

LEARNING FACTORY - ASSEMBLING LEARNING CONTENT WITH A FRAMEWORK

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ABSTRACT

Many of the challenges currently facing lectures are symptoms of problems with learning content creation, development and presentation. Learning Factory solves these problems by integrating critical innovations that have been proven over the last ten to twenty years in different industrial areas, but have not yet been brought or ported together in higher education. We explain that a Learning Factory Framework is a configuration of processes, templates, patterns, and tools that can be used to rapidly and cost-effectively produce an open-ended set of unique variants of a “standard product” (learning content). The new methodology promises to industrialize content creation, first by supporting the creation and development process of content, auto-mating the assembly of the content, and then by connecting these processes across organizational boundaries to form supply chains that organizes distributed teams together.

KEYWORDS

E-Learning content, production, learning factory

1. INTRODUCTION

Nobody knows about the money spend for creating, production and distribution of learning content in higher education in Germany. In any other industry, a result like this would generate a quick response aimed at restoring the bottom line. For the last years, however, everybody has looked only the other way, letting the budget absorb the cost of these production processes. In these less certain economic times, they are now calling to account for underperforming technology.

Are these problems of interest only when the economy is weak? Will they move away into the background again, as the market rebounds, or are there more pervasive and fundamental forces at work?

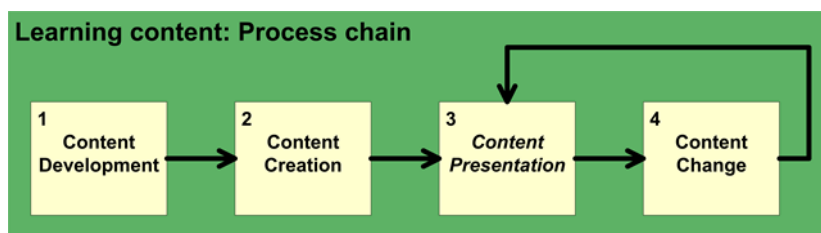


Figure 1. Process chain of learning content over their lifetime

We think the problem is that tools have not kept pace with the learning content development, creation and production. We can use the latest toolset to show video, flash movies or highly interactive content on the web or with Microsoft PowerPoint, but we still hand-stitch every content presentation. We decided to go one-step further and started a line of application to support each process and build a landscape of tools for the production process of learning content.

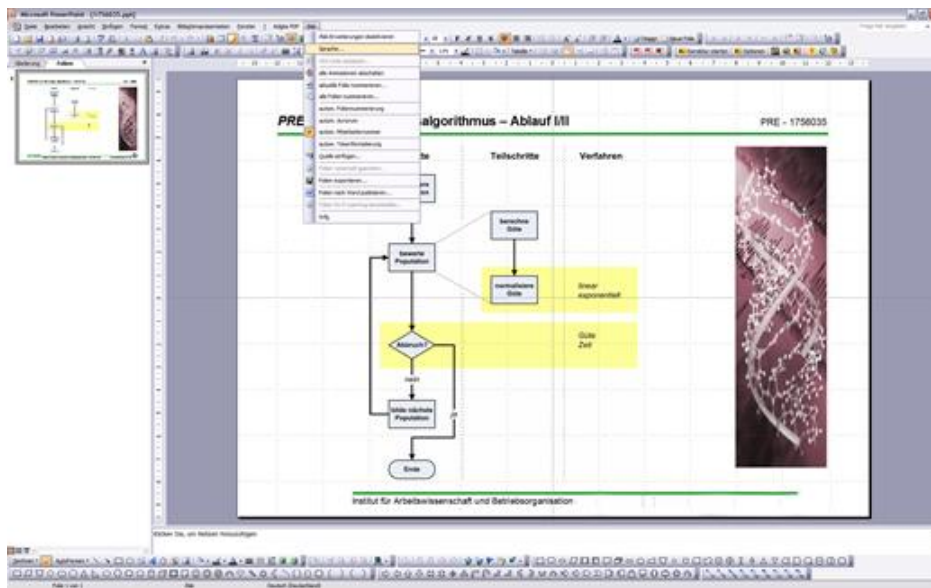


Figure 2. Microsoft PowerPoint with template and Extensions

2. THE LEARNING CONTENT LANDSCAPE

First, we explored the technology and tools, which are used to produce material for our teaching process today. To support this study, we introduce a student worker, and watched him in the process of learning content creation. We then described the architecture of the tools, processes, etc. in just enough detail to expose some of the challenges that the worker encounters using the technologies. At the end, we started to re-define the process of learning content creation with standardized, current methods, tools and best practices learned from the evaluation.

We found key elements, which are very important for our process: slides, presentations, hand out (called script), e-learning content and so on.

The most central application is Microsoft PowerPoint (see Figure 1) for producing slides, and giving presentations. Therefore, the decision to standardize this application for content creation is a vital part.

High production value, rich media content can seldom be produced outside of a team environment – this is the preserve of the professionalized organization. The same team environment produced the best learning materials using traditional media. To enlarge productivity in the team for the digital world, we have to support the team with the best tools based on the environment given as a platform for content creation. Only a minority of enthusiasts are able to operate in the production process as solo practitioners without process tools to support their work.

2.1 Presentations

Having PowerPoint addressed as the heart of our process chain for content creation, we extended it with slide templates (POTX-file) for different purposes (e.g. presenting for an audience, web presentation, etc.), different languages (e.g. German, English, and French) and different graphic (screen) resolutions. Having a slide template guarantees each slide has an identical look regarding the formal elements like parts for corporate identity of the institute, references to literature (e.g. same place, same style, etc.), and also not so well known elements like size of slide, colors used within the slide (presentation) etc.

In addition, an extension to PowerPoint itself was implemented using the *Microsoft .Net Framework* and *C#*, to support interface *IDTEExtensibility2* (Microsoft 2007), which is a door to any Microsoft Office application (see Figure 2) to support and automate our specific interaction of the user with PowerPoint.

By implementing this extension, we have the ability to work with any object (elements of a slide or presentation) from PowerPoint or any other element of an Office application (e.g. document within word, chart within Excel, etc.), create, manipulate, delete and so on.

Now we had the ability to work in a full automated way with each application, specifically PowerPoint. So standardization went one step further to implement such things like:

- automated numbering of slides; giving each slide an identity of creator and a slide history,
- automated template switching; ability to convert the formal parts of a slide to supported teaching languages (German, English, French),
- automated publication to the web; convert a slide for direct integration into our e-learning system,
- standard creation of citation objects,
- etc.

All operations are assembled in one menu and are accessibly like any other menu in PowerPoint. These operations reflect locally to PowerPoint or interact with web service(s) in a service-orientated architecture.

Within a service-oriented architecture solution, services are an important component. The W3C defines service-oriented architecture as "a set of components which can be invoked and whose interface descriptions can be discovered and published" (World Wide Web Consortium 2008). This allows the services that will be consumed to be consumed by whatever business logic is calling them – thus making them platform independent. Further, services could act in isolation of one another. This makes them more resilient to updating and it makes your solutions more scalable. There are other, more complex issues to consider that are outside the scope of this paper, such as security and protocol considerations.

Integrating with PowerPoint directly, we are able to interact and extend the object model. Extending the object model gives us the ability to have not only text on a slide, but also to know if this text is a reference, slide number, graphic a specific type or theme. This means digital knowledge of slides. We have the plan of building slides.

Now it is easy to switch a slide for a German lecture to the format used for an English lecture, automating the transformation of slide template, reference style, and so on.

2.2 Handouts

Another important product for teaching is a script (handout) for students and it was very time consuming to produce one. In the old days, you have to print a slide, produce a scaled photocopy, and assemble it in a binder and so on.

This process is very time consuming and error-prone. So the decision was clear to automate that process also; after researching different products and their cost, we decided to have Microsoft Word as a production environment for handouts.

Secretaries, researches and the easiness of creating a template for handouts with different styles, languages, etc. base this decision on well-known handling of Word and of course, we have already licensed the Microsoft Office suite.

At the beginning of a handout production we have to know which slides are needed for that specific lecture. A reference list (see Figure 3) was introduced, which assigns a slide at specific place in a lecture.

Such a list is implemented inside an intranet portal as a special editor to support building and maintaining such data.

A reference list represents an ordered list of slide numbers (objects), outline text (outline and chapter information, title, etc.), explanations (text, references, etc.), and so on. All data is stored inside a relational, server-based database for later retrieval by production processes.

2.3 Searching

We also integrated a full text index of content in our content archive, which can be used to find slides, graphics, etc. very fast by issuing a query via our internal web portal (see Figure 4), or integrates with PowerPoint and Word through an implemented web service consumed by Office.

Indexing extracts the content by filtering – using filter components that understand a file's format. The format could include multi-language features such as international languages and locales. A filter component

implements the filter, which supplies methods to read a file to extract text and properties. Indexing then merges the extracted information into catalogues of indexes for efficient searches. Indexing is the overall process of filtering, creating index entries, and merging them into catalogues.

The final step in the indexing process is creation of a catalogue that contains a master index (and any temporary word lists and shadow indexes) storing words and their locations within a set of indexed documents. Subsequently, searching, or querying, the catalogues for particular word combinations uses the master index as well as word lists and shadow indexes to execute queries quickly and efficiently.

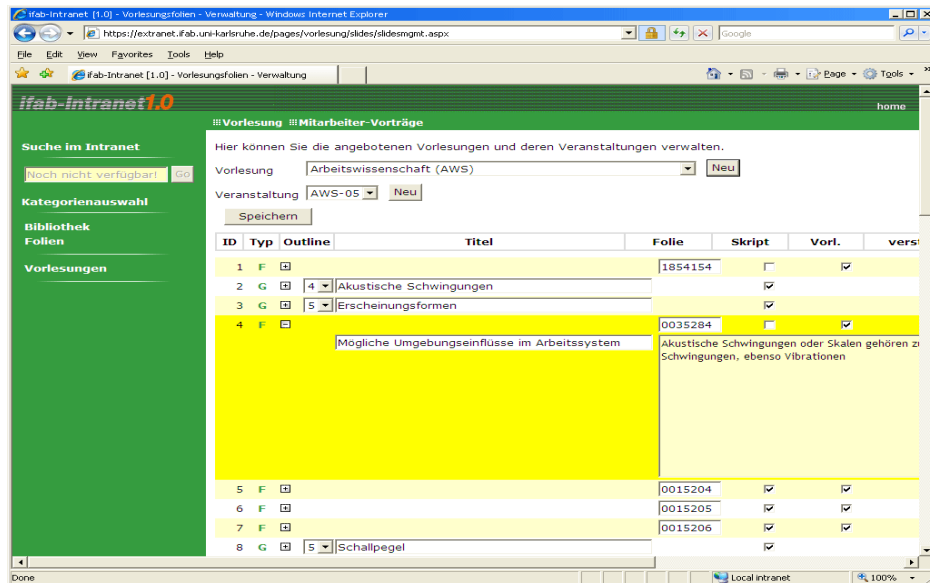


Figure 3. Intranet lecture reference editor

2.4 Benefits

The need to transform how universities produce and work with learning content points to the future, but tools to support them point to the past. It is not a modern, efficient, and flexible process, also in the timeframe of e-learning. The mission of universities is to supply the students with an up-to-date and cost-effective program that yields motivated and skilled students.

Creation processes of learning content are performed in conditions that are fairly well known and their result needs to be guaranteed because even one or few misses are considered unacceptable. This is, like other processes identically to the case of mission critical processes, assembly chain, health care processes etc. In these cases, the process is usually known with precision and the actual activities performed should strictly follow the process. We call this kind of process a hard normative process.

The activities to be performed and their order depend little or not at all on the opinions of the people running the process. This are processes which we can be supported by information technology systems to give creators more time to support student needs.

Indeed, the process is designed so that it is independent of such opinions so that the result is continuously guaranteed, regardless of the people who perform the process.

Many other processes, a lecture process for example, are somewhat different. The activities to be performed and their order are less rigidly prescribed than those in the hard normative process. Some activities may be omitted (such as not talking about a specific slide) and the order of activities can be changed.

Soft normative processes may have different versions and people driving these processes need more time to support customers (students) relying on the process.

Just what is learned is a matter of content, but helping it to happen is a matter of managing the process. In teaching and learning, as in other communicative activities, process is more basic than content. Indeed,

without a minimally satisfactory process, content never gets a look in. That process, however, has to be tuned so that it helps rather than hinders learning.

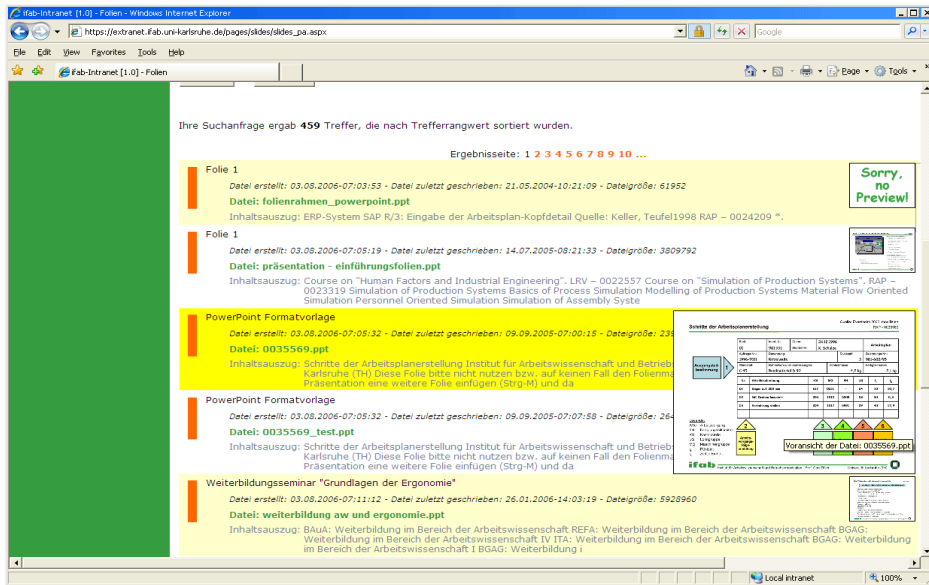


Figure 4. Intranet result of a search query against the content archive

3. CONCLUSION

We have learned many things to improve our internal processes, also we had the possibility to arrange the processes and integrate with them in a computer supported extended process.

We gain a large benefit in not concentrating in sampling slides to presentations or building handouts or lectures. Also finding a specific slide is reduced from asking colleagues, overlooking a binder archive, and so on, to issuing a query with some key words against the content archive. This is the right track and the possibilities are nearly endless, the limit is imagination. We have just built a framework (platform) for an ongoing process integration and improvement.

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