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# Empowering Content Providers: An Approach for Developing Large Web Sites

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## Abstract

*To reduce maintenance costs, empowering content providers fosters a new approach for the design and construction of large web sites. This paper presents an approach to empowering content providers and discusses an architecture for such web sites.*

## Introduction

One main advantage of the web as a publication media over the traditional publication media is the ease of updating published contents. Once the contents of a web page are updated locally, worldwide accesses to the web page immediately are "updated" in the sense that all future accesses can see the updated information. Such a capability has attracted corporations to establish corporate Intranets that have significantly reduced publishing and distribution costs. Such capability has also enabled companies to quickly channel marketing and product information to millions of Internet users and gain competitive advantages.

This advantage comes with costs. Updating web site contents constitutes a major maintenance cost. Companies spend an average of $109,000 to set up and maintain a web site for one year.[1] In a large web site where published contents come from the various departments of a company, managing and updating web site contents become a labor-consuming task. Therefore, the design of a web site must consider how to shorten the cycle of web publishing from producing contents to publishing the contents in a web site as well as reducing the cost for updating the web site contents.

The current practice is to set up a specialized team, called *web masters* who are in charge of maintaining the contents of a web site. Members of this team possess skills in the areas of HTML, computer graphic design, web page design, database programming, CGI programming, and others. However, web masters do not produce the published content. Instead, web site contents are provided by the individual person or department that is responsible for, or owns, the contents. These individuals or departments are called *Content Providers*. Thus, web publishing is two-step process. Content providers first produce the contents and then forward the contents to web masters. Web masters then convert the contents into web format and then use this content to either update existing web pages or create new web pages.

However, this two-step web publishing model surfers from several major problems:
- Information publishing may not be timely since there is a delay between the time the information is produced and published.
- The published information may not be accurate, as the final published contents may not be in the same form submitted by content providers. For example, if the published contents come from a corporate database, the marketing department (a content provider) may simply request what information in the database should be published. However, web masters have to retrieve the information from the database and format it for publication, which opens a door for errors.
- Coordinating and managing the publishing processes imposes a new challenge. In a large, diverse organization, there are multiple content providers who have their own, unique information needs and timeline for web publications. Given the gap between available resources and increasing demand, setting up a proper priority and publishing schedule to meet with diverse needs raises difficult to resolve managerial and political issues.
- Alienating content providers from the contents for which they are responsible and care about contributes to the tension between content providers and web masters.

In an attempt to address the problems listed above, we propose a different approach in the design of large web sites. This approach empowers content providers by allowing content providers to directly update the web site contents they are responsible for. Research done by Kappelman and Guynes on end-user training has found that "By providing opportunities for empowerment, user participation fosters a sense of user control, promotes user motivation, and reduces resistance toward the organizational changes manifest in the IS changes."[2] Through empowerment of end users, system development professionals can "find they have new partners in creating IS that function better, contribute to a greater quality of work life and distribute power more democratically."[3]

We applied the proposed approach to design and implement a large web site. The section, Empowering Content Providers, discusses the project and presents the system architecture of the web site. In our Conclusion we discuss several issues related to this approach and areas of future research.

# Empowering Content Providers

Led by the authors, a web development team was formed in 1997 to redesign the web site for the College of Business Administration, Georgia State University. The purpose of this web site is to be an effective marketing tool for the college as well as the central information source for present and prospective students, faculty, and staff. One of the requirements is to provide uniform web pages for the various college units and faculty members to enforce the same look-and-feel across the site. These uniform web pages are the front pages for individual web sites built by college units and faculty members.

This project imposed a unique challenge. The web site contents come from diverse content providers including college units, faculty members, and doctoral students. From the organization side, there was no single authorized entity in the college that would define and enforce standards governing the web site contents. The college also has no full-time web masters. Instead, graduate students have been hired as web masters. In other words, the college had no infrastructure to oversee, coordinate, and maintain the contents to be published in the web site.

After analyzing the requirements, the team concluded that the two-step web publishing model would not be suitable for this application. After studying alternative ways to develop web sites, it became clear that a solution to address this challenge must be based on the principle of *empowerment of content providers*. A unique approach emerged from the research. Figure 1 shows the architecture of the web site developed based on this approach which consists of *content manager*, *content generator*, *web page templates*, and *content database*.
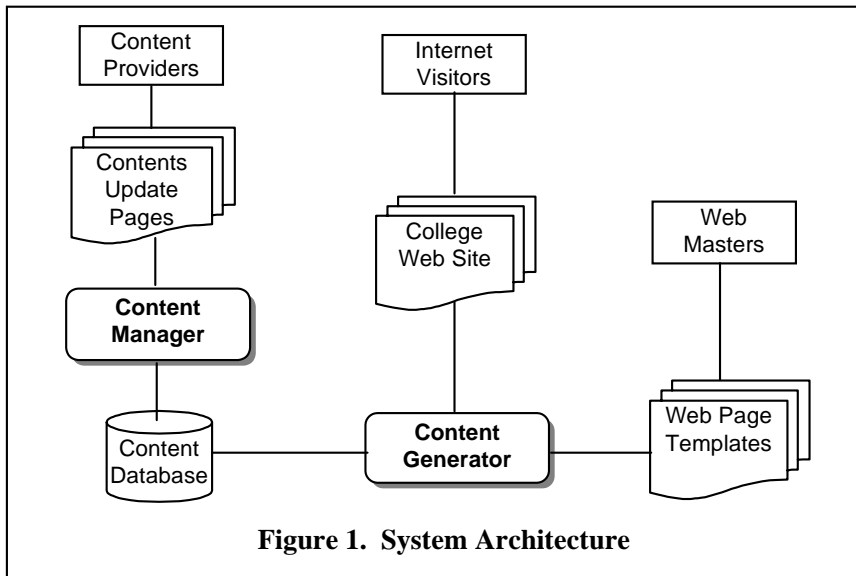


**Figure 1. System Architecture**

The web site contents are stored in the *content database*. The contents of the database include information supplied by the content providers, which ultimately becomes the contents of the site's web pages. Also stored in the database are administrative data including user id's and passwords so that each content provider only has access to his or her information.

The *content manager* is responsible for managing the content database. When a content provider logs in, the content manager determines the web contents for which the provider is responsible. The provider can then view, add, delete, and update web site contents stored in the content database. These functions are implemented as content administration pages so that content providers can work with a familiar web browser interface, which reduces the need for end-user training. Those administration pages also allow content providers to update the contents without geographical restriction by taking advantage of the Internet.

The *content generator* is used to create web pages based on the data stored in the content database. After a content provider updates the web site contents, the content generator automatically transforms the change into new web pages to replace web pages that are out of date. The web page generation process relies on a set of web page templates. These web templates define the presentation of the contents, i.e., the look-and-feel of the web pages. Content providers have control over the informational content displayed on their pages, however, the presentation of this information (in the form of web page layout templates) is controlled by the web master.

Compared with the two-step web publishing model, this approach has several advantages:
- Empowers content providers, placing web publishing in the hands of content providers
- Frees Web masters from routine updates and allows them to focus on more critical tasks such as maintaining the web site structure and improving the presentation of the published contents
- Reduces maintenance costs by eliminating manual updates in both contents and presentation of generated web pages
- Imposes no performance penalty as the content generator creates static web pages that do not incur the run-time overhead associated with dynamic web pages

# Conclusion

A new approach for developing large web sites has been presented in this paper. By changing the role of content providers to include content publishers, ownership of information is established for content providers. By shifting web masters to a supporting role, not publishers, a healthy relationship is fostered between content providers and web masters. This approach can shorten the cycle of web publishing and reduce the maintenance costs associated with manually updating existing web pages.

However, this approach requires a rethinking of the roles of different players in web site development and a set of organizational policies to govern the role of the content provider. Our approach provides the architecture to empower the content providers but does not provide a means to monitor the quality of the contents, though web templates are used to control the presentation of the contents. This approach does not address the issue of how to establish who the content providers are. These management issues, which must be addressed by appropriate organizational policies, suggest areas for further research.

This approach allows content providers to change only the published contents. Future research should extend this approach to empower the content providers with control over the design layouts, the structure and the flow of the pages. It would call for developing a "meta-system" that can aid content providers to design both page layout and page structures. This system would generate corresponding database structures, administration pages, and web page templates that manage the update of the contents.

Finally, the benefits of this approach are assessed based on our experience. A formal validation and comparison demands further investigation.

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