

# Special Issue Editorial

## Development and Use of Web-Based Information Systems

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Since CERN released the WorldWide Web in 1991 the pace of development of the technology and its usage has been extreme. The technology was—and still is—fairly simple, but the technical ideas and the concepts for information exchange have opened for completely rethinking information systems and businesses. The success might be found in the fact that protocols, services, standards and mark up languages are sufficiently advanced to provide useful support, and at the same time sufficiently simple to be widely adopted (Braa et al. 2000). The result is a general interaction technology providing a standardized platform and an enormous number of standard components and applications. The advantages combined with the potentials are significant. Today the web-technology has matured enough to become an attractive platform for business applications and organizational information systems. Many organizations are increasing their investment in web-based information system resources, such as electronic commerce, intranets and extranets. This trend has been so strong that highly esteemed IS scholars have suggested that IS researchers should drop research approaches and topics that do not address the internetwork architecture, e.g., Lyytinen et al. (1998).

Web-technology is often presented as a ‘revolution’ propelling change from static, hierarchical structures to dynamic, flexible and knowledge-based organizational forms. However, at the present time, organizational models for implementing and managing web-applications can only be described as emergent. The technology is in a state of flux—with competition among alternative products and technical standards—and organizations designing and implementing web-based systems are often in the dark with regard to appropriate organizational models and technological solutions.

Complex web-based information systems are tightly integrated with other, traditional or non-web-based information systems, e.g., databases and transaction processing systems, or in other ways intricately linked with other communication technologies. Such complex web-based information systems differ from ordinary web-sites (a set of web-pages) in that they mediate interactions among multiple distributed actors who are not only users, but also designers in the sense that they contribute to the system’s structure and content. Flexible and integrative by nature, complex web-based information systems serve a range of purposes. They provide a universal multi-modal user interface to business applications, databases and legacy systems, while supporting document and workflow management, cooperative work and distributed knowledge sharing.

The availability of the web-technology for complex web-based information systems has created a number of interesting challenges in relation to traditional information systems that can be described as follows:

- The web is fundamentally a *new medium of human communication*—not a technology for information processing or computation. As a result, software design will coalesce with media design.
- Web-based information services will be available at any time and at any place. This *ubiquity of services* will lead to new kinds of organizations and new ways of interacting within existing organizations (for example distributed and networked organizational forms).
- The *rate of change* in technologies is unprecedented. The pace at which new tools and techniques are invented is unheard of even in the fast-moving world of computing. This proliferation of new technologies creates an interoperability nightmare for application developers and users, and makes it difficult to manage the development process.
- The traditional *division of labor* and definition of work roles in IS development breaks down. The distinction between designers, programmers and users becomes increasingly blurred and new types of specialists—such as graphic designers and communications specialists—enter the design process.

For some years, the web-technology was primarily used for publication of information and for e-business applications, but as described by Isakowitz et al. (already in 1998) “the platform has matured and transformed itself into a platform that can support all facets of organizational work,” and almost all organizations increase their investment in and usage of web-based technology.

Development and use of innovative applications of web technology thus raise a host of timely, and sparsely investigated, practical, conceptual, methodological, and technological issues. Among the obvious differences and challenges in web-based information systems development are the involvement of a series of new competencies in the teams compared to more traditional development, and the lack of well-established standards and routines for the development work. Also the relationships between developer organizations and the user organizations are changing. The users play a more central role in working out the emerging design of information systems, and the well-established distinction between contract development, product development, and in-house development (Grudin 1991) is insufficient.

The most frequently mentioned new aspect of development of web-based applications is the extreme pace under which the work must be conducted due to a very high frequency of new releases (cf. for example Ramesh et al. 2002). An equally important aspect of pace is the speed of change in the technological basis. The pace of the continuous evolution of tools and features is extreme even compared to the rest of the computing field (Bhattacharjee 1998). The result is that many of the—at last—adapted practices within traditional IS development—careful analysis and modelling, punctual establishment of conform architectures and estimates, etc.—are absent in much web-based information system development.

The challenges become even greater since much web-based information system development and organizational implementation has been started as ad-hoc based quick and dirty’ development and introduction of small systems used for toy purposes, information publishing or advertising. Thus, the notion of cloning of existing components and tinkering will be (or rather: are) central characteristics of web-application development and implementation. The ambiguous requirements, the short time-scale, the typically small project teams, and uncertain internal quality parameters imply that the primary benchmark for quality is customer perceptions. Internal development quality of for example the design of databases, the internal architecture and the code is not in focus. Instead, the system as a visual artifact and the aesthetics become essential (Vidgen 2002).

Much of the literature on web-technologies concerns the new potentials, possibilities and challenges for business and user organizations, e.g., as a tech-

nology with potentials for perfect communication and information transmission that it might be labelled as a new type of information system, but it is fundamentally a new medium of human communication (Turoff and Hiltz 1998).

In general information systems based on web-technology can be considered systems that are very easy to modify since they are based upon a fixed, but open standard. This implies that the systems will have fast changing structures that cannot be foreseen at the design and implementation time. There is no doubt that the drifting aspects of information systems will be even stronger in the age of the web-based technologies.

All these above mentioned trends have been predicted by various authors in various settings. But to what extent have these trends become reality, and what are the actual changes in the design and use of information systems due to changes in the basic technology? In order to put explicit focus on these questions we called for contributions reflecting on how, and to what extent, the appearance and usage of web-based technologies have affected the development and usage of complex information systems. We were particularly interested in contributions addressing questions and issues like:

- How the scope, content, and organization of information systems development and use processes change as information services become ubiquitous and software development coalesces with media design?
- What are the accompanying implications of the above mentioned changes for the division of labor, skills, and knowledge in information systems development and use?
- How can we understand the issue of interaction when web-based information systems mediate human communication in a distributed networked organizational context (i.e., a human-human nexus, instead of the traditional human-machine nexus)?
- What are the key organizational and technical factors that facilitate or impede successful implementation of web applications supporting complex interaction between human actors.
- Concepts, methods and tools for guiding both the development of web-based information systems and the development of distributed and networked organizational forms.

We received a total number of 15 submissions that were reviewed in accordance with the normal SJIS standards. The result was a selection of the five papers presented in this issue. These five papers were revised in accordance with the suggestions and recommendations from the reviewers. The five papers cover aspects of both the development of web-based

information systems and the usage and organizational implementation of web-based information systems.

The first paper is written by Jan Pries-Heje, Richard Baskerville, Linda Levine and Balasubramaniam Ramesh. It presents a comparison of the practices of development of web-based applications in 2000 and 2002. The authors focus on identifying key organizational and technical factors relevant for the development of web-based information systems. The empirical basis consists of interviews in ten companies based in North-America and Denmark.

The second paper is written by Jørgen Bansler and Erling Havn. Based on a longitudinal study of the implementation and use of a web-based virtual workspace for project management in a large multinational company this paper discusses the role and activities of the mediators. Carl Weick's concept of sensemaking (Weick 1995) is applied for a detailed analysis of how the mediators understand the situation in which they are involved and how these constructions are enacted. The paper demonstrates the important role exercised by these mediators as well as the extent to which the character of the web-application is created by the mediators.

The third paper is somewhat related to the previous paper since it also addresses aspects of the organizational implementation of virtual workspaces in a large multinational organization. The paper is written by Keld Bødker, Jens K. Pors and Jesper Simonsen. Their paper deals with the implementation of a web-based information system for supporting communication and coordination in a large, distributed organization in the financial sector. Based on findings from the case study, models for change management are elaborated. Especially Orlikowski and Hofman's (1997) model for improvisational change management and Gallivan's (2001) model for the secondary adoption decision processes are used as sources of inspiration.

The fourth paper is written by Magnus Holmqvist and Kalevi Pessi. In this paper experience from implementation of a large-scale supply change management system in Volvo based on web-services is presented. Holmqvist and Pessi share their experience from linking IS and management concepts in relation to business-to-business process integration in at large manufacturing company.

The last paper is by Kristian B. Bøving and Jesper Simonsen. It deals with an interesting methodological issue in relation to studying the use of web-based information systems in distributed organizational settings. Log files of the http transactions to and from a web-server are discussed as media for research into the use of a web-based information system. It is suggested that http log analysis is triangulated with other data to support interpretation of for example interview or observation data.

As mentioned the contributions cover both development issues, aspects regarding the organizational implementation of web-based information systems, and reflections on methodological issues. It is hard to draw precise conclusions and trends across the papers included in this special issue, but there is no doubt that the papers elaborate and refine many of the trends presented in the introduction of this note. As guest editors we are very satisfied both with the quality of the papers presented in this issue, and with the relevance on the themes we hoped to put focus on via this special issue.

We would like to take the opportunity to thank all authors who submitted papers for the special issue as well as the anonymous reviewers for helping us. Without your help it would have been impossible to produce this special issue.

We hope you will enjoy the result of the efforts.

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