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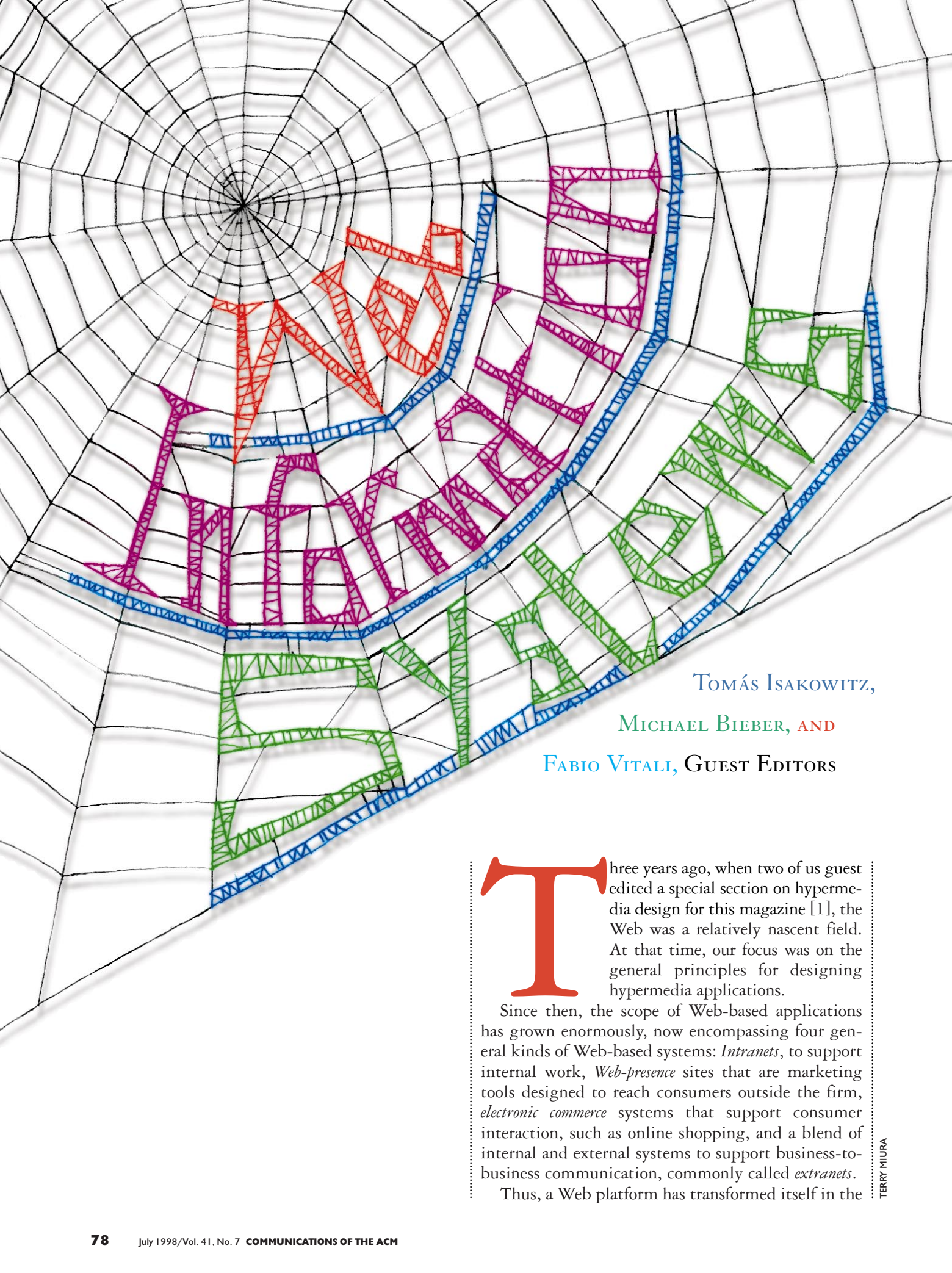


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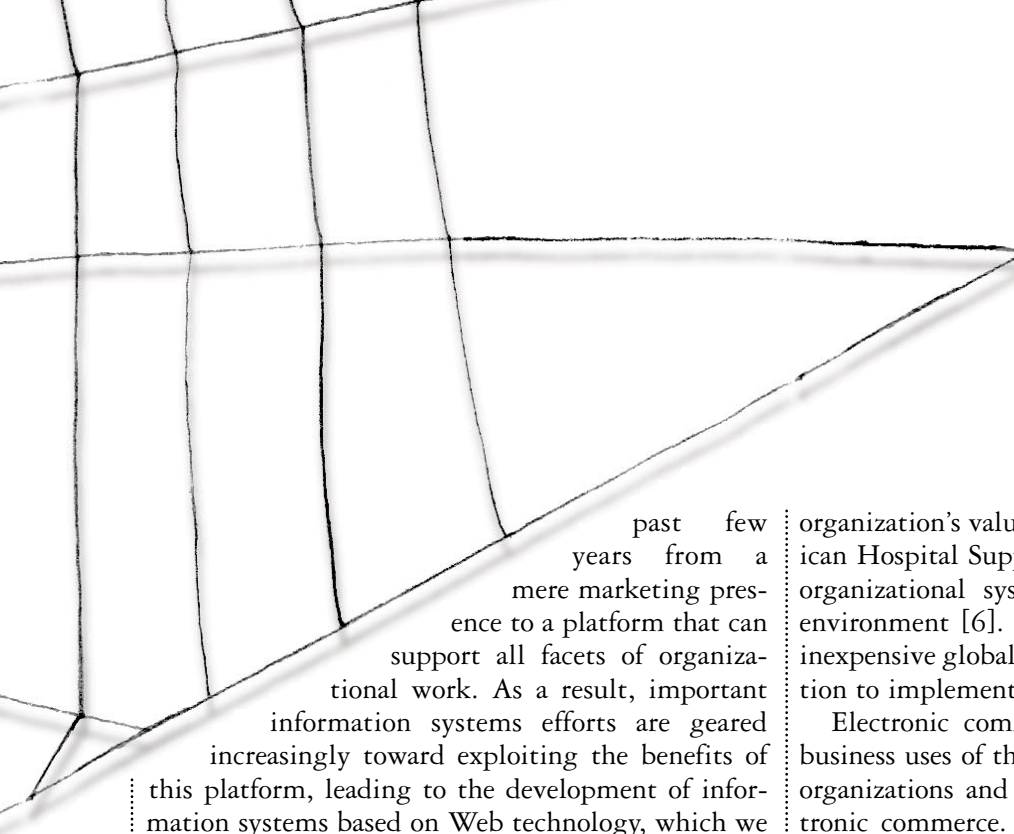
TOMÁS ISAKOWITZ,
MICHAEL BIEBER, AND
FABIO VITALI, GUEST EDITORS

Three years ago, when two of us guest edited a special section on hypermedia design for this magazine [1], the Web was a relatively nascent field. At that time, our focus was on the general principles for designing hypermedia applications.

Since then, the scope of Web-based applications has grown enormously, now encompassing four general kinds of Web-based systems: *Intranets*, to support internal work, *Web-presence* sites that are marketing tools designed to reach consumers outside the firm, *electronic commerce* systems that support consumer interaction, such as online shopping, and a blend of internal and external systems to support business-to-business communication, commonly called *extranets*.

Thus, a Web platform has transformed itself in the

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past few years from a mere marketing presence to a platform that can support all facets of organizational work. As a result, important information systems efforts are geared increasingly toward exploiting the benefits of this platform, leading to the development of information systems based on Web technology, which we call "Web-based information systems" (WISs). We believe this type of system will become more pervasive than client/server systems did a decade ago, with an exponentially higher impact on our lives, simply because the Web has the potential of reaching a much wider audience than client/server systems based on proprietary networks.

There is a clear difference between a set of Web pages and a WIS. The latter supports work, and is usually tightly integrated with other non-WISs such as databases and transaction processing systems. WISs are also different from traditional information systems. They require new approaches to design and development, have the potential of reaching a much wider audience, and are usually a result of grass-roots efforts. These differences introduce managerial and technical challenges.

A major goal of this special section is to raise the awareness among developers, managers, and users that WISs are a different kind of information system, thus requiring people to think about them much differently than traditional systems. The feature articles and numerous sidebars presented here cover a broad range of aspects concerning WISs.

Turoff and Hiltz coin the new term "superconnectivity" to note the Web's potential as a conduit for "almost perfect transmission of communication and information" and to define the eventual global interconnection of all people and organizations. Inexpensive, seamless superconnectivity is leading to new kinds of organizations and new ways of interacting with existing organizations. Senn, for example, describes how Federal Express integrates its information systems into an intranet at a client site. This provides an example of how a WIS can extend an

organization's value chain. Companies such as American Hospital Supply pioneered such strategic inter-organizational systems in a non-Web distributed environment [6]. The Web's standard interface and inexpensive global access enable almost any organization to implement an interorganizational system.

Electronic commerce is one of the most visible business uses of the Web. WISs are the systems that organizations and their clients use to conduct electronic commerce. Tenenbaum offers a vision of the interorganizational systems and value-added services that will underlie future electronic commerce. Today's electronic commerce applications are simply forerunners for WISs of the future. While they achieve ubiquitous access, Tenenbaum notes the current lack of standards for structuring information on the Web limits the power of search engines and intelligent agents. Nevertheless, many fledgling electronic commerce systems are quite innovative. For example, Van Heck and Vervest describe online electronic auctions. These could revolutionize the way organizations sell and clients purchase goods and services. Lohse and Spiller examine opportunities for coordination and integration within a cyber mall of several online retail stores. Lincke and Schmid expand on Tenenbaum's promotion of standards describing a common language for specifying product information within Web shopping systems. This could lead third parties to compile consolidated product catalogs from multiple companies, thereby providing a useful service to consumers. Arocena and Mendelzon describe a new approach to modeling data on the Web to help query such consolidated information.

An alternative competitive strategy is to add value to or around a product. Rosenbluth Corporation [3] and Federal Express' proprietary network application provide well-known examples of adding value with pre-Web distributed systems. Organizations can now repackage and supplement both existing Web information and hitherto off-Web information. Kambil and Ginsburg discuss the opportunities for, and challenges of, augmenting financial information from the U.S. Securities Exchange Commission through the EDGAR pro-

ject. They note the Web will change the way governments distribute information, thereby creating opportunities for many third-party companies to repackaging it for particular groups of consumers.

WISs can integrate processes or systems within a single interface, and allow access over a local intranet or global Internet network. Balasubramanian and Bashian explore the challenges and opportunities in implementing Web-based document management systems at Merrill Lynch.

They also highlight an important inherent structural feature of the Web that too few WISs exploit: hypermedia. In fact, there is more to hypermedia than is present in the Web platform. Both Maurer and Oinas-Kukkonen enrich the concept and implementation of links. Takahashi notes that rich hypermedia links underlie many of the features that set WIS apart from more traditional systems. Just as Tenenbaum believes the current Web structure can support the forerunners of future electronic commerce applications, these authors and others contend the Web's current implementations of hypermedia inhibit the true potential for hypermedia's relationship management and navigation to augment WIS. Bieber et al. [2] describe many hypermedia features lacking or poorly supported on the Web. Fielding et al. [4] describe hypermedia-related improvements to the Web that would enable a virtual software engineering enterprise dispersed geographically.

Many of the WIS aspects described here follow from applying standard IS strategy (for example, [3, 6]) to the Web. As Lederer, Mirchandani, and Sims state: "If a WIS is to enhance competitiveness, then it should support the traditional means by which companies compete: by lowering costs, focusing on groups of customers, ... or differentiating their products and services..." Indeed, the survey they describe highlights competitiveness as the top benefit of WIS.

WIS success, however, will hinge on successful development. As Dennis states: "WISs are information systems first and Web systems second... WIS development should use the same disciplined principles... required to build successful non-Web information systems." Dennis highlights four major lessons for managers and developers along this theme. Web development, however, is sufficiently different from traditional IS development in that it requires new approaches to software engineering. One such approach is an object-oriented hypermedia design methodology (OOHDM) [7]. Another approach is the relationship management methodology (RMM) [5] based on the more traditional entities and relationships database centric model of information systems. Balasubramanian and Bashian's document

management project, which is loosely based on RMM, is Web specific and provides many insights for Web development, yet it also highlights the point that WIS development parallels traditional systems engineering. WISs require a solid design and can be plagued by user acceptance problems. Lohse applies this point to the user interface and shows that many online retail stores ignore established lessons in user interface design to their great disadvantage.

In sum, this special section highlights several of the new opportunities the Web brings to information systems. Surely more opportunities will arise as technologies mature and standards evolve. At the same time, WISs continue to face the same longstanding issues and challenges of traditional information systems, with twists that Web technologies and super-connectivity bring. Hopefully, organizations and developers will adapt their existing knowledge of systems design and strategic value to this new field, ensuring that people construct robust WISs and use them to their full potential. We hope the concepts and examples in this special section lead the way. ■

REFERENCES

1. Bieber, M. and Isakowitz, T. Special issue on hypermedia design. *Commun. ACM* 38, 8 (Aug. 1995).
2. Bieber, M., Vitali, F., Ashman, H., Balasubramanian, V., and Oinas-Kukkonen, H. Fourth generation hypermedia: Some missing links for the World Wide Web. *Intern. J. Human Computer Studies* 47 (1997), 31–65.
3. Clemons, E. K. and Row, M.C. Information technology at Rosenbluth Travel: Competitive advantage in a rapidly growing global service company. *J. Manage. Info.* 8, 2 (1991), 53–79.
4. Fielding, R., Whitehead, E.J. Jr., Anderson, K., Bolcer, G., Oriezy, P., and Taylor, R. Web-based development of complex information products. To appear in *Commun. ACM* (1998).
5. Isakowitz, T., Stohr, E.A., and Balasubramanian, P. RMM: A methodology for the design of structured hypermedia applications. *Commun. ACM* 38, 8 (1995), 34–44.
6. Porter, M. and Millar, V. How information gives you competitive advantage. *Harvard Bus. Rev.*, (July-Aug. 1985), 149–160.
7. Schwabe, D., Rossi G., and Barbosa, S. Systematic hypermedia design with OOHDM. In *Proceedings of the ACM International Conference on Hypertext '96*. (Washington, DC., March 1996).

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