

Experiences and Results from Tailoring and Deploying a Large Process Standard in a Company

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Abstract

With increasing process maturity of the software-developing companies, an increasing interest in standardized processes can be observed. Company-specific standards are often derived from reference standards such as ISO/IEC 12207 or the German V-Modell XT. Developing and deploying a (new) company-wide standard is a challenging task with many obstacles. Many efforts in defining and deploying standard processes in a company do not result in sufficient adherence between the defined and the lived (i.e., the enacted) process. Such situations have severe consequences, e.g., it is not possible to measure processes. Published experience with process definition and deployment projects is often anecdotal or incomplete. This paper describes the adaptation of a generic process standard to an organization and its deployment to daily practice. In this article, the approach taken for adapting and deploying the V-Modell XT in the data processing department of the German Josef Witt GmbH is described. Additionally, effort data and lessons learned with respect to these activities are given. Finally, effects visible so far are sketched.

Keywords

Process definition, process standard, process adaptation, process deployment, experience, lessons learned, success factors.

1 Process Standards in Industry

In recent years, the trend of introducing and optimizing defined process models for developing software-intensive systems in companies and other organizations has gained momentum. This is motivated by a plethora of different reasons working alone or in combination. These reasons include, in particular, (1) the increasing maturity of companies, which – for a certain level – demand defined processes, (2) the need for defined and possibly certified processes to acquire external orders and to prove the quality of development processes, (3) the increasing complexity of real-world development processes, especially in terms of interdisciplinary development with other disciplines such as mechanical engineering, (4) the increasing (global) distribution of development processes, which demand a coordinated approach, especially at the interfaces.

Potential advantages of defined processes in organizations include – among others – high development productivity, the ability to (better) plan development projects, usage of experience from past projects, and support regarding the coordination and cooperation of developers. Apart from this, explicit and instated process models are a necessary prerequisite for continuous, metric-based process improvement, because only such process models allow for instrumenting processes with process metrics.

Since development processes are mostly human-based and, in the software area, depend strongly on the development context, there are no ideal or commonly applicable development processes. Selecting suitable processes normally depends on the respective development context and project goals. For example, the criticality of the software to be developed and its maintenance period have a distinct impact on the development documentation necessary. According to this, it is important to carefully distinguish the different process models, e.g., in terms of agility or discipline. Likewise, when introducing such a process model, it needs to be adapted to the development context. Furthermore, it is necessary that defined processes are followed and improved continuously. In practice, this means that existing and often implicit processes need to be changed gradually towards defined target processes, which poses great difficulties, because with this task comes the necessity to change human behavioral patterns. Simply prescribing pre-defined process standards has not been successful in practice.

There are different ways to establish a defined and followed development process within an organization. For one, this depends on the goals of the organization with regard to process management. Another important point is organization maturity. Three substantial goals concerning process management measures are *improvement*, *certification*, and *process harmonization*. If *improvement* is the goal, then the interest in process models is usually triggered by acute problems with the daily business, e.g., many defects surfacing after delivery or many late requirements changes. If *certification* following a standard is the goal, several reasons may be identified as triggers. For example, certain certifications are often necessary prerequisites to acquiring an order, for example, a SPICE certification within the automobile industry, or its equivalent for the V-Modell XT in the German public administration. Certifications may also be actively used as a recommendation for certain tasks, because a certification identifies (or rules out) potential weaknesses compared to a reference model. Finally, *process harmonization* often seeks to integrate different organizational units and to facilitate their cooperation. This may be the case after acquisitions or following quick growth. A uniform understanding of the process and a uniform vocabulary enable these units to work together effectively.

Organization maturity considerably influences the approach of introducing and evolving a process: for example, if a new development branch is set up within an organization, or if organization maturity is so low that even implicitly followed processes do not exist, it may be wise to use a domain-specific process template as a starting point, adapt these processes, and then use the adapted variant of the standard within the organization. Such process templates may be ISO/IEC 12207 or the V-Modell XT. In case the templates do not fit the organization's domain, one may still use the process architecture (i.e., the meta-model) without the concrete processes, in order to achieve a common notation to describe process entities and their interaction. More mature organizations with defined and established processes usually cannot be improved by simply modifying their processes towards a prescribed, external process model. This approach only makes sense in some exceptional cases, e.g., concerning standards for process interfaces. For example, changing from one development technique to another

may pose substantial risks. If a mature organization is forced by external powers to comply to some standard, there normally exists the possibility to provide a mapping between the organization-specific processes and the ones of the standard, thus demonstrating a sufficient equivalence between both and thereby proving process conformity.

Depending on the goals of process management and organization maturity, different measures are necessary to introduce defined and followed processes into an organization. Particularly if process standards external to the organization are to be introduced, such measures have been found to be extremely important. An unadep approach will almost certainly lead to negative provisions with developers concerning usage of the processes, and have a lasting negative effect on the success of the measure.

This article describes a two-phased approach to adapt the German V-Modell XT [Koo06], a process standard supported and demanded by the Germany government, and introduce it into industry practice. The experience gained shows that it is by far not sufficient to systematically develop a company-tailored variant of the standard, but that equal efforts need to be invested into getting the organization to use the tailored standard.

The paper is structured as follows. Section 2 gives some related work. Section 3 explains the adaptation of the process standard and its subsequent deployment at Witt. Section 4 describes lessons learned during the project, and Section 5 discusses the experience and gives an outlook on the process future at Witt.

2 Related Work

In a five-year study conducted at Ericsson AB (Sweden), 18 process improvement projects were accompanied [BM04]. The main influence factors on project success identified were *process push*, which originates from the process deployment group, and *practice pull*, which comes from the people who execute the process. [KK00] presents a framework for process deployment used by Nokia. lists as one important success factor a helpdesk facility for employees who have difficulties with the new process. [O'H00] stresses the importance of early and active involvement of the affected employees, as well as their continuous mentoring during and after process deployment. The meaning of strong management commitment and a high level of transparency and employee involvement when designing and deploying new processes is reported in [HA05]. presents five major influence factors with high relevance as a result of a comprehensive literature study concerning influence factors on organizational change during software process improvement programs.

[Bec04] describes a method for the systematic elicitation and documentation pf process knowledge in descriptive process modeling. A common overview of software process modeling is given in [CKO92]. Finally, new processes are often based of or replace already existing ones. An approach to automatically compare old and new processes in order to identify changes is described in .

3 Selecting, Adapting, and Deploying a New Process Standard

3.1 Goals and Context

Josef Witt GmbH is a medium-sized (2.200 employees) mail order business in the clothing domain within the Otto group (123 companies, 55.000 employees). IT services are an integral part of the group – outsourcing IT to external service providers would only be possible to a limited extent because of the necessary flexibility and detail of knowledge of the business processes. Therefore, most of the development work is done internally. The Datenverarbeitung (data processing) department sequentially performs about 60 projects every year with 80 employees. These projects are in the range of 20 to 2000 person days. Besides projects, a multitude of so-called “Tasks” are realized. Every year,

about 200 of such mini-projects are executed, covering all kinds of maintenance work. Tasks have two distinct features: low estimated effort (up to 10 person days) and low complexity.

For several years, the V-Modell 97 (the predecessor of the V-Modell XT) has been used for all projects. During this time, this has proven to be the source of a number of problems. Since the V-Modell 97 had been created mainly for development work for public clients, it was suitable only partially for typical Witt projects. For example, many project types common for Witt (e.g., infrastructure projects of the systems department) were not covered at all by the V-Modell 97. At the same time, the tailoring abilities of the V-Modell 97 are not exactly great, either, so that a lot of effort is required either for adapting the V-Modell 97 or during project execution with a suboptimal approach. Because of these problems, the search for a new process standard was started in 2004.

The goal was not certification according to a specific standard, but to find a stable basis, onto which a Witt-specific process standard could be developed. While the V-Modell 97 lacked the required features, its successor, the V-Modell XT, provided them, in particular through its good support for tailoring the process. The V-Modell XT is a process model for planning and realizing (software) development projects. It is designed as guidance for planning and executing development projects, considering the entire system life cycle. It defines the results to be achieved in a project and describes approaches for developing these results. In addition, the V-Modell specifies the responsibilities of the participants. Thus, the V-Modell describes in detail "who" has to do "what" and "when" within a project [Koo06].

At the same time the decision in favor of the V-Modell XT was taken, Witt joined the BMBF-funded research project V-Bench [Fra06], which concentrates on the adaptation of the V-Modell XT and its application in industrial contexts. This way, Witt profited from the direct interaction with the V-Modell XT project team, e.g., for model adaptations and coaching purposes. For the V-Modell XT project team, on the other hand, Witt provided valuable data concerning the usability and quality of the V-Modell XT. Further goals of the new Witt-specific process standard, besides the optimal support of Witt projects, were the adaptation of the existing tool landscape for project management, configuration management, and software modeling to the current project situation. In addition to that, all tools should work in a V-Modell XT-aware manner, i.e., support the creation of the necessary documentation. One major goal throughout the entire project was to ensure user acceptance of the V-Modell XT in order to really use the new process standard, and not to produce a big book that nobody ever reads.

The V-Modell XT is neither an assessment standard, nor a capability maturity model. Therefore, the goal of the Witt V-Modell XT project was not to become a certified Level-3 company. Its intention was purely to create and deploy a company-wide standard software process. Likewise, measurement issues besides effort and duration were mostly neglected and will be addressed in future stages.

The project was controlled through a series of Jours Fixes, where the complete project team would meet and discuss work done so far, identify problems, devise solutions, and fine-plan the increment until the next Jour Fixe. Another important topic was to process the problems and suggestions list. About 20 Jour Fixe dates were fixed at project start, taking into consideration the fact that the concept and process design phases required more coordination than the later phases.

3.2 Creating a Custom Process Standard

This chapter describes the steps taken on the path from the generic standard as provided by the V-Modell XT to the Witt-specific process standard (see Figure 1). The steps are explained in the following sections.

3.2.1 Analysis Phase

During analysis of the current working procedures, projects of the past five years were analyzed for repeating, similar parts

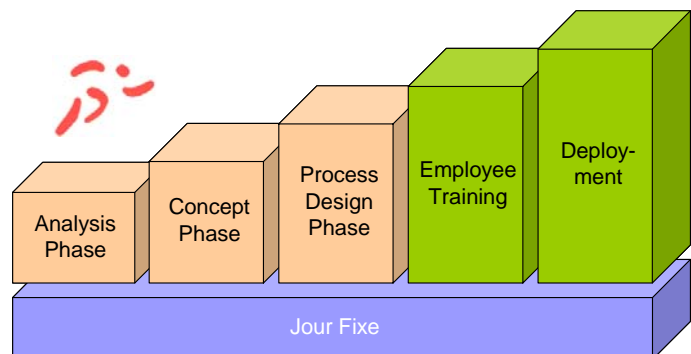


Figure 1: Project Structure

and for variations. The results of this analysis were used later in the definition of the Witt-specific project templates. Data collection was done by means of questionnaires that were filled in by Witt employees, by interviewing key personnel, and through discussions within the Witt V-Modell XT project group. In total, 15 questionnaires were filled in by 25 people. Interview partners were mostly project managers and software developers. One major output of the analysis were the strengths and weaknesses of the current development approach within Witt. This output was later used to incorporate improvements into the new process standard. For example, one weakness identified was project manager overload with too many and too unspecific tasks. Other weaknesses included too little quality assurance at some points and sometimes different considerations of projects of different departments.

In a second step, the generic V-Modell XT was analyzed for features that depicted the current approach at Witt. The features identified were marked for direct transfer to the Witt-specific model, while features with no direct match were evaluated as to whether they were necessary or could be left out. Finally, necessary changes to features were identified. The whole analysis phase took about five months.

3.2.2 *Concept Phase*

The goal of this phase was to model the new Witt processes and to create a mapping to V-Modell XT concepts and terminology. The starting point was the identification of the project types relevant for Witt. Besides client-server-development projects, these were projects concerned with mainframe development, system operation projects, and projects for the introduction of new technologies and methods. Except for the client-server-development projects, which were widely equivalent to V-Modell XT's software development projects, none of the project types relevant for Witt were foreseen within the V-Modell XT standard. Thus, creating them was necessary.

The project types were created according to the V-Modell XT rules. Quite a number of work products required by the V-Modell XT were already instated in some form or another at Witt. Therefore, wherever possible, the existing products were used and/or adapted, in order to facilitate the transition to the new processes for the developers. All conceptual work was done in the form of workshops. Participants in the workshops included – depending on the project type being discussed – the future users, management, the coaches from TU München [TU 07] and MID GmbH [MID07], and Witt's V-Modell XT project team. Only by incorporating all these stakeholders into the efforts could it be assured that all parties had a common understanding of the new processes and therefore would fully support them. This phase took about three to four months, during which time a two- to three-day workshop was held about every other week.

3.2.3 *Process Design Phase*

The initial process structure in the form of V-Modell XT process type descriptions created during the concept phase was filled with life during the process design phase. For example, descriptions for all concerned process elements (products, activities, roles, milestone plans, ...) had to be adapted or newly created. This work was mainly carried out by the future users of the respective elements. For example, members of the system operations group were responsible for the elaboration of the activity "hardware exchange", while "software development" was elaborated by the software developers of the data processing department. The core activities (project management, quality assurance, configuration, control, and change management), on the other hand, were copied mostly unchanged and only partially adapted or expanded, to suit Witt's needs.

During process design, the future users of the process were explicitly included in the ongoing work. This was done to achieve better identification with the new processes and thus, better acceptance of the new process as a whole. Another step into this direction was the decision not to use V-Modell XT's project assistant's ability to generate document templates, but to create Witt-specific templates based on Word and Excel. The goal behind this was to create more user-friendly templates than the somewhat limited abilities of the project assistant would allow. For example, the standard V-Modell XT templates for product descriptions were amended with tables, macros and fields. Experience collected during process deployment later showed that these individually crafted templates had a major influence on V-Modell XT's acceptance.

Problems encountered. The only serious problem during process design was to maintain a uniform

look and feel of the many descriptions, despite their many different editors. In order to achieve this, a style guide was developed in advance to mitigate this risk. The style guide described the structure and format of all texts developed and was applied consistently throughout the phase. Because of the many editors who had to be coordinated, the process design phase was the most effort-prone phase of process adaptation. It took about five to six months to complete.

3.3 Deploying the Customized Process Standard

3.3.1 Employee Training

Since the newly defined Witt process meant major changes in many daily activities of the data processing department, a detailed concept for training and deployment was devised. This included information events before actual deployment, “guided tours” through the new process for all employees, as well as role-specific training units for certain groups of employees. During these training units, nine different roles were educated in terms of methodology and (new) tools used. Special trainings addressed the tools INNOVATOR [MID07], Dimensions [Ser07], Augeo , and QA-Center [Com07], and were held for specific employees, in cases where the common or role-specific trainings did not contain the respective parts. In addition to the data processing department trainings, all affected departments within Witt that were taking on the customer role were informed about the new process and trained as well. A supplementary newsletter was established, keeping all Witt employees posted about new developments and “breaking news” in the Witt-V-Modell XT area.

The training measures required significant effort to be spent. In numbers, 56 person days were spent for the common information events and the guided tours. Role-specific trainings required about 140 person days, and the additional tool trainings consumed another 42 person days. In total, 238 person days were spent to train about 80 data processing department employees and the required personnel in the (customer) departments of Witt (about 20 additional people). The training phase took nine months to complete and was held in parallel to process design and process deployment.

3.3.2 Process Deployment

Deployment of the new process was achieved in a project-based manner. This means that new projects starting after an appointed date were carried out using the new process, while already running projects were not converted. This approach minimized friction losses during deployment and, at the same time, ensured consistent application of the new process. Especially during the first weeks and months of using the new process, many questions surfaced amongst the affected employees. This was anticipated, because it was clear that the trainings dispensed the formal knowledge required, but its application in the daily project business was not always easy. To cope with this, a helpdesk service was provided from the first day, which could be addressed in case of any questions and problems with the new process. The helpdesk service was provided by the V-Modell XT development team and thus had expert knowledge about the new process. At the same time, a problem and suggestion list was established, where any employee could add problems, inadequacies, and unclarities sensed within the V-Modell XT, and also make improvement suggestions. The list was processed at every Jour Fixe, so that every employee got timely feedback to his or her list entries.

Both offers – helpdesk service and problem and suggestion list – were accepted right away by the employees, and used intensively. The collected feedback suggests that because of these two measures, employees never had the feeling of being left alone in front of a pile of new concepts. At the same time, integrating employees into process customization through the problem and suggestion list provided valuable improvement feedback, which already led to significant enhancements of the originally devised process. Both helpdesk service and problem and suggestion list have been continuously supported in the stabilization phase (since April 2006), whereas helpdesk usage has been continuously declining with increasing employee routine.

4 Lessons Learned & Success Factors

4.1 Overcome Resistance

At the beginning of the project, many employees were skeptical concerning the new process. Often, changes were opposed with statements such as “the V-Modell XT does not fit our situation”, “everything is different here”, “why change anything, it is working all right”. This fear of the unknown, respectively of changes, was not unexpected, but partly surprising in its intensity. Eventually, these fears were removed through a combination of different measures with the goal of maxing out the transparency of the changes that were going to happen. For example, information concerning upcoming changes was dispensed to employees constantly, during the process customization phase as well as during deployment. At the same time, employees from all departments were integrated into the different project phases all the time, so that the new process also was a result of their efforts right from the beginning.

4.2 Ensure Support Services

Providing contact persons for questions and problems at any time turned out to be another important success factor. The trainings provided knowledge about the “tool” V-Modell XT and a “user manual” for its application all right, but actual usage in daily business turned up many stumbling blocks. In the end, most of these stumbling blocks were removed only through intensive mentoring of all affected employees. Mentoring was done through various means: A “V-Modell XT fibula” provided help in a number of everyday situations. In addition to that, a helpdesk service was established, which provided a V-Modell XT hotline for answering questions and providing further assistance in case of problems. This support ranged from pointing people to suitable templates to assistance in creating a (new) document for the first time.

4.3 Keep Proven Concepts

A third significant success factor was to not replace everything by default, but to always keep the benefit in focus. For example, it was necessary to unify role definitions across the entire Witt data processing department in order to reach the goal of implementing consistent project execution, leading to major changes in some areas. On the other hand, the document templates provided by the V-Modell XT, resp. its tools, were not transferred to Witt, because the templates already in use were more comfortable to use. Rather, the existing templates were cautiously adapted where necessary, without altering the look & feel known to everybody. This led to a high rate of recognition amongst employees and, as a consequence, better acceptance of the partially new templates.

4.4 Management Commitment

Last but not least, string and continuous management commitment was another decisive factor for the success of the V-Modell XT project at Witt. In the end, the project consumed more than marginal effort (see Figure 2). The support demonstrated by management made the importance of the project visible to the employees on the one hand, and on the other hand, relieved the project team of unnecessary financial fights, distracting it from its real duties of designing and deploying a new standard process. The key was trust: The management trusted the project team that it would do their job properly, and the project team trusted the management that it would get the needed resources.

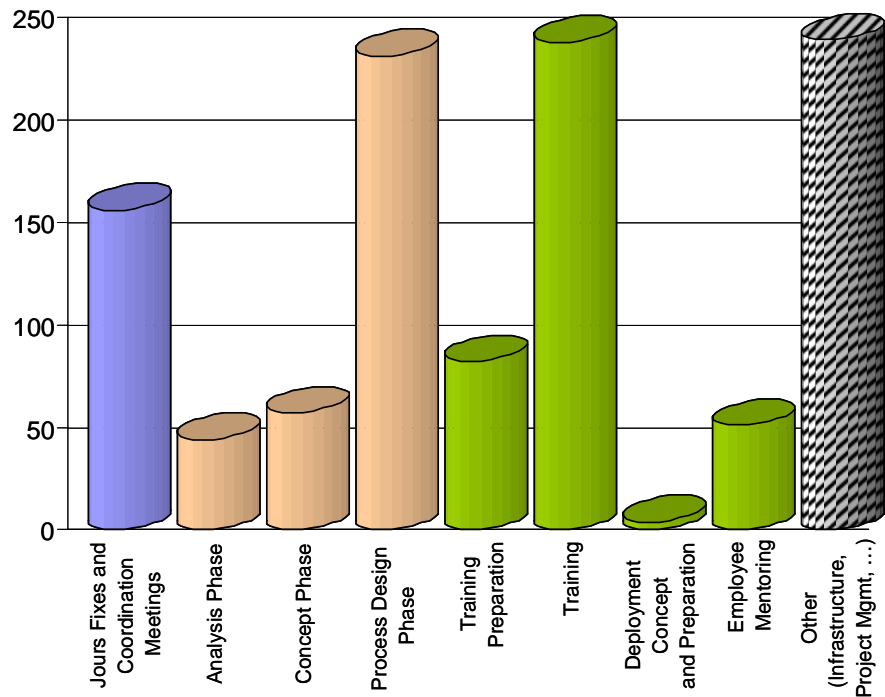


Figure 2: Effort spent

5 Discussion and Outlook

The main advantage Witt gained through its specific V-Modell XT instance is the unified, consistent process applied throughout all projects. Every project uses the same terms, document templates, role names and definitions, etc. – this started saving enormous maintenance and communication effort right after the deployment of the new process. In addition to that, all people involved profit from the clear (process) interface definitions that clearly describe all activities. The precise definition of the customer/supplier interface especially helps to make the Witt-internal relationship of the departments to data processing explicit and unambiguous. Since the V-Modell XT prescribes the documentation of all activities, this documentation has stopped to depend on the respective person carrying out the activity. This led to every project being documented similarly, simplifying cooperation amongst different groups and departments enormously, as well as facilitating the management of these projects. Altogether, the following reports gathered from literature could be confirmed during development and deployment of the Witt-specific process:

- At the beginning, many people have a skeptical to negative attitude.
- This problem may be remedied with lots of information, transparency, and especially contact persons in case of problems.
- Active involvement of employees in process changes yields valuable information for further improvement and, at the same time, helps to reduce resistance.
- A goal-oriented approach that only changes things if this is definitely beneficial for reaching the goals helps to reduce the number of changes and increases their acceptance.

- Management commitment throughout the whole process definition and deployment project is essential for the success of the project.

Currently, the project is in its stabilization phase. Therefore, not all benefits expected from using a standard process model have set in with full effect. Nevertheless, the following benefits have already surfaced:

- The binding character of the new process model helps in many project situations. This applies to the flow of activities as well as to the perception of the defined roles. This helps to reduce unnecessary and time-consuming coordination activities.
- Currently, projects are running as fast as before the process changes. Nevertheless, the improvement potential is clearly visible and is being systematically exploited.
- Identification of employees with their roles is already clearly visible.
- Project quality has clearly improved already. Project and product documentation are both much better than with the old processes.

Besides the benefits gained through the new process, it has become apparent that the ability to leverage these benefits strongly depends on the employees' acceptance of the new process. The heavy focus on the deployment aspect (as can be seen by the effort spent during the different phases in Figure 2) throughout the whole project has proven to be the right decision, and has led to a smooth transition to the new processes. Taking a close look at Figure 2, it becomes apparent that the effort for training and deployment (green columns) exceeds the effort spent on process analysis and design (orange columns). In fact, training and deployment consumed about 370 person days, whereas analysis and design required about 330 person days. These numbers average to about 3.7 days of training, deployment, and mentoring effort per person affected, including the effort for both "teachers" and "students". Considering total effort, about 5.5 person years were spent to develop and deploy the new process for 100 affected people.

After about one year of doing project work with the new process, almost all employees are convinced of the benefits of the new process and do not want to go back to the old processes. The Witt-internal project "V-Modell XT" has been completed in the meantime. A maintenance project for the process, which evolves and further optimizes the process, has been started and attached seamlessly. There still comes in a constant stream of improvement suggestions from employees, which are regularly evaluated and implemented. Just like the software systems developed and maintained by the data processing department at Witt, the process also lives. And like the software systems, the process also must be adapted to new challenges, in order to ensure the current level of performance and to improve it in the future.

Current activities, besides systematic adaptation and maintenance of the company process, focus on the definition, collection, and usage of measures in order to gain quantitative insights into the (new) process. We will report on this in a future paper.

6 Literature

[BM04] A. Börjesson, L. Mathiassen: Successful Process Implementation, In: *IEEE Software* 21 (4), S.36-44, 2004.

[Bec04] U. Becker-Kornstaedt: *Prospect: A method for systematic elicitation of software processes* 2004.

[CKO92] B. Curtis, M. I. Kellner, J. Over: Process modeling, In: *Communications of the ACM* 35 (9), S.75-90, 1992.

[Com07] Compuware Corporation: *Compuware Homepage*, last visited 2007-03-16. URL: <http://www.compuware.de/>.

[Fra06] Fraunhofer IESE (Konsortialführer): *V-Bench - Prozesseinführung und -reifung in der industriellen Praxis*. URL: <http://www.v-bench.de>.

[HA05] B. C. Hardgrave, D. J. Armstrong: Software Process Improvement: It's a Journey, Not a Destination, In: *Communications of the ACM* 48 (11), S.93-96, 2005.

- [KK00] T. Kaltio, A. Kinnula: Deploying the Defined SW Process, In: *Software Process: Improvement and Practice* 5, S.65-83, 2000.
- [Koo06] Koordinierungs- und Beratungsstelle der Bundesregierung für Informationstechnik in der Bundesverwaltung im Bundesministerium des Innern (KBSI): *V-Modell XT*. URL: <http://www.vmodellxt.de/>.
- [MID07] MID GmbH: *MID Homepage*, last visited 2007-03-16. URL: <http://www.mid.de/>.
- [O'H00] F. O'Hara: *European Experiences with Software Process Improvement*. Proceedings of the 22nd International Conference on Software Engineering (ICSE'2000), Limerick, Ireland, 2000.
- [Ser07] Serena Software GmbH: *Serena Software*, last visited 2007-03-16. URL: <http://www.serenainternational.com/DE/home.asp>.
- [TU 07] TU München: Willkommen an der Technischen Universität München, last visited 2007-03-16. URL: <http://portal.mytum.de/welcome>.