Chapter I
Web Engineering:
Introduction and Perspectives

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ABSTRACT

Web-based systems and applications now deliver a complex array of functionality to a large number of
diverse groups of users. As our dependence and reliance on the Web has increased dramatically over
the years, their performance, reliability and quality have become paramount importance. As a result,
the development of Web applications has become more complex and challenging than most of us think.
In many ways, it is also different and more complex than traditional software development. But, cur-
rently, the development and maintenance of most Web applications is chaotic and far from satisfactory.
To successfully build and maintain large, complex Web-based systems and applications, Web developers
need to adopt a disciplined development process and a sound methodology. The emerging discipline
of Web engineering advocates a holistic, disciplined approach to successful Web development. In this
chapter, we articulate and raise awareness of the issues and considerations in large, complex Web ap-
plication development, and introduce Web engineering as a way of managing complexity and diversity
of large-scale Web development.

INTRODUCTION

Within a decade, the World Wide Web has become ubiquitous, and it continues to grow unabated
at exponential rate. Web-based systems and ap-
plications now deliver a complex array of varied
content and functionality to a large number of
heterogeneous users. The interaction between a
Web system and its backend information systems
has also become more tight and complex.
As we now increasingly depend on Web-based systems and applications, their performance, reliability and quality have become paramount importance, and the expectations of and demands placed on Web applications have increased significantly over the years. As a result, the design, development, deployment and maintenance of Web-based systems have become more complex and difficult to manage.

Though massive amounts of Web development and maintenance continue to take place, most of them are carried out in ad hoc manner, resulting in poor quality Web systems and applications. Problems such as outdated or irrelevant information, difficulties in using the Web site and finding relevant information of interest, slow response, Web site crashes, and security breaches are common. We encounter these kinds of problems because Web developers failed to address users’ needs and issues such as content management, maintenance, performance, security, and scalability of Web applications. They also often overlook important non-technical considerations such as copyright and privacy.

Many Web developers seem to think that Web application development is just simple Web page creation using HTML or Web development software such as Front Page or Dreamweaver and embodying few images and hyperlinking documents and Web pages. Though certain simple applications such as personal Web pages, seminar announcements, and simple online company brochures that call for simple content presentation and navigation fall into this category, many Web applications are complex and are required to meet an array of challenging requirements which change and evolve. There is more to Web application development than visual design and user interface. It involves planning, Web architecture and system design, testing, quality assurance and performance evaluation, and continual update and maintenance of the systems as the requirements and usage grow and develop.

Hence, ad hoc development is not appropriate for large, complex Web systems, and it could result in serious problems: the delivered systems are not what the user wants; they are not maintainable and scalable, and hence have short useful life; they often do not provide desired levels of performance and security; and/or most Web systems are often much behind schedule and overrun the budget estimates.

More importantly, many enterprises and organisations cannot afford to have faulty Web systems or tolerate downtime or inconsistent or stale content/information. The problems on the Web become quickly visible and frustrate the users, possibly costing the enterprises heavily in terms of financial loss, lost customer and loss of reputation. As is often said, “We cannot hide the problems on the Web.”

Unfortunately, despite being faced with these problems and challenges, most Web application development still continues to be ad hoc, chaotic, failure-prone, and unsatisfactory. And this could get worse as more inherently complex Web systems and applications that involve interaction with many other systems or components pervade us and our dependence on them increases.

To successfully build large-scale, complex Web-based systems and applications, Web developers need to adopt a disciplined development process and a sound methodology, use better development tools, and follow a set of good guidelines.

The emerging discipline of Web engineering addresses these needs and focuses on successful development of Web-based systems and applications, while advocating a holistic, disciplined approach to Web development.

Web Engineering uses scientific, engineering, and management principles and systematic approaches to successfully develop, deploy, and maintain high-quality Web systems and applications (Murugesan et al., 1999). It aims to bring Web-based system development under control,