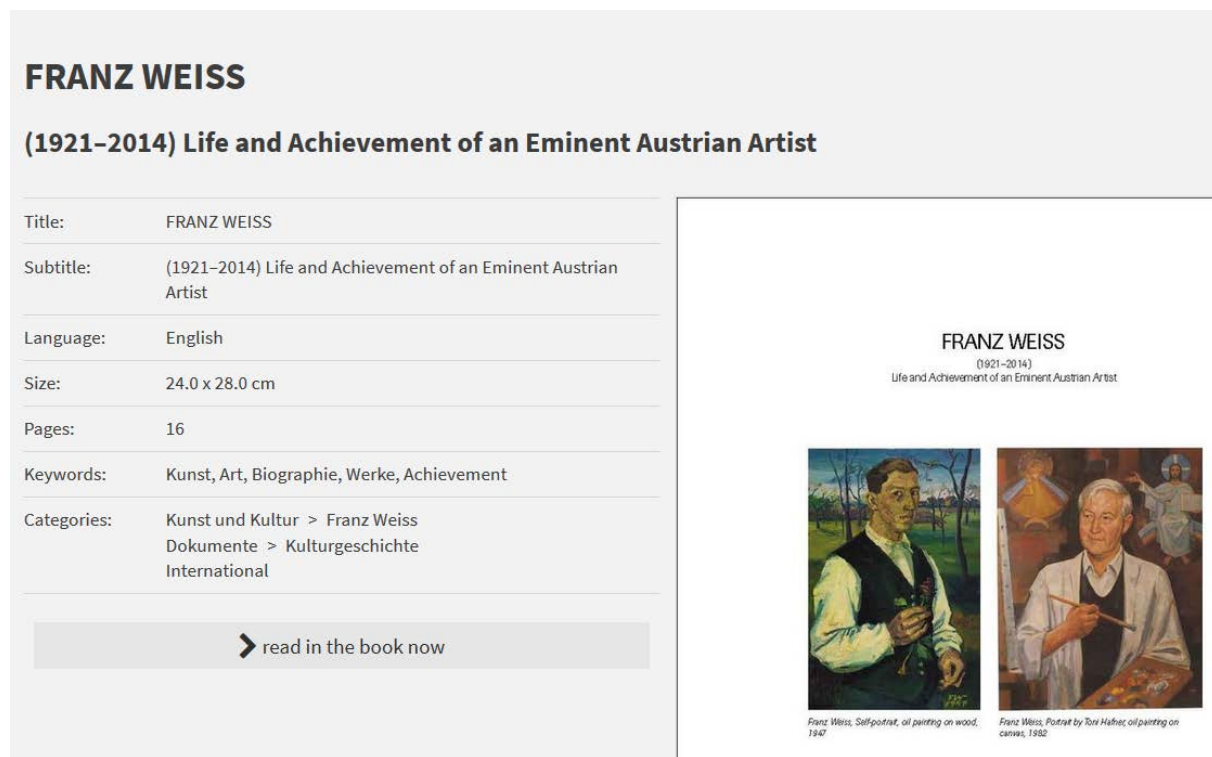


Fig.1: Cover page of the book “Life and Achievement of an Eminent Austria Artist”

On the next page you find the picture shown above, but in addition a field “search in the book” and an arrangement of icons at the bottom as shown in Fig. 2.



Fig. 2: List of icons

The meaning of the icons are, from left to right: zoom out, go back to not zoomed mode, zoom in, rotate counter clockwise, rotate clockwise, magnify a small part of the picture very much, go back one page with <, you are on page 1 (i.e. one can put in here e.g. also 12 and with enter you would jump to page 12), go to next page with >, full-page (makes a bit more room on the screen), one page-view, two-page view and thumb-nail view.

We suggest you select one-page view and just go from page to page until you reach page 16. Now click at thumb-nail view giving you all or part (depending on screen size) what you see in Fig. 3

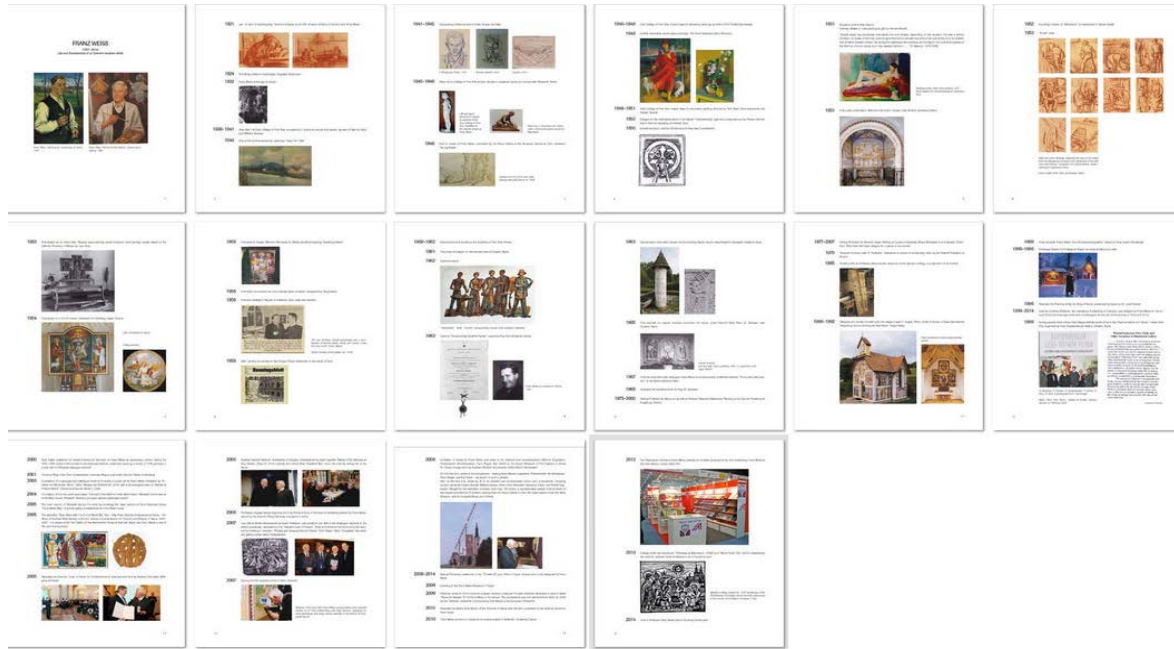


Fig.3: All 16 pages of the booklet in thumb-nail view.

Now click at page 4 and then at the double-page view and you get what you see in Fig. 4.



Fig. 4: The two pages 4 and 5, much as if you had opened the printed booklet.



Now type “shepherd” in the field “search in the book” (right upper corner) and you get a picture containing what you see in Fig. 5: A glass painting called “The Good Shepherd”.

1948 Earliest retrievable reserve glass paintings: *The Good Shepherd*, *Berry Blossoms*



Fig. 5: Result of a full text-search.

Now you have seen a bit how Web-Books behave. There is much more to them: If a book is available in different fonts or languages, you can choose the font, you can even have one font (language) on the left, the other font (language) on the right, but, most important, if you have the necessary editing privileges you can create links from any spot in the book to somewhere else.

To see how much one can do this way, go now page by page through the ”marked up version of the book” found at <https://austria-forum.org/web-books/doclifeandachiev00eniicm> and follow the links (shown by the symbol ) or by clicking in a rectangle that is outlined in white. Use the one-page mode . Note in passing that at the right lower part of each page there is a link to a Discussion Forum.

Clearly, this is quite an enrichment of the original small book. Indeed it is a true enrichment, but not much more, since the only real interactivity is in the Discussion Forum. It is clear that there are a number of weaknesses that have to be addressed to come to a more satisfactory version.

### From prototype IBs to standard-based systems

The experimental system described has many weaknesses that we are currently trying to overcome in the next version:

To use the Discussion Forum, users have to be logged in as members of the underlying Wiki. Surely they should be able to log in as part of the Web-Books.

As soon as one allows users to log into the Web-Book system there is no reason not to allow users to make comments and links visible to them, with a possible recommendation to the administrator to make them visible to all users.

The current version allows comments only as part of the discussion forum, and links are shown by the thin outline of a rectangle (hard to notice on some backgrounds) and a clumsy link icon on the side of the page. The clumsy symbol would not be necessary if the color of the rectangle’s border can be chosen arbitrarily.

To place links at the moment is a privilege of the administrators and the process (not described in this paper) is complicated. It should be made much easier and should be available for every identified (logged-in) user (visible for only them, unless a request is sent to the administrator to make it public and administrators approve this link as useful for the public).

Users should be allowed to place bookmarks for themselves.

However, the most critical issue is that Web-Books do not conform to what has almost become a standard for large libraries, the International Image Interoperability Framework, IIIF for short (<https://iiif.io/>), in which some of the abovementioned issues are dealt with, anyway.

Despite above weaknesses, there are some interesting features of Web-Books that have been proven useful and must not be lost, like the possible choice between fonts or even languages (much depending on the book at issue), that a table of content can be accessed on any page, how full text search is indicated by just showing thumbnails with hits, etc.

With above improvements one would have quite a powerful system, yet some functionalities to really create full interactivity are still missing and will be discussed in the next section.

### **Further functionalities making IBs fairly universal**

In this Section we discuss desirable features, but leave many details open for the technical discussion of a concrete implementation.

A feature mentioned briefly before, registering as user for a set of Web-Books (let us now call the improved version Interactive Books, IBs) has many important ramifications if implemented properly.

First, users can be combined into groups. A link, a comment and a discussion forum can be associated with one or more groups, and it is then only visible to members of one of those groups. This means that a book may look entirely different for different users and not just look different, but feel different: Since e.g. although a link is visible to a user  $U$  in a group  $G$ , whether a link created by  $U$  is now visible only to  $U$  or  $G$ , or parts of  $G$ , or is public, should be definable.

Clearly, the user administration system required to handle (the many) conceivable wishes is complex and will be dealt with in another paper.

Books should allow that small fragments of other books (or even Webpages) to be incorporated, but must be clearly visible as citations with their source. A possible guide is the one by Alliant International Library (<https://alliant.libguides.com>). IBs should allow the insertion of citations but automatically format them properly and with exact source.

The idea of transclusions goes beyond citations: A substantial segment of some other book can be transcluded, not by copying it, but by linking to it and defining the size of the material to be shown, as is not possible with an ordinary link (Rubin 1987). We believe that such transclusions are feasible in a well-defined collection of IBs, but of course copy-right issues might restrict certain types of implementation. For more on transclusions see the original version (Nelson 1987) and the later modifications (Krottmaier et al 2001).

IBs should allow to have a “hide” feature, allowing to hide certain parts of a book for all users in specified user groups. Why this is a desirable feature is best explained by means of two examples. Suppose a book on physics with complex equations is to be used for junior students: it might be a great book, but it might make sense to hide complex equations, or add comments / explanations for some readers. Or consider a leaflet explaining a company: surely some information important for officers of the company should not be visible for customers, etc.

Another issue to be considered is how much of a book can be printed out. Since this will much depend on the book (e.g. public domain or not) parameters must be defined to specify what is allowed and what is not, and the system should try to prevent printing out more than allowed. Just to give an example, in Web-Books at most 1000 characters can be printed out, except if it is stated that the PDF of the book can be downloaded and used freely.

In a library of IBs searching is conceivable in many ways: By searching in keywords associated with a book (called “manifest” in IIF), by full-text searching in a book (difficult if fonts cannot be handled with some version of OCR). Both of those alternatives are provided in the Web-Book prototype. There are two important other search facilities that are missing: (a) a full-text search in a dynamically define collection of books should be possible (like in the Web-book experiment, there is a 24 volume treatment of a country. One can search each volume, but to search the collection, 24 individual searches have to be carried out: surely the system should be able to do this for the user); (b) it would be important to associate with clever heuristics keywords to pages of the book and restrict the search in a book to those keywords, rather than the full text, to avoid an undesirable flood of hits.

A feature of particular interest for instructional purposes would be placing a STOP marker at some point for identified users of some group: Those users are the lead to e.g. a multiple-choice test: if they fail, additional material is provided for them: They can only read more in the book when they (finally) pass the test.

## Conclusion

The idea of IBs has at least five advantages:

- (1) It makes a book more interesting to read, because media material, experiments, tests etc. are thrown in and encourages users to continue;
- (2) Since the material can be outside the IBs (even on some remote server run by someone else), if a particular application at some stage does not work one can delete the link to the application or replace it by a link to some other application;
- (3) Other efforts, like parts of MOOCs ([https://en.wikipedia.org/wiki/Massive\\_open\\_online\\_course](https://en.wikipedia.org/wiki/Massive_open_online_course)) or Wikipedia or clips from YouTube or some other source can be included, making it easy to establish the desired content by e.g. constructing a book more or less as an expanded table of contents, adding other stuff (e.g. video clips, explanations, etc.) separately.
- (4) IBs make use of existing material in existing books or on some Web-pages , by just incorporating them via a link or better (implementation pending) a transclusion;
- (5) The material can be enhanced by readers and (if used for teaching by instructional staff) all the time without the need of any programming.

## References

- Ebner, M. & Pretenthaler, C. & Hamada, M. (2014). Cloud-based service for eBooks using EPUB under the Aspect of Learning Analytics, *IEEE 8th International Symposium on Embedded Multicore/Manycore SoCs*, 116-122
- Ebner, M.: (2011). *Lehrbuch für Lernen und Lehren mit Technologien*
- Huber, T. & Nagler, W. & Ebner, M. (2008). The ABC-eBook System: From Content Management Application to Mash-up Landscape; *20th World Conference on Educational Multimedia, Hypermedia and Telecommunications ED-MEDIA 2008*, 6015-6022
- Krottmaier, H.; Maurer, H. (2001). Transclusions in the 21st Century; *Journal of Universal Computer Science*, 7 (12), 1125–1136
- Lanier, J. (2018). *Ten arguments for deleting your social media accounts right now*. Penguin, Random House, UK
- Maurer, H. & Mueller, H. (2013). Can the web turn into a Digital Library; *Intl. Journal of Digital Libraries*, Springer Pub. Co. 13(2), 65-75; <https://dl.acm.org/citation.cfm?id=2064065>
- Nelson, T. (1987). *Literary Machine*
- Rubin, F. (1987). GOTO considered Harmful; *Communications of the ACM*, 30 (3), 195-196
- Scerbakov, A. & Ebner, M. & Scerbakov, N. (2015). Using Cloud Services in a Modern Learning Management System, *Journal for Computing and Information Technology*, 23(1), 75-86
- Taraghi, B. & Ebner, M. & Till, G. & Mühlburger, H. (2009). Personal Learning Environment - A Conceptual Study, *International Conference on Interactive Computer Aided Learning*, Villach, Austria