Chapter 7
Towards Understanding the Use of Patterns in Software Engineering

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ABSTRACT

There are a number of avenues of articulating experiential knowledge, including patterns. However, the mere availability of patterns does not lead to their suitable use, if at all. In order to establish a systematic approach for using patterns, a pattern stakeholder model and a general, process environment-neutral and domain-independent pattern usage model are proposed, and the relationships between them are underscored. The underlying essential and accidental concerns in putting patterns into practice by pattern stakeholders are highlighted and, in some cases, possible resolutions are suggested. In particular, challenges in acquisition, selection, and application of patterns are discussed.

INTRODUCTION

The reliance on the knowledge garnered from past experience can be crucial for solving problems in any development. In the past couple of decades or so, patterns (Buschmann, Henney, & Schmidt, 2007) have emerged as one kind of knowledge (Kamthan, 2010) that has proven to be effective. Indeed, over the years, patterns have been ‘discovered’ and subsequently used in a variety of domains (Rising, 2000), including software engineering.

There are both academic and industrial implications of patterns. For experts, patterns have been useful as means of reference; for novices, patterns have been useful as means for guidance. It has been suggested (Elssamadisy, 2007) that, if used appropriately, patterns contribute to business
values such as reduction in cost and reduction in time to market.

This chapter views patterns as conceptually reusable experiential knowledge that provides value. However, the mere availability of any kind of knowledge, in itself, is not sufficient for its appropriate usage, and the same applies to patterns. The valuative aspect of patterns is also not realized automatically. Indeed, an inappropriate use of patterns can compromise the benefits of using them, and has been termed as ‘pattern pathology’ (LaVigne, 2009). For an objective and sustainable use of patterns, it is crucial that their usage be approached systematically.

The rest of the chapter is organized as follows. First, the background necessary for further discussion is given and related work is presented. Then, conceptual models for stakeholders of patterns and for usage of patterns are proposed, and the prospects and concerns in a commitment to patterns are analyzed. Next, directions for future research, including challenges in addressing them, are outlined. Finally, concluding remarks are given.

BACKGROUND

In this section, basic terminology related to patterns is given and related work is presented.

An Overview of the Pattern Domain

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, to define the terminology needed for the chapter, this section relies on selected publications (Buschmann, Henney, & Schmidt, 2007; Coplien, 1996; Meszaros & Doble, 1998) that can be considered as authoritative.

Basic and Ancillary Concepts in the PBOK

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.

A pattern application domain is the area of study to which a pattern corresponds to. A pattern always corresponds to some pattern application domain, even if that domain is implicit.

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.

Concepts in the PBOK related to Multiple Patterns

There are certain concepts in PBOK that arise due to the existence of multiple patterns. The patternsphere consists of all available patterns in any medium.

A pattern collection is a set of patterns that are specific to some pattern application domain and correlated in some manner.

If \( P_1 \) and \( P_2 \) are two patterns in the patternsphere that address the same problem, then \( P_1 \) and \( P_2 \) are pattern complements. For example, the LINKS pattern, the TRANSCLUSION pattern, and the VIEWS pattern (Correia et al., 2009) are pattern complements.

It may not be feasible to provide a single solution to a ‘large’ problem. In such a case, the problem is considerately 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. For example, a
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