Multi-perspective Cooperation based on Boundary Objects

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Abstract—Boundary Objects (BOs) are means of communication support for teams. In eLearning projects, teams usually consist of people with diverse professional backgrounds and different experiences. Due to this fact, team members have different perspectives on the eLearning product or service to be developed – eLearning system development thus becomes a complex and demanding task. Using specific BOs in a purposeful way can help people to communicate and support interaction between team members. Amongst others, process models, scripts, patterns and architecture models have been investigated as BOs for eLearning system development.

Keywords: Boundary Objects, Communication Support, Development

I. INTRODUCTION

A very special aspect of eLearning is the fact that teaching and learning systems, teaching and learning content, teaching and learning environments and all the supporting parts of a system have to be developed by multi-disciplinary teams. E-Learning teams usually consist of computer scientists and experts from the application domain, often also experts from educational sciences and/or psychology participate, same as media design experts, and potentially also the users of the system, i.e. the teachers and the learners. Each one of these “experts” has a different perspective on the eLearning system, which is completely natural due to their different professional background. Mainly three different perspectives occur: the disciplinary perspective (related to the participant’s professional education), the branch perspective (reflecting e.g. a learning tradition), and the role perspective (related to the participant’s current role, e.g. industrial partner or learner). Each perspective influences and steers eLearning system development – either deliberately or (which is even more complex) not deliberately. Whereas the different perspectives and missing communication about these perspectives can in the worst case hinder and aggravate eLearning system development, diverse Boundary Objects (BOs) can be used to facilitate and support teamwork. The choice of the appropriate BO can support the development process in clarifying perspectives and roles. In the following, we will introduce the concept of BOs, and describe three exemplary BOs, which we have used and tested in multi-perspective teams.

II. BOUNDARY OBJECTS

In Human-Human-Interaction, a set of different media is used for supporting communication, coordination and collaboration with the goal to “find a common language” and to avoid the three “mis-”, i.e. misunderstanding, misinterpretation and misconception. Means for supporting interaction of teams may be conceptual, technical or structural. They can be methods or tools. Means which can be used to support communication between humans are called Boundary Objects (BOs) according to [1] – they provide help at the “communication boundary” [2]. Such a boundary is easily located when experts with different professional background work together, e.g. in eLearning system development.

The multi-disciplinary situation found in eLearning system development can best be related to the “communities” [3], [4] concept which separates into communities of practice (CoP) and communities of interest (CoI) [4], [5]. Communities of Practice are groups of people which have a comparable professional background, which have the same goal, and which usually work in a similar environment. In contrast to CoPs, the communities of interest consist of individuals having a different professional background but working towards a common goal (e.g. [6], [7],8). In CoPs the communication problems are structured differently than in CoPs. Usually, in CoIs communication problems are more difficult to identify than in CoPs, as the group members tend to speak a “different language”.

III. BOs FOR E-LEARNING

The BO “Process Model” can be found in diverse disciplines and also in e-Learning system development, e.g. [9], [10]. The process models used as an BO are abstract descriptions of an idealized e-Learning system development process, and allow for structuring project
work. They differentiate between participants, roles of the participants, the activities which have to take place, and other related resources, e.g. methods, tools and standards [11], [12], [13]. The process model has been used as a BO in the development of an eLearning environment for hotel staff, which should train behavior at the telephone. The project team consisted of an hotel manager, an educational science expert for vocational training, some computer scientists, and one designer. With this team, we have the classical CoI situation. Initially the comparably strict structure of the process model has been a source for irritation. However, during project lifetime especially this aspect has shown its benefits. Major problems have been related to the fact that the process model only gives a basic structure – content and pedagogy have to be invented and developed by the team, leading to the well-known communication problems in teams.

The BO “Script” has its roots in psychology, where they are used to describe schemata of behavior as part of cognitive processes [14]. In computer science, scripts are used to schematically describe the behavior of systems. Fischer et al. explain in [15] that scripts can be seen as boundary objects to support communication in interdisciplinary research in CSCL. An e-Learning script is a schema description of teaching and learning with digital media (e.g. [16], [17]). We have experienced the successful usage of scripts in training with our students as part of project work. Scripts have helped to structure team communication. At the end of the course, the students mentioned that the scripts have helped them “thinking”. However, our test group here has been a CoP, too. Due to the fact that scripts are usually closely related to the application domain, it can be expected that they are not the tool to choose in CoIs.

The BO “Pattern” can be traced back to Christopher Alexander’s much cited work about architecture in the 1970s [18]. Later, the idea has successfully been transferred to software development [19], [20]. In contrast to Alexander’s pattern, which claim to be understandable for everybody, the software pattern have been developed for software engineers – in most cases computer scientists. Patterns for eLearning systems have been described, e.g. by [21], [22]. Our test case here has been the above mentioned development of the medical teaching and training system. We tried to use special purpose patterns for eLearning to ground communication within a multi-disciplinary team, but the result has been negligible. The team accepted the patterns but used them in a rather artificial way – not as basis for the development but as something which should be looked at after design decisions have been made (“is everything all right”). On the other hand, the pattern has been accepted as an easy-to-use means, not only for the computer scientists, but also for the physicians. Thus, our experience with the CoI has led us to the insight, that for eLearning a collection of patterns on multiple levels should be developed. Each level can be used by the related group – there should be patterns for the discipline perspective, patterns for the branch perspective and pattern for the user/vendor perspective. As a first step, we have developed a pattern catalogue [23], where we have combined patterns at diverse levels, starting at the top-level which should be readable for all CoI members, down to the software patterns described in [20]. The development will continue same as the test of patterns as BOs.

The BO “Model of system architecture” have to be used if multiple e-Learning tools and infrastructures should be orchestrated (e.g. [24], [25], [26], [27]). Examples are client-server-architectures, peer-to-peer-architectures, and the broker-architecture. As the system architecture models have their roots deep in computer sciences, they are best used in CoP. If system architecture models become part of the system development process a lot of bottlenecks have been avoided from the first step on. A combination of different approaches, e.g. the system architecture models and the patterns, has led to even better results. However, even if our impression had been that computer scientists should be able to easily grasp the idea of system architectures, a lot of “clearing communication” and explanation has been necessary.

The BO “Mindmap” has been found to be very easy to communicate in CoP and CoI. Even team members who have never before worked with such tools have been able to use and develop mindmaps (admittedly in different quality). Main drawback here is that in most cases, untrained developed a mindmap has put it on the stack afterwards, instead of using it as a basis for development. Here, the project or team leader has to embed the mindmaps in the development process and revisit them in some intervals.

IV. Conclusion

Based on the idea of Boundary Objects for communication support in different Communities of Interest and Communities of Practice, we have investigated several more or less computer science related BOs in heterogeneous groups and project teams. We have established a set of three different perspectives, which we have found in interdisciplinary eLearning development teams. The perspectives have been called the discipline perspective, related to the scientific background of the participant, the branch perspective, related to the organizational branch of the participant, and the user’s/vendor’s perspective, which reflects the end-users and the vendors ideas about the system to develop. The different perspectives on the eLearning system often lead to problems in communication and in system development. This is not only well known in multi-discipline eLearning project teams, but also occurs in other types of projects, and
even in CoP, where people have a similar background and should at least “speak the same language”.

The result of our investigations and on interviews during and after project work have been that a purpose oriented and careful usage of BOs as part of project management can facilitate and support the communication in heterogeneous teams. To call our collection of comparably different approaches “Boundary Objects” has helped us to get a scientific perspective on the project development and steering process, and in purposeful usage of the sketched methods and tools.

However, other problems occurred. Usually, the development of an eLearning project required a separation of the groups, i.e. after some co-ordination phases in the superordinate “e-Learning Col”, small CoI are build, which are reflected by the three perspectives. For example, a team of pedagogy and domain experts develop the system’s pedagogy and content, a team of psychologists designs the empirical evaluation, whereas the computer science team implements the software. Each of these CoIs or CoPs (depending on the group members) uses their own BOs, e.g. computer science experts often use the UML. The problem arises when the teams come back together in their superordinate CoI and should communicate problems and develop or discuss solutions. Here the question arises how to combine BOs and which BOs can best be used for communication of development problems. This question will be part of our further investigations. Our goal is, to have a set of BOs which have been proven and tested in eLearning projects, and can thus be collected and recommended to other teams.

REFERENCES


