



## Chapter XII

# CMU-WEB: A Conceptual Model With Metrics For Testing and Designing Usability in Web Applications

Akhilesh Bajaj and Ramayya Krishnan  
Carnegie Mellon University, USA

With the ubiquitous availability of browsers and Internet access, the last few years have seen a tremendous growth in the number of applications being developed on the World Wide Web (WWW). Models for analyzing and designing these applications are only just beginning to emerge. In this work, we propose a three-dimensional classification space for WWW applications, consisting of a *degree of structure of pages* dimension, a *degree of support for interrelated events* dimension, and a *location of processing* dimension. Next, we propose usability design metrics for WWW applications along the *structure of pages* dimension. To measure these, we propose CMU-WEB—a conceptual model that can be used to design WWW applications, such that its schema provide values for the design metrics. This work represents the first effort, to the best of our knowledge, to provide a conceptual model that measures quantifiable metrics that can be used for the design of more usable Web applications, and that can also be used to compare the usability of existing Web applications, without empirical testing.

## INTRODUCTION

Over the last five years, there has been a tremendous growth of applications being developed to run over the World Wide Web (WWW) (Berners-Lee, Caillau, Luotonen, Nielsen, & Secret, 1994). Several technologies are in vogue for writing these applications

(Bhargava & Krishnan, 1998). Depending on the kind of technology used, different classes of applications can be created using the WWW as the medium of transport.

Given the large number of systems analysis and design methods available, there is some confusion as to which methods are suitable for WWW applications. This work makes two contributions. First, we present a three dimensional classification space for WWW applications. The dimensions used are the *location of processing*, the *degree of support for interrelated events*, and the *structure of pages*. The classification scheme we use provides insight into which existing modeling methodologies are useful for designing a WWW application along each dimension. We find that adequate models exist for the *location of processing* and the *interrelated events* dimension. However, while several modeling methods (e.g., Bichler & Nusser, 1996; Isakowitz, Stohr, & Balasubramanian, 1995) have been recently proposed for the documentation and maintenance of WWW applications, there is a need for a conceptual model that can facilitate the **design** of WWW applications along the *degree of structure of pages* dimension, such that the applications are more usable. We propose design criteria that relate to usability and hold along the *structure of pages* dimension in the form of **high-level requirements**. These requirements represent questions that should be answered by a conceptual model that seeks to facilitate the design of WWW applications so that they are more usable.

The second contribution of this work is a model that solves the above need to be able to quantitatively evaluate the high-level requirements. We propose Conceptual Model for Usable Web Applications (CMU-WEB), a conceptual model of WWW applications that facilitates the **design** of more useable WWW applications by providing a schema that provides values for **metrics** that measure the high-level requirements along the *structure of pages* dimension.

The rest of this chapter is organized as follows. In the following section, we present a 3-dimensional classification space for WWW applications. Next, we propose a list of high-level usability metrics, along one dimension of the space. Then, we define CMU-WEB and show how usability metric values can be derived from CMU-WEB schema. After that, we discuss how CMU-WEB can be used to design new Web applications, and how it fits in with commonly used heuristic techniques for Web application design. Finally, we give directions for future research and the conclusion in the final section.

## A CLASSIFICATION SPACE FOR WWW APPLICATIONS

In this work, we define a WWW **application** as one that runs using the hypertext transfer protocol (HTTP) as the transfer protocol. In our view, this is what differentiates WWW applications from other networked applications. We define an **application** as consisting of a series of zero or more events. We define an **event** as a subset of an application that consists of at least one user input, followed by some processing.

Networked applications in general differ along several dimensions, such as the degree of state maintained on the server, the class of user, the type of user interface, and the programming language used. Before identifying dimensions for classifying WWW applications (which are a subset of all networked applications), we identify certain features that are **shared** by all WWW applications:

- All WWW applications are inherently client/server. The WWW client is a Web browser, that communicates with a WWW server using HTTP.<sup>1</sup>

18 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/cmu-web-conceptual-model-metrics/4330](http://www.igi-global.com/chapter/cmu-web-conceptual-model-metrics/4330)

## Related Content

---

### Introduction to Fuzzy Logic

Jose Galindo, Angelica Urrutiaand Mario Piattini (2006). *Fuzzy Databases: Modeling, Design and Implementation* (pp. 1-44).

[www.irma-international.org/chapter/introduction-fuzzy-logic/18758](http://www.irma-international.org/chapter/introduction-fuzzy-logic/18758)

### Congestion Control Using Soft Computing

T. Revathiand K. Muneeswaran (2010). *Soft Computing Applications for Database Technologies: Techniques and Issues* (pp. 271-289).

[www.irma-international.org/chapter/congestion-control-using-soft-computing/44392](http://www.irma-international.org/chapter/congestion-control-using-soft-computing/44392)

### Profiling the Users of High Influence on Social Media in the Context of Public Events

Lu An, Junyang Hu, Manting Xu, Gang Liand Chuanming Yu (2021). *Journal of Database Management* (pp. 36-49).

[www.irma-international.org/article/profiling-the-users-of-high-influence-on-social-media-in-the-context-of-public-events/276498](http://www.irma-international.org/article/profiling-the-users-of-high-influence-on-social-media-in-the-context-of-public-events/276498)

### Process-Embedded Data Integrity

Yang W. Lee, Leo Pipino, Diane M. Strongand Richard Y. Wang (2004). *Journal of Database Management* (pp. 87-103).

[www.irma-international.org/article/process-embedded-data-integrity/3307](http://www.irma-international.org/article/process-embedded-data-integrity/3307)

### Fuzzy Database Approaches

Jose Galindo, Angelica Urrutiaand Mario Piattini (2006). *Fuzzy Databases: Modeling, Design and Implementation* (pp. 45-59).

[www.irma-international.org/chapter/fuzzy-database-approaches/18759](http://www.irma-international.org/chapter/fuzzy-database-approaches/18759)