The Impact of Patterns on the Exchange of Practical Knowledge

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Abstract Organizations often face the challenge that practical knowledge cannot easily be transferred between practitioners with different degrees of expertise, as there is no way of directly observing good practice, and practical knowledge often only exists in implicit form. This PhD project focuses on the question of how the exchange of practical knowledge can be supported for becoming adaptive to all practitioners. In this regard, we describe how patterns may be used to support sharing practical knowledge. We present the results of a case study that supports the efficiency of patterns. Patterns facilitate the exchange of good practice by leading to more explicit and understandable descriptions.

Keywords: Knowledge Exchange, Practical Knowledge, Patterns

1 Introduction

Organizations are under pressure to use their financial and staff resources efficiently and to improve their own practices constantly. An exchange and reflection of good practice is crucial for raising the occupational qualification of their personnel to the required level and to work successfully [3,9]. But knowledge of good practice is in most cases implicit and not easy to externalize because it is based on experienced work routines which are often carried out unconsciously [8]. For this reason, it is difficult for practitioners to ensure an efficient exchange of practical knowledge, especially when they are dispersed over many different places. A process of reflecting of one's own practice and of advancing practical knowledge will need to be assisted by the organization itself. So the main question of this PhD Project is: how can practitioners be supported by providing conditions for a web-based exchange of their practical knowledge?

This PhD project takes place within the research project PATONGO (Patterns and Tools for Non-Governmental Organizations). The aim of PATONGO is to investigate

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and optimize the web-based exchange of good practices and to develop a common knowledge base using Web 2.0 technologies[2].

2 Theoretical Background

The known approach storytelling which is used for the exchange of implicit knowledge in the context of narrative knowledge management includes the issues that you need an expert for conducting the interviews and face-to-face contact between the interviewer and the interviewee [12]. Furthermore, it is difficult for practitioners to externalize practical knowledge adhering to very specific situations. They need adequate cues for an efficient externalization. Thus, we assume that so-called patterns are a more qualified method for the exchange of practical knowledge in an online context. Patterns are an established form of templates with solutions for recurrent problems and frequently used in software development. They are, so to speak, a re-usable example of problem-solving in similar contexts. Because of the fact that patterns contain a given structure for guiding the processes of writing and reading, they can make exchange of practical knowledge easier.

Exchange of Practical Knowledge. Generally, the larger part of practical knowledge will consist of implicit knowledge about sequences of action [8]. The *externalization* of such practical knowledge is laborious because practitioners have to be aware of their individual sequences of action. From their own concrete knowledge, they will have to draw general conclusions which can then be presented as abstract knowledge and transfer that to other cases. Moreover, *internalization* processes are also a complex procedure and not easy to perform in the everyday working life of people working in the field. They will have to transfer information from an abstract level to a very specific and concrete situation in order to make it adaptive. Both externalization and internalization are indispensible components of what constitutes collaborative knowledge building. Sharing knowledge and consequential collaborative knowledge building (especially in an online context like the project PATONGO) are complex procedures which can be facilitated and supported by patterns.

Patterns for Sharing Practical Knowledge. When experts are confronted with a problem, they will resort to solutions which have proved in the past that they work under conditions with similar problems. The invariant aspects of this solution structure, abstract fragments of individual cases, can be considered as a mental pattern. This unchangeable structure is based on specific problem situations, and the result of repeatedly applying a procedure of abstracting single experiences. Knowledge of this structure distinguishes an expert from a novice [6]. But often such

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practical knowledge is only available in implicit form. This means that experts may resort to this knowledge but are not aware of the problem-solution pair. The aim of the pattern approach is to reduce these complications by externalizing practical knowledge and allocating this knowledge to others.

Based on examples of good practice, patterns collect the know-how of experienced practitioners, including invariant components of recurring problems and their successful solution within work routines [1]. This means that a pattern describes a frequent problem "and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing the same way twice" [1, p. x]. Thus, patterns of successful solutions are used as samples for solving recurrent problems in similar contexts, and they make it possible to externalize implicit knowledge by providing structures to fill in. They support the co-evolution of a user's practical knowledge and of the common knowledge base as they provide the stage for successful communication between these two systems.

The pattern concept is derived from architecture and based on Christopher Alexander's idea to collect samples of good practice as problem-solving examples for their purpose of designing houses and streets by the respective communities [1]. The concept of a 'good practice collection' has been already implemented, e.g., in the fields of object-oriented software development [5,10]. Assuming that using patterns for describing complex software problems leads to improved externalization of knowledge, it seems to be a good idea to share and reflect practical knowledge by using patterns as well.

The documentation of practical knowledge in terms of patterns has been described in an increasing number of contexts but in many cases only based on some inductive theoretical justification of their potential. Only few, not very systematic studies exist reviewing the practical implementation of patterns in a specific field. Although some practical derivations of a pattern concept exist, and it is plausible that the pattern approach is efficient, there is no theoretical framework so far and no empirical evidence of the mode of operation of patterns. What has been missing so far is an explicitly cognitive point of view at the pattern approach and its practical implementation in different fields.

Patterns from a Cognitive Point of View. During the act of composing their texts, writers are guided by distinctive processes of thinking, like rhetorical considerations, their own long-term memory and individual writing processes. The main difficulty of such a writing process is to become aware of one's own rhetorical situation. Relating to the exchange of practical knowledge, the authors of good practice descriptions will first have to become aware of their own knowledge in order to be able to externalize it effectively. But retrieving information from the implicit part of one's own long-term memory is a difficult process. For this reason there is a need for "finding the cue that will let retrieve a network of useful knowledge" [4, p. 371]. We assume that patterns can support these awareness processes by preparing structures for reflecting and scrutinizing one's own actions and behaviors. But to be able to do that, writers have to reorganize the retrieved information because it contains an individual structure and may in this form not match what readers need. Authors of good practice descriptions have to review and edit their practical knowledge in such a way that this knowledge

may be adapted by other practitioners. In this context, research on representational guidance has shown that people will process represented material in a more intense way if they get it in the form of graphs or matrices, instead of an unstructured text [11,13]. And, in turn, applied to the pattern concept, representational guidance would imply that the inherent structure of patterns will guide and support practitioners when they write down their own good practice.

Flower and Hayes often observed a coherent underlying structure behind the writing process, although the writers themselves believed that their writing processes were disorganized and chaotic [4]. These results seem to be evidence for the existence of "patterns in mind". According to Kohls and Scheiter, patterns may exist in the form of mental representations [6]. Such "patterns in mind" will include a problem-solving schema which activates adequate solution structures when a known problem is recognized. So patterns can serve as a structure for problem-solving. Problem-solving processes are actions aimed at achieving some target state. Individuals who solve a problem will arrive at their destination by passing different sub-goals and recalling the required knowledge from memory in order to solve a current problem by analogy to an example [2,7]. In the same fashion, patterns may support finding the best possible way of solving the problem. They act as an operator to proceed from one sub-goal to the next one, and may be considered as analogies and worked examples [13].

3 Studies

In this PhD project both three studies in the laboratory within the domain first aid and three studies in the field with ecclesiastical practitioners have been intended. Thereof, three (one in the laboratory and two in the field) have already been conducted. The study in the laboratory and one of the two field-studies are finished and the data evaluation will start in the near future. The second field study is analyzed and presented below.

Patterns provide an adequate structure that can improve systematic descriptions of experiences and behavior. From this point of view, we expect that patterns will facilitate the externalization of practical knowledge and lead to a more comprehensible and adaptive description of good practices. To test this hypothesis, we performed a qualitative case study with ten vicars in the middle of their apprenticeship of becoming pastors and compared two conditions (blank sheet of paper and structured pattern in a wiki) of a good practice description.

The participants were asked to describe two different good practices of their ecclesiastical daily work. At the beginning, they were requested to write down the first good practice description in the form of an unstructured pen and paper version. After each participant had described a project, they received a description of some good practice from another vicar and acted as a reviewer. In this second round, the vicars were asked to highlight all those points of the description which they did not understand (requests). After that, in the third and last round, each vicar was confronted with a new, previously unknown description of a good practice and had to criticize constructively and highlight those areas which they thought could be improved by their own ideas and experiences (suggestions for improvement).

The second good practice which each of the vicars was asked to report was meant to be written down in the form of a structured pattern (provided in a wiki). The cycle of writing down the own description and reading descriptions from two other vicars was similar to the first good practice description in the pen and paper condition. On the line of this procedure each vicar wrote two good practice descriptions. So the study realizes a within-subject design with repeated measures (without pattern vs. with pattern).

A good project description has to be complete, understandable and adaptive to other situations. We determined the quality of the written practice descriptions by analyzing the comments of vicars who had read and reviewed the project description. These comments may be understood as a form of feedback from experienced peers and as a valid evaluation of the quality of the respective practices. On average, there were significantly more *requests* concerning the description of good practices if this was written down in blank sheets of paper (M=9.2, SD=4.36) than in the structured patterns (M=2.0, SD=2.33, $t(9)$=4.72, p=.001). This can be seen as evidence for the assumption that practices described by patterns offered a more explicit and more understandable structure to practitioners with some routine than practices described without the support of patterns. The results of *suggestions for improvement* were along the same lines: in contrast to the patterns (M=0.3, SD=0.48), the paper versions received significantly more *suggestions for improvement* by the vicars (M=2.3, SD=1.7, $t(9)$=3.72, p=.005). What was frequently criticized was a missing categorization of information and unavailable recommendations on what should be done. In contrast to that, the patterns seemed to include all the required information in their categories for a good practice description. This indicates that patterns lead to fewer requests and suggestions for improvement because of their inherent structure, which guides both the author and the reader of the good practice description.

4 Conclusion

These results lead to the assumption that an explicit structure, as provided by a pattern, will facilitate an effective description of one's own practical knowledge and, in this way, enable a successful exchange of knowledge between practitioners. Patterns seem to support the difficult process of becoming aware of one's own knowledge and guide authors in writing down their implicit knowledge. This may lead to deeper elaboration and reflection of their own practice which will, in turn, be improved.

The aim of this PhD work is to close the gap between theory and empiricism of the pattern-concept. For this purpose, we apply the pattern-concept to the web-based exchange of practical knowledge and provide a theoretical underpinning of patterns. Consequently, this PhD project focuses on both a theoretical framework for describing how a computer-supported exchange of practical knowledge takes place and the empirical verification of the mode of operation of patterns.

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