A Pattern-Oriented Methodology for Engineering High-Quality E-Commerce Applications

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ABSTRACT

This article proposes, develops, and explores a methodology for engineering electronic commerce applications (ECA) aiming for “high-quality.” In doing so, the development and maintenance of ECA is undertaken from the perspective of Web Engineering. The relevant quality attributes and corresponding stakeholder types for the ECA are identified, and the role of a flexible development process and the challenges in making optimal use of patterns are analyzed. The activities of a systematic selection and application of patterns to the macro- and micro-architecture design of business-to-consumer (B2C) ECA are given. The scope and limitations of the proposed methodology are discussed, and some possible directions for its evolution are outlined. [Article copies are available for purchase from InfoSci-on-Demand.com]

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INTRODUCTION

The integration of Web has led to remarkable changes in business models of enterprises (Lowe, 2003; Seethamraju, 2004). Indeed, over the past decade, electronic commerce applications (ECA) have broadened the potential consumer-base of a business, lowered the cost of certain aspects of business like marketing, and have reduced the gap between small-and-medium size enterprises (SMEs) and large corporations (Kalakota & Whinston, 1996; Kamthan, 1999). However, for this change to be sustainable, the quality concerns of ECA must be clearly understood and adequately addressed.

The need for ECA to exhibit “high-quality” is critical to all stakeholders involved. If unaddressed, there is a potential, for example, for ECA to abruptly fail during a crucial transaction or become unusable by a customer using an “obsolete” computer, or become prohibitive to modifications by an engineer. This could severely impact the viability and evolvability of the ECA in question, unfavorably affect a business’s selling capability and, in general, undermine the bottom line of the business that owns the application. The successes of
ECA have come with their share of failures (Nguyen, Johnson, & Hackett, 2003), many of which have been attributed to quality (Pertet & Narasimhan, 2005).

In order to elevate, restore, and/or sustain the confidence of stakeholders, it is incumbent upon the providers to ensure the quality of ECA, and to do so in a feasible manner. A commitment towards quality makes both ethical and business sense. Indeed, it has been shown in empirical studies (Sharkey, Scott, & Acton, 2006) that the quality of ECA is directly related to its “dimensions” of success such as user intention to perform transactions and user satisfaction.

The previous approaches for addressing the issue of quality of ECA are largely non-rigorous where quality is considered as an afterthought rather than as an integral consideration in the development process. Also, the focus in the past has been less on assurance (prevention) and more on evaluation (cure). In this article, our interest is in a systematic approach to engineering large-scale ECA based on the knowledge garnered from past experience and expertise and, in doing so, address the issue of quality early in development (Kamthan, 2008). For that, we adopt the time-invariant knowledge of patterns (Appleton, 1997).

The rest of the article is organized as follows. We first outline the background necessary for the discussion that follows, and state our position in that regard. This is followed by the presentation of a Pattern-Oriented E-Commerce Applications Methodology (POECAM) for systematically addressing the pragmatic quality (Shanks, 1999) of ECA. POECAM includes a model consisting of quality attributes at different tiers that are relevant to different classes of stakeholders, and the role of patterns as means for addressing them. Following a top-down approach to design, examples illustrating the use of patterns during macro- and micro-architecture design of business-to-consumer (B2C) ECA are explored. Next, challenges and directions for future research are outlined. Finally, concluding remarks are given.

**BACKGROUND AND RELATED WORK**

In this section, we present the motivation for a systematic approach to engineering ECA, understanding and addressing the quality of ECA, and a synopsis of the role of patterns to that effect.

The Interplay of Process, Quality, and Patterns for E-Commerce Applications

The view of a systematic development methodology for the improvement of quality of ECA taken here rests on the following interrelated hypothesis:

**Hypothesis 1.** An improvement in the process for development can bring about improvement in the quality of the product, namely the ECA itself (Nelson & Monarchi, 2007).

**Hypothesis 2.** For an understanding of quality of ECA from a stakeholders’ perspective or otherwise, the notion of quality needs to be decomposed into a manageable number of attributes (Fenton & Pfleeger, 1997).

**Hypothesis 3.** A preventative approach to addressing quality (attributes) is at least as significant as a curative approach (Dromey, 2003). (For example, guidelines and patterns are preventative, and inspections and testing are curative.)

We note that the set of Hypothesis 1-3 is minimal in the sense that a subset of it is insufficient. For example, the Internet Commerce Development Methodology (ICDM) (Standing, 2001; Standing, 2002) is a framework that highlights characteristics unique to ECA, suggests their evolutionary development by involving the users, and provides support for management and business. However, it does not consider the issue of quality of ECA.
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