Chapter 2.11
A Knowledge Management Model for Patterns

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INTRODUCTION

The reliance on the knowledge garnered from past experience can be crucial for solving problems that occur in any development (Pólya, 1945). A *pattern* (Buschmann, Henney, & Schmidt, 2007) is a type of conceptually reusable knowledge that has been found useful in various domains of interest (Rising, 2000). For novices, patterns have served as means of guidance; for experts, they have served as means of reference.

There are a number of viewpoints of a pattern, and views emanating from these viewpoints (Kamthan, 2010). The interest in this article is to formulate an understanding of a pattern from the perspective of knowledge management. This understanding can, in turn, be useful for commu-

nicating a pattern to both humans and machines in a number of ways including publishing a pattern, disseminating a pattern, and using a pattern.

The rest of the article is organized as follows. First, the background and related work necessary for subsequent discussion is outlined. Then, relevant stakeholders of a pattern are identified and, based on a process for knowledge creation and transfer that originated in industrial engineering, a knowledge management model for a pattern is proposed. Next, challenges and directions for future research are outlined. Finally, concluding remarks are given.

BACKGROUND

This section presents the essential terminology on patterns and outlines a model of the process

for producing a pattern. It also provides a brief overview of related work.

A Terminological Overview of Patterns

The *pattern domain* is the universe of discourse for all things related to patterns. The *pattern body of knowledge (PBOK)* is the set of fundamental concepts, activities, and results that characterize the pattern domain. In the last two decades or so, the PBOK has grown and the scope of concepts in it has broadened. There is currently no single source, reference model, or standard for the PBOK. Therefore, this section relies on selected publications (Appleton, 1997; Meszaros & Doble, 1998; Buschmann, Henney, & Schmidt, 2007) that can be considered as authoritative.

There are certain basic concepts in PBOK that are of interest. A *pattern* is an empirically proven solution to a recurring problem that occurs in a particular context. An *anti-pattern* suggests a 'negative' solution to a given problem. It occurs when the context of the problem is not understood or the underlying forces are not optimally balanced. It may not be feasible to provide a single solution to a 'large' problem. In such a case, the problem can be partitioned into a manageable collection of smaller problems. A *pattern language* is a collection of patterns that are closely related to each other through their individual contexts and contribute towards a common goal. Thus, a pattern language solves a larger problem than that possible by any individual pattern.

There are other concepts in PBOK that are of interest. A *pattern description* is a set of indicative statements that specify a pattern. A pattern description, if structured, typically consists of a number of elements. The labels of elements can vary across the pattern community and other (optional) elements, such as those related to metadata, may be included to enrich a pattern description. It is this explicit structure that makes patterns more than a mere collection of 'problem-solution' pairs,

and makes them unique and more practical in their applicability among other types of experiential knowledge such as guidelines and heuristics. A pattern must have a name, and is usually referred to by using its name. A *pattern form* is a prescription of a specific set of pattern elements that are expected to appear in a pattern description. A *pattern collection* is a set of patterns that are specific to some pattern application domain and correlated in some manner. For example, a pattern language is a pattern collection; however, the converse is not necessarily the case in general. If P_1 and P_2 be two patterns that address the same problem, then P_1 and P_2 are *pattern complements*. Finally, *pattern engineering* is a systematic and disciplined approach to (1) the definition, subsequent use, and maintenance, and (2) interface to humans, machines, and other entities of knowledge, of a pattern within the given constraints of available resources.

A Process for Producing a Pattern

P3 (Kamthan, 2010) is a model of the process for producing a pattern. A *workflow* of P3 is a high-level organization unit that consists of one or more activities. There are a number of workflows in P3, including [P3-W1] *Planning*, [P3-W2] *Developing*, [P3-W3] *Describing*, [P3-W4] *Evaluating and Revising*, [P3-W5] *Publishing and Outreaching*, and [P3-W6] *Maintaining*. These are prefixed by [P3-W0] *Acquiring Sapience and Assessing Viability*, which is a prerequisite to the workflows that follow. Figure 1 illustrates the order of execution of the workflows in P3 by means of a UML Activity Diagram.

Related Work on the Perspectives of Patterns as Knowledge

The pursuit of understanding a pattern has led to several studies of it from the perspective of the theories of knowledge. In the rest of this section, these initiatives are outlined chronologically.

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