Chapter 6
On the Prospects and Concerns of Pattern-Oriented Web Engineering

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ABSTRACT
In this chapter, the development and evolution of Web Applications is viewed from an engineering perspective that relies on and accommodates the knowledge inherent in patterns. It proposes an approach in the direction of building a foundation for pattern-oriented Web Engineering. For that, a methodology for pattern-oriented Web Engineering, namely POWEM, is described. The steps of POWEM include selection of a suitable development process model, construction of a semiotic quality model, namely PoQ, and selection and mapping of suitable patterns to quality attributes in PoQ. To support decision making and to place POWEM in context, the feasibility issues involved in each step are discussed. For the sake of illustration, the use of patterns during the design phase of a Web Application are highlighted. Finally, some directions for future research, including those for Web Engineering education and Social Web Applications, are given.

INTRODUCTION
The engineering of non-trivial Web Applications presents various challenges (Zheng, 2008). The reliance on available expertise (including knowledge, skills, and discretion) derived from past practical experience can help meet those challenges. In this chapter, the interest is in one such body of knowledge, namely patterns.

The ideas behind the notion of a pattern originated in the mid-to-late 1960s, largely motivated by the pursuit for a systematic approach to solving recurring structural problems in the urban architectural and design aspects of civil engineering. The term pattern itself was formally coined in the late 1970s (Alexander, 1979; Alexander, Ishikawa, & Silverstein, 1977). It has since then been found useful in other engineering domains of interest (Rising, 2000) including Web Engineering.
The interest in this chapter is highlighting the prospects and concerns in the deployment of patterns, particularly from the viewpoint of quality. From the empirical studies that have been reported (Ivory & Megraw, 2005), it can be concluded that a lack of attention towards the pragmatic quality of Web Applications is an increasing concern. This chapter builds on previous work (Kamthan, 2008a; Kamthan, 2008b; Kamthan, 2008c) of using patterns for orienting the development of (Mobile) Web Applications aiming for ‘high-quality.’

The organization of the rest of the chapter is as follows. First, the background and state-of-the-art related to the evolution of Web Applications and patterns necessary for the discussion that follows is outlined. This is followed by the presentation of a methodology for pattern-oriented Web Engineering, namely POWEM (pronounced as “poem”), for systematically addressing the quality of Web Applications. POWEM consists of a sequence of steps that include selection of a suitable development process model, construction of a semiotic quality model, namely PoQ, and selection and mapping of suitable patterns to quality attributes in PoQ, along with the feasibility of each of these steps. Then, the use of patterns during macro- and micro-architecture design of a Web Application is illustrated. Next, challenges and directions for future research, including those for Social Web Applications, are discussed. Finally, the concluding remarks are presented.

**BACKGROUND AND RELATED WORK**

In this section, the background and previous work on the need for a systematic approach to the development of Web Applications from the perspective of quality and the role of patterns is briefly presented.

For the sake of this chapter, a *Web Site* is defined as a collection of resources that reside in a distributed computing environment enabled by the technological infrastructure of the Internet. Furthermore, a *Web Application* is defined as a Web Site that behaves like an information-intensive interactive software system specific to a domain and typically requires a non-trivial infrastructure for development. This infrastructure may include a disciplined and systematic development process, a team with high-level of knowledge and skills, deployment of additional software on the client- and/or server-side, and a schedule comprising of several weeks or months from inception to completion.

**Identifying Characteristics for the Directions of the Evolution of Web Applications**

It is admittedly difficult to make (any) predictions of a rapidly growing field. However, based on the knowledge of the past decade, the following characteristics identify the pivotal directions of evolution in the development of Web Applications: [C-1] Computing Environment-Neutral, [C-2] Domain-Specific, [C-3] Human-Centered, [C-4] Information Interaction-Intensive, [C-5] Model-Driven, [C-6] Open Environment-Based, [C-7] Pattern-Oriented, and [C-8] Quality-Sensitive.

Figure 1 depicts [C-1] − [C-8] and their (non-transitive) interrelationships of dependencies. The interest in this chapter is in a confluence of [C-1] − [C-8], especially in the interplay between [C-7] and [C-8]. This is implicit in the sections that follow; however, for consideration of space, a detailed treatment of each of these individually is suppressed. [C-1] − [C-8] together determine the *velocity* of development: a *sensitivity to quality* implies that the issue of quality is taken into consideration in all activities and could determine the ‘speed’ of development, and an *orientation due to patterns* implies that it is patterns that determine the *direction* taken by development.

It is important to note that certain characteristics, such as standards-conforming, even though desirable, are not among the current directions of