

Representing examination regulations with BPMN

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1. EXECUTIVE SUMMARY

Past experience gained from project Campus IT shows the importance of comprehensible documentation when visualising examination regulations.

Since numerous examination regulations had to be processed over the course of the project, we started by creating a concept governing the modelling of examination regulations itself as well as the process from modelling to deployment. Using Business Process Modelling Notation (BPMN), we “standardized“ both the graphic visualisation and the modelling and transferring process for the project.

Why Business Process Modelling Notation was chosen, and how it applies to the modelling of examination regulations in particular will be explained on the basis of the selection process and the exemplary models for examination regulations, quality control and deployment.

Project Campus IT is responsible for the technical realisation of the Bologna-Process within the University of Erlangen-Nuremberg, modelling examination regulations in HIS GmbH’s examination management system HIS-POS. HIS GmbH, located in Hannover, Germany, is national market leader for university administration IT solutions.

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2. ERLANGEN MEETS BOLOGNA

In the course of implementing the Bologna Process, a number of new examination regulations for Bachelors' and Masters' degrees were passed which needed to be converted into the electronic examination management system. Since the amount of work could not be handled by the examination office alone, and since an implementation in a short period of time was necessary, Project Campus IT was charged with the technical realisation.

3. TARGET / ACTUAL ANALYSIS

How to approach a pile of examination regulations on your desk that needs to be converted into an electronic examination management system as soon as possible? Our task was to answer this question, taking into account existing restrictions and new requirements.

During the allocated time of six months, about 70 new study and examination regulations needed to be integrated into the examination management system. Since all of the examination regulations contained one or more courses of study, a total of about 140 "exam relevant" courses of study needed to be represented by Campus IT.

Another requirement was representing the examination regulations in such a way that they were easily comprehensible to members of the examination office. Since examination regulations so far were only available in written form, and only some of them were in a structured tabular form, a solution had to be found to both represent the mapped structures and make them as comprehensible and clear as possible

Due to the tight schedule for mapping the examination regulations, the creation of a set of well-defined rules was necessary. These "work policies" were defined at the project's start, and were made clear to all participants. The guidelines concerned numeric systems, graphic documentation for the mapped structures as well as the steps from test system to active operations.

Since the project's team was employed only temporarily, and the mapped examination regulations and their further maintenance were to be handed over to the examination office afterwards, documentation had to be easily comprehensible to both professionals and "normal" officials at the examination office.

4. PHASES OF CONCEPT CREATION

Creating a logic for mapping examination regulations

The decision for a mapping logic was based on a detailed comparison of the available study concepts and the different subjects' examination regulations. Special attention was given to links between the courses of studies, shown by the use of the same examination modules for different courses of studies and degrees. The study showed that both modules and partial achievements can be used for different courses of studies and degrees.

After consulting with HIS GmbH, the decision was made to use a pool-based representation. The term refers to a mapping structure with three levels: a pool of examinations for actual examination results, a pool of modules for all modules and the actual courses of studies. Allocating actual examinations to modules defines the composition of the modules. In the same way, structural composition of courses of studies is defined by the allocation of modules.

This logic for mapping has several advantages: Modules can be used several times in different courses of studies, and exams can be used in different modules. This results in a lower workload for both initial mapping and maintenance. A consistent, system internal numeric system for use with this mapping logic was also implemented (Grimm, 2007-07).

Choosing BPMN as a mapping notation

In keeping with the proverb „A picture is worth a thousand words“, Campus IT decided that a graphical representation would be the easiest and most comprehensible form of documentation. For a theoretical approach, it was decided to use "Business Process Modelling Notation" (BPMN). This specification language, a standard for process modelling recognized by OMG in 2006, focuses on the

graphical representation of process flows. It makes use of four different categories of elements (Object Management Group, 2006-02). For representing the examination regulations' structure each part of the regulations was allocated a notational element.

Transforming BPMB elements for examination regulations

Flow Objects

Flow Objects in BPMN contain *activities*, *gateways* (decisions) and *events*. *Activities* are represented by rounded-corner rectangles, *gateways* by diamond shapes and *events* by circles. *Activities* are used to represent elements of examinations (partial achievements, modules, accounts); *gateways* and *events* are - in our case - not used for mapping the examination regulation structure.

Connecting Objects

Connecting objects join different tasks. *Sequence flows* are represented with a solid line and arrowhead and show the order in which tasks are performed. *Message flows* are used to represent communication between different activities. For mapping examination regulations, only *sequence flows* are used. They show correlations between different elements of the examinations.

Swimlanes

Swimlanes are elements used for organising and categorising activities. If a system needs to be divided into subsystems, several *lanes* can be combined into a *pool*. In the context of examination regulations, *swimlanes* are used to represent the different courses of studies in which elements of the examinations are created.

Artifacts

Artifacts are used to visualise additional information. In addition to *annotations*, there are *group* and *data objects*. For mapping examination regulations, *annotations* are used when additional explanations are needed, *groups* are used to differentiate between the different courses of studies.

Transforming BPMB elements for examination regulations

After a detailed analysis of the given examination regulations, three basic types could be discerned, differing in their final degree: Courses of studies ending with a Bachelor's degree with one or two majors, and courses of studies for teacher education. For each of these three types, a key was created as a guideline for mapping.

Bachelors degree with one major subject

The simplest type of courses of study was found to be Bachelors with a single major. This type needed only very few rules for mapping.

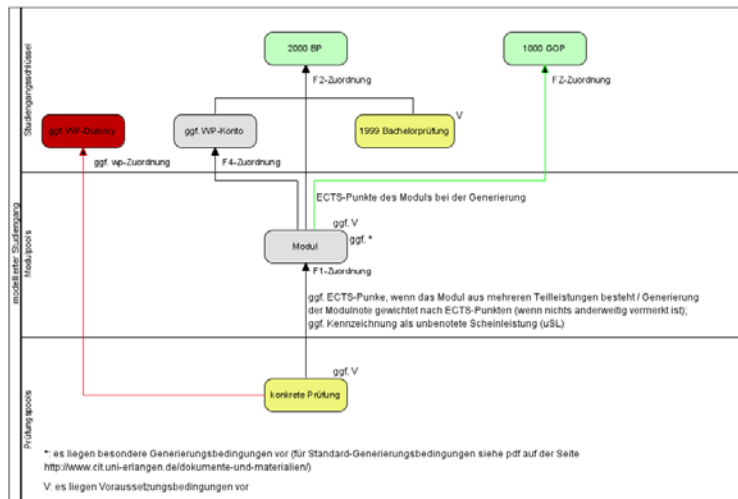


Figure 1: Mapping structure for single major courses of studies. (Campus IT, 2009)

This model for single major bachelors can, with a few modifications, also be used for Masters' degrees.

Bachelors with two major subjects and teaching degrees

For Bachelors with two majors, the rules are more complex. Due to the size of the graphics, they will not be displayed here, they can, however, be viewed online.

For teaching degrees, the different types of schools (primary school, as well as the three branches of the German secondary school, Hauptschule, Realschule and Gymnasium) were each mapped in their own model. In complexity and structure, they are similar to Bachelors with two majors (Campus IT, 2009).

5. VALIDATION AND TRANSFER OF EXAMINATION REGULATIONS INTO A THREE COLUMN ARCHITECTURE

Campus IT's basic architecture is a three column model (Roas, 2007-07). In addition to the live system, there are two identical copies: the development system and the test system. This configuration allows for improvements and adaptations of examination regulations without disrupting running operations. Based on this architecture, a concept was developed that allows for transfer of modelled and tested examination regulations between the columns. This process was defined to be an internal standard for the modelling of examination regulations.

Examination regulations are first approved by university administration and then assigned to one of the modellers on the team responsible for mapping. The modeller then analyses the examination regulation, gathers missing information from the office responsible for the course of study if necessary and informs the examination office about the initialisation of the modelling process. The analysis's result is documented graphically before the modelling of the examination regulation is started within the development column. After tests and internal approval, the modelled examination regulation is moved to the test system, where the examination office checks it for correctness and completeness. With the office's approval, the model is then moved to the live system. The modelling process is then concluded by documenting it and informing the examination office about the completion of the process.

This process was modelled using BPMN, and was defined as standard for transferring newly modelled examination regulations from development system to live system via test system. It is consistently used by the Campus IT team.

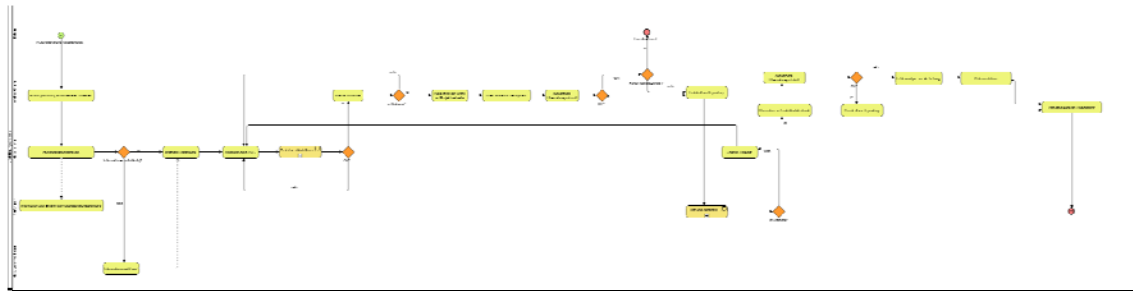


Figure 2: Process of Modelling and Transferring examination regulations (Campus IT, 2009)

6. CONCLUSION

The concept for documenting examination regulation modelling introduced here has been used by project Campus IT since the beginning. The graphical documentation of examination regulations in particular found a high degree of acceptance. It was published on project Campus IT's website and makes daily work with the regulations easier for the officials. The process for validating and transferring examination regulations with a three column architecture also proved to be well suited. Multiple control instances within the team, as well as inspections by the operating department, guarantee a repeated quality control from different angles and a validation of the mapping structure. With this multilevel process, standard cases can be tested as well as special cases occurring in daily practice which often only the officials know about. Based on experience so far, both concepts introduced here will be adhered to in the future - both for introducing new and for changing old courses of studies.

7. REFERENCES

- Campus IT (2009): Dokumente und Materialien, <http://www.cit.uni-erlangen.de/dokumente-und-materialien/>, (last visited: 2009-05-25)
- Grimm, Andrea (2007-07): Abbildungslogik für Studiengänge festgelegt, <http://www.cit.uni-erlangen.de/nc/blog/detailansicht/meldung/abbildungslogik-fuer-studiengaenge-festgelegt/>, (last visited: 2009-05-25).
- Object Management Group (2006-02): Business Process Modeling Notation Specification, <http://www.bpmn.org/Documents/OMG%20Final%20Adopted%20BPMN%201-0%20Spec%2006-02-01.pdf>, pages 297 pp.
- Roas, Stefan (2007-07): Systemarchitektur, <http://www.cit.uni-erlangen.de/nc/blog/detailansicht/meldung/systemarchitektur/>, (last visited: 2009-05-25)