

WEB-BASED INFORMATION SYSTEMS— INNOVATION OR RE-SPUN EMPEROR’S CLOTHING?

Chris Barry

Department of Accountancy and Finance, National University of Ireland, Galway, Ireland

Abstract: The challenge of developing new systems with Web technologies has led many to take for granted that such Web-based Information Systems (IS) are by their nature, and in their essence, fundamentally innovative and different from conventional IS. This paper questions whether this is in fact the case. Assumptions of Web-related novelty pervade the academic literature, texts and sales literature where impressive claims are made for the potential of e-commerce and e-business information technology (IT) and applications. In this paper a number of closely related aspects of organizational Web-based IS are considered - the business context and the use of Web technologies, systems development and information systems theory. To assess whether Web-based IS are fundamentally innovative, features or aspects of each of these dimensions are critically studied. In doing so the author puts forward a number of revisionist perspectives. The paper concludes that much of what is claimed to be new about Web-based IS is often recycled, re-labelled or simply erroneous.

Key words: Web-based information systems; information technology; e-commerce; information systems development; information systems theory.

1. INTRODUCTION

In recent years firms have made massive investments in Web-based applications, reaching into almost every aspect of organizational work. The effect of the Web on many firms has been dramatic – new business strategies have been developed based around innovative Web-based technologies; existing business strategies have been re-worked and re-aligned with Web strategies; ways in which business had been done in the past have been

changed, such as supply chains, to exploit the potential of the Web; and new business models have been developed. However the economic downturn in all sectors, especially the ICT (Information, Communications and Technology) sector, and the collapse of many Web enterprises in 2001 and 2002 has dampened enthusiasm and sent world stock markets into steep reversals. Some equilibrium is being restored to the market as firms begin to recognize that e-business is really about business and that “market signals” from the early days were heavily distorted (Porter, 2001).

Frenetic Web-based systems development leading up to this period was characterized by processes that were unstructured and usually unsupported by methods or techniques that one might ordinarily expect to ensure high quality or effectiveness. Some poor Websites reflect this lack of formalization in the development process, while others may have been successful precisely because they were not patched together with old methods and techniques. Since little research has been conducted on Web systems development processes it is unclear how some organizations got it right and others got it fabulously wrong. Perhaps luckily for some, much of the chaos in development was masked because many Web projects had investors with deep pockets and systems, perhaps as Ciborra suggests (1999), were assembled as much by improvisation as by design.

There is also uncertainty and confusion within the academic world of Information Systems (IS) about the novelty of Web-based IS, whether we need new ways of developing such systems and whether existing, established IS theories are able to explain and absorb this new “type” of information system. Now, as we emerge from the hype surrounding all things preceded by “Web” and “e-”, it gives academics and developers some time for reflection about the nature of Web-based IS.

2. SO WHAT IS NEW AND WHAT IS NOT?

It is often assumed that the Web has brought “newness” to many aspects related to its development, deployment and use. On the face of it the assumption is reasonable since nothing like the information technology (IT) had been seen before and many, who would never have engaged with IT at any serious level previously, were soon e-mailing, browsing and shopping on-line. The enormous social change that these new technologies brought, served to fuel the notion that all that was Web-related was original and innovative. Some even make claims that it is a “fundamentally a new medium of human communications” (Turoff and Hiltz, 1998) – a phenomenon of superconnectivity. This paper is concerned with information systems issues and evaluates three closely related aspects of Web-based IS:

the business context and the use of Web technologies, systems development and information systems theory. In order to assess whether Web-based IS are fundamentally original, an analysis of each of these dimensions is undertaken to distinctly characterize such systems. The following table illustrates each feature or aspect of the Web and suggests whether some of its novelties are real or whether some degree of revisionism is warranted.

Table 1. Novelty of Web-based Innovation

Web Feature or Aspect	Assumed Novelty	Revisionism?
Business and Technology	New Web business sector	The Web is every business sector!
	New way of selling and advertising	One more distribution channel and advertising medium
	Better direct marketing	Some success, e.g. solicited advertising but damaged by spam
	Redundancy of corresponding conventional businesses	The few successful Web-based competitors were merged or mopped up
	Projects did not demand traditional capital budgeting assessment techniques	Explosive costs went unnoticed until share prices collapsed
	Rapid emergence of new technologies	None - unprecedented rate of technological development in IT
	Cheap alternative to conventional systems development	Growing evidence that large-scale Web-based IS more costly than traditional in-house cousins
	Technology delivers benefits	A proven myth
Systems Development	Early expectation that impact would be limited to small-scale, standalone applications	Explosive growth in use of Web-based technologies demands integration
	Nature of Web-based IS requires alternative approach to development	Yes, since few suggested Web methods (e.g., WebHDM, RMM) are used in practice
	Existing development techniques inappropriate	For the most part correct - but no widely agreed substitutes found
IS Theory	Assumption that Web-based IS are theoretically "new"	IS literature comfortably absorbs them into existing frameworks
	Assumption that Web-based IS are a new type of IS	Analysis reveals non-homogeneity, examples can be found everywhere
	Fertile ground for new theoretical IS models	None found to be widely accepted

Table 1 illustrates how many assumptions and predictions about the Web-based world have been unfounded or unfulfilled. It remains full of promise but it is immature in almost all respects. Each feature or aspect is discussed more fully in the following sections.

3. BUSINESS AND TECHNOLOGY DIMENSIONS

As the introduction pointed out, the business world is now more cautious about investing in Web-related enterprises. Little needs to be said about the heightened expectations of that time except that they under-achieved spectacularly. Professionals and academics tried to make sense of the many and varied types of Websites that emerged. Undoubtedly the originality of searching for products on-line and buying them or gathering more information in minutes that you could collect in months by other means grabbed everyone's imagination. But while these features of the Web made everyone sense the emergence of a new age, many such business or technology revolutions have come and gone in the past (for example the railway boom of the nineteenth century or the space age of the twentieth century) - having an impact but ultimately, excessively over-optimistic (Howcroft, 2001). The notion that this was a new business sector was quickly put to rest as it became clear that the Web had tremendous possibilities for every sector. Suggestions that there was a "new economy" where success was measured by factors like growth in customer numbers, increased market share, acquisitions and ultimately company floatation, forged through exciting new Web-delivered businesses, were quickly shelved. As Porter puts it, the idea that the "...Internet rendered all the old rules about companies and competition obsolete ... is a dangerous one." (2001 p. 63). He goes further, suggesting it led many companies to make bad decisions that have eroded their competitive advantage. Profits are now back in fashion. The upheaval has shaken the bad fruit from the tree and left the remaining firms with profitable, sustainable, business models. Perhaps unsurprisingly many of these models closely resemble more old-fashioned ones such as retailing, financial services, education and entertainment.

Below, in Table 2, is an amalgam of several classification schemes for new types of commercial Websites (exceptionally the free-content or library model has been included). It is not necessarily complete but most Websites are characterized by one, and perhaps several, of these models illustrating the non-homogenous nature of Web-based IS. Clearly, the table demonstrates the diverse nature of Websites and while the classifications help to categorize them it does not suggest many fundamentally new business models. Undoubtedly the Web is allowing businesses develop value by leveraging its power (Tapscott, Ticoll and Lowy, 2000) and new business opportunities and markets have emerged - but any suggestion that revenue-based models or banner advertising are important innovations is without merit.

Table 2. Commercial Website Classification

Model	Illustration
The free-content or e-publishing model	Original, philosophically-driven use or a public broadcasting service like bbc.co.uk
The subscription model	The Irish Times at Ireland.com
The mail-order or storefront model	Amazon.com or Tesco.co.uk
The digital delivery model	Most software suppliers / trial versions
The direct marketing model	Solicited and unsolicited mail
The real estate model	Firms sell opportunistic domain names and e-mail addresses
The incentive scheme model	Used by market research firms
The business to business model	For EDI exchange or trade
The free-content, advertising based model	General search engines turned portals like Altavista.com and Yahoo.com
The financial service centre	Web only or new bank channel
Electronic markets	Sector-based markets that extend the value chain
The e-learning model	Formal and informal, paying or free
The on-line entertainment model	Web TV or Music distribution

The not-for-profit ethos of the early days of the Internet seemed to insulate it from commercialization and some of its more unsavoury facets. Now relentless marketing and certain firms have degraded the experience in pursuit of profit. Techniques that have been deployed increasingly frustrate users. Website “stickiness”, that makes it difficult to extricate yourself from a site is increasingly common. Similarly, direct marketing that promised great potential for “no-waste”, focussed advertising and marketing has become blemished with outrageous techniques of a small number of spammers who are obliterating the medium for legitimate firms. The Web, just like the “real world” of business, is far from insulated from tacky schemes.

A more mature view of the Web is that it is now a new, sophisticated marketing channel. It hold the promise of being potentially better than others because it is possible to collect, in real-time, information about customers as they click their way through pages, buttons and advertisements. It has been proven by some to deliver products and offer services more quickly and more cheaply than through certain traditional channels (e.g., Dell) and to radically re-structure some industries such as Internet based e-ticketing systems (e.g. Ryanair). However this is fundamentally to do with business success, not a technological triumph. There needs to be less concentration on “e” and more on business and business strategy (Brache and Webb, 2000; Porter, 2001; McGrath and Heiens, 2003).

Predictions that conventional businesses like high street banks, retail firms and publishers would melt away as low cost Web-based alternatives attracted customers has not happened. Wild market capitalizations of Web-

based firms like lastminute.com (at one time £700 million with £0.6 million turnover) just made no sense. When the bubble burst, even many of the success stories of firms that made profits (or manageable losses) on the Web were unable to survive and were either merged or mopped up by firms with real, “old” money. The business world has come full circle, from bricks to clicks and back to bricks (or bricks and clicks). As Saloner & Spence (2002) put it - “It is now widely accepted that for the vast majority of goods and services, the Internet will supplement rather than replace existing channels.”

Without question new Web technologies have moved along at a dizzying pace, producing increasingly sophisticated Websites that extend business services and proffer new ways of conducting business. However there are associated problems, such as compatibility, the organizational cost of change and skills training in education and industry. Often, each new “innovation” is given more credit than it deserves. Exaggerated claims made in the past for new technologies such as 4th generation languages and CASE tools have given those within the IS academic and professional community some healthy scepticism. This is a view rarely shared by those more intimately involved in Web-based development, many of whom began work within that environment, fuelled by youthful enthusiasm and un-lumbered by the legacy of traditional systems and practices.

Most of the technology of the Web is new and has emerged at an unprecedented rate. Where to begin? - Web browsers, HTML, DHTML, XHTML, XML, CGI, ASP, Javascript, PHP, plug-ins, Intranets, Web portals, dedicated e-mail and Web servers, server “farms” to name a few. It was and remains the rapid emergence of new technologies that makes the Web such a hectic place – for businesses, developers and users alike. In the early days, it seemed so simple to put together a few Web pages and declare ones arrival in cyberspace. It was a cheap window on the world. Now the complex technologies of the World Wide Web present immense challenges to systems developers who must ensure that the systems are robust, always-on and universally accessible on multiple platforms. Today it is an expensive proposition to develop large-scale IS using Web technologies, rivalling, if not exceeding, traditional IS in cost and complexity. New requirements or dimensions of a system will naturally impinge on development and maintenance and add to a system’s cost. For example, multilingualism and localization, legal issues across national boundaries and the need to regularly update volatile content.

Two schools of thought on competitiveness through IT innovation inform the debate - the technology-driven and the competency-driven approach. The former sees IT as a powerful weapon in achieving competitive advantage and thus business benefits. This view, given weight to and based on the work of Porter (1985), sees the “strategic” use of IT as closely related to an

organization's fundamental business strategy (Porter and Dent-Micallef, 1997). The latter view considers any competitive advantage to be organizationally specific, based on its own distinctive resources, from which it may gain benefit. This view holds that the real strength and value of IT is that it can release, support and nurture existing skills and competencies (Clemons, 1991; Booth and Philip, 1996), creating greater organizational flexibility - a hard come-by commodity.

At the outset, a technology-driven version was typically pitched to prospective clients seeking a Web-based system. This was usually so whether or not any clear set of business objectives for the system existed. Firms were encouraged to have a "presence" otherwise some possible competitive advantage would be lost. This contention has long been debunked (Earl, 1992) and the reverse is in fact the case - that a firm must establish the business case first, then other activities such as marketing, financial planning and human resource management, as well as IT investments, would follow. Finally, all going to plan, business benefits will flow. Similarly Howcroft, more recently, noted that investors mistakenly expected that "technology *per se* delivers benefits" (Howcroft, 2001). As Porter suggests we should see the Internet for what it is "...an enabling technology - a powerful set of tools that can be used, wisely or unwisely, in almost any industry and as part of almost any strategy" (2001).

4. SYSTEMS DEVELOPMENT

4.1 What Development Practices are Best?

Does the systems development process for Web-based IS demand an entirely new approach? On the face of it the many distinct characteristics of such systems based on new technologies suggests it should. However it should not be assumed that systems development in a Web-based context differs in every respect. There are still many issues that remain common to all IS projects. These include:

- A business case must be made for a Web-based project
- The feasibility of projects should be evaluated using traditional investment appraisal techniques such as Return on Investment, Net Present Value or Payback Analysis
- The management of Web-based projects is crucial to bring them in on time and within budget
- Some "structure" in the development process is needed (provided by new or existing methods and techniques)
- Systems analysis still needs to be conducted to elicit user needs

– Web-based IS have to be integrated with existing IS

The early, *laissez-faire* approach to Web-based IS development had led to on-the-fly and ad-hoc development practices. This was to a large extent understandable, as traditional methods seem inappropriate for the development of what were typically small Websites (Barry and Lang, 2001). While the reasons why this might be so may not be fully understood, it should be noted that Web-based IS are far more interactive than traditional systems and aspects such as changing dynamic interfaces, multimedia content and personalized content are rarely modelled by existing IS or software engineering techniques. That traditional methods could further be shown to be unsuitable is evident when the working arrangement between team members is considered. Web-based development teams comprise individuals from quite diverse backgrounds but are nonetheless highly dependent on each other's skills. Now, however, as Web-based IS have grown in scale and include multimedia, data-heavy, business applications, it is essential for practitioners to use comprehensive, easily understood development techniques (Britton, Jones, Myers and Sharif, 1997; Barry and Lang, 2003). The time when small-scale Web-based IS could flaunt more conventional development practice has passed as large Web-projects demand a more managed process. It has also been noted that Web-based IS development differs because they are developed on "internet time" (Iansiti and MacCormack, 1997; Aoyama, 1998; Cusumano and Yoffie, 1999) and that they are characteristically different from other IS because they exhibit properties such as extreme times pressures, vague requirements, a release orientation, parallel development, variable quality and a dependence on quality staff (Baskerville and Pries-Heje, 2002).

So what methods should practitioners be using? Many innovative methods have been put forward by academics (Garzotto, Paolini and Schwabe, 1993; Isakowitz, Stohr and Balasubramanian, 1995; Gellersen, Wicke and Gaedke, 1997) but research indicates that practitioners are not making use of them (Barry and Lang, 2001). Should the IS community be alarmed at this? Not necessarily. Barry and Lang found that many multimedia and Web developers were using some form of in-house method based on a semi-structured SDLC approach and improvising with old, familiar techniques such as ERDs for data design, storyboarding and flowcharting. This improvisational aspect of Web-based IS development is a repeated theme in recent literature (Cusumano and Yoffie, 1999; Vidgen, 2002; Baskerville, Ramesh, Levine, Pries-Heje and Slaughter, 2003) that may help to explain the way methodology, as it is conventionally understood, has become contingent and variable (Fitzgerald, Russo and O'Kane, 2000). This "à la carte" approach to methodology usage is consistent with findings on how multimedia and Web development takes

place in Barry and Lang's work. Nevertheless, assuming that without "structured" methods developers are using poorly disciplined approaches to produce Web-based IS is not a safe assumption. Lang's research (2003) reveals that hypermedia and Web-based development is more disciplined than is commonly believed and that talk of a "hypermedia crisis" is not being borne out by research. He found that 84% of respondents used a hypermedia development process that had clear tasks and/or phases and that in half of these organizations the processes were explicitly documented.

This must be a surprise for some academics and many consulting firms that still share a widely held view that development practice remains sloppy and ad-hoc and would benefit by prescribed, engineering oriented methods. More recently, several Web-specific development methods have been proposed (De Troyer and Leune, 1998; Howcroft and Carroll, 2000; Ginige and Murugesan, 2001; Vidgen, Avison, Wood and Wood-Harper, 2003) but it remains to be seen if they will be widely adopted. Development approaches that are emerging from practitioners should make the academic community sit up and take note – they may offer more promise. Some small teams developing software for quick-to-market applications are using agile software development (ASD) approaches that include XP, Scrum, Adaptive Software Development, Feature-Driven Development (FDD) and Dynamic Systems Development Methodology (DSDM). Indeed Web-based IS projects may be well suited to the use of ASD techniques. The first principle of the Agile Software Manifesto states "our highest priority is to satisfy the customer through early and continuous delivery of valuable software." The emphasis is on individuals and interactions rather than processes, tools and project plans. Research by Baskerville et al. has identified practices that characterize Internet speed development and conclude that "agile principles are better suited than traditional software development principles" (Baskerville et al., 2003 p. 70).

4.2 Challenges for the IS Development Community

There are, of course, huge challenges that face the IS community to deal with the rising complexity of Web-based IS. Development methods can be improved, in this author's view by first understanding how such systems are being developed and basing methods and techniques on firmly rooted comprehension. Early assumptions regarding the homogeneity of Web-based projects were misplaced. It soon became apparent that there was no one methodology or set of techniques for developing Web-based IS. This was simply because Web-based IS are as diverse as all other types of IS (see discussion in section 5 below). Different approaches, contingency-style, are needed depending on project type, size, functionality and so on. Indeed

differences in the approach to end-user requirements determination are needed depending on whether a Web-based application is being designed for internal rather than external users (Huang, 2003). The externally oriented systems, where the user base is typically beyond the control of the developer, makes requirements determination and monitoring more difficult. For a particular organization there must also be a match between process maturity and the development approach.

An area that remains as complex as it is unresolved is that of integration. Making Web-based system communicate with, sit alongside or on top of other systems is difficult and hazardous. The most high-tech systems have to be integrated with sometimes the most low-tech, sometimes the most ancient and sometimes proprietary systems that don't like talking to anything. Integration is big business at the moment as consultants capitalize on the plain truth that computers and associated technologies communicate in almost as many languages as we humans do.

Team members need to understand the perspectives and approaches of their colleagues, so that good design decisions are made (Sano, 1996; Rosenfeld and Morville, 1998). Multi-disciplinary collaboration needs to be a vital part of any new approach and development methods and techniques that cater for the differing nature of developer roles must be accounted for. If software engineers are from Mars and graphic designers are from Venus the development environment must productively accommodate both with a "universal" language.

5. INFORMATION SYSTEMS THEORY

5.1 The Novelty of Web-based IS

Claims for the newness or novelty of all things Web-related have dominated the media and IS press for some years now. While most IS professionals and researchers are well used to exaggerated assertions from software and hardware vendors about new technologies, some of the academic literature has also been guilty of abandonment and adoption in one graceful movement. It is of no surprise then that a good deal of uncertainty and confusion is evident amongst IS students and researchers alike. In a debate on the fundamental novelty of Web-based IS this author recalls a post-graduate student exasperatingly asserting that "...of course Web IS are new, they have just been invented!"

IS researchers do need to ask some essential questions, none the least of which is "are Web-based IS new?" If they are can we construct models to demonstrate their originality? Do Web-based IS represent a novel ensemble

of IS components such as people, machines, procedures and activities? Perhaps if they are not entirely new, are they a reasonable extension to some taxonomy, can they usefully extend an existing framework or can they be understood and explained by widely accepted existing IS concepts? There are undoubtedly exciting, productive and new agendas that can be pursued, but overlooking existing research does no service to the field of IS or to the tradition of exemplar research. Anchors in the corpus, oft-cited references, cumulative research – these should be the starting point for sound research. Given the past failings of the discipline in forgoing the establishment of sound theoretical foundations it would be wise for all IS researchers to examine the extant boundaries of the field. We should also as Galliers suggests look for lessons in the reference disciplines (2000).

5.2 Existing IS Definitions and Models

A brief look at some of the longest established, and widely accepted, IS conceptual literature demonstrates that theoretically Web-based IS can be quite comfortably accommodated. If we were to attempt an informal proof of whether Web-based IS are new, a definitional view is an obvious starting point. Definitions of Management Information Systems (MIS) have been generally broad and inclusive. Take one from Whitten and Bentley:

“An information system is an arrangement of people, data, interfaces and geography that are integrated for the purpose of supporting and improving the day-to-day operations in a business, as well as fulfilling the problem-solving and decision-making information needs of business managers” (Whitten and Bentley, 1998).

At a glance one can think of many types of Web-based IS that neatly fall within this definitional domain such as a distributed group of users of an intranet-based production scheduling system, a Web-based sales reporting system might deliver summarized sales information to Account Managers in support of client sales or an Intranet-based personnel system distributes training opportunities, job postings, task guidelines and newsletters to staff. Definitions of other more recent types of IS such as Decision Support Systems (DSS) or Executive Information Systems (EIS) produce similar outcomes.

“A DSS is a computer-based information system used to support decision making activities where it is not possible or desirable to have an automated systems perform the entire decision process” (Ginzberg and Stohr, 1981).

“Computer based systems that help decision makers confront ill-structured problems through direct interaction with data and analysis models” (Sprague and Carlson, 1982).

An Intranet-based application that has been designed to support a complex joint venture or a Web-based system that assists managers in forecasting departmental budgeting requirements would both constitute legitimate DSS-like Web-based IS.

EIS, developed to provide executives and senior managers with the internal and external information they need for monitoring operational procedures as well as for strategic decision-making, can be defined as:

“A computerised system that provides executives with easy access to internal and external information that is relevant to their critical success factors” (Watson, Houdeshel and Rainer, 1997).

Once again Web-based IS can be identified as applications of EIS. For example, a browser-based Virtual Private Network might deliver to top executives key information on each production facility such as production schedules, capacity utilization, sales and economic forecasts, and news feeds from the media and industry analysts.

In reality none of this should be surprising if we characterize a Web-based IS as an information system that utilizes Web and other technologies to serve an organizational need. While we can debate the conceptual similarity between the definitions above it is clear that Web-based IS are easily recognizable as applications of each of these types of IS.

5.3 Gorry and Scott Morton’s Framework

Looking back at some of the earlier IS literature may help to give researchers and practitioners some perspective. Gorry and Scott Morton’s framework (1971) has been widely used to classify information systems. Substituting Gorry and Scott Morton’s examples for Web-based IS, Figure 1 demonstrates that such systems can fall above or below a line (shown dashed) that distinguishes structured from semi-structured or even unstructured decision domains. Similarly, such systems can range across managerial activity from operational to strategic.

If one looks for examples of MIS, DSS and EIS defined in the previous section, the retrofitting of Web-based IS into Gorry and Scott Morton’s framework works! It would appear that it is possible to find Web-based IS to fall into every part of the framework. There are two possible conclusions that can be drawn from this – either Web-based IS are entirely unexplained by the framework or they are neither unique nor homogeneous. Given the

examples of Web-based IS illustrated above it is reasonable to assume the latter explanation.

Decision Structure ↓	Categories of Managerial Activity		
	Operational Control	Management Control	Strategic Planning
Structured	Web-based Credit Clearance Systems Internet EDI	Intranet-based Project Time Allocation Intranet-based Budget Analysis System	Intranet-based Investment Management System Issue-specific Corporate Public Relations site
Semi-structured	Web-based Taxation Compliance System Web-based Order Tracking Web-based Quality Control Systems	WAP-based Truck Routing System Web-based ERP and CRM Web-enabled Groupware	Web-based Strategic Management System Web-based Corporate Intelligence EIS Web-based Meetingware
Unstructured			

Figure 1. Web-based IS in Gorry and Scott Morton’s Framework

5.4 Taxonomic Perspectives

Further evidence that Web-based IS are not new in any theoretical sense, can be found in Mason’s seminal paper (1969). In it, he describes a continuum along which assumptions about the decision-making process are added in as you move across from left to right (see Figure 2). At various points (of articulation) in the process the IS stops and the decision-maker takes over. This analysis allows one to demonstrate the relative simplicity or complexity of a system, and to express what remains for the decision-maker to do in order to complete the decision-making process.

	Typical Decision Complexity				
	High		Medium	Low	
Decision-making Activities →	Source	Data	Predictions and Inferences	Values and Choices	Action
Mason's Taxonomy	Databank System		Predictive Information System	Decision-Making System	Decision-Taking System
Types of Information Systems	Executive Information System		Decision Support System	Data Processing	Automated EDI
Simon's decision-making phases	Intelligence		Design		Choice
Web-based IS	Web-based Information Retrieval/Archive		B2B Supply-chain System	Web-based Order Entry	Automated Internet EDI

Figure 2. Web-based IS in Mason's Model

The model also holds a great deal of resilience in classifying new “types” of information systems. For example, a sales forecasting DSS equates to a Predictive Information System and a payroll application equates to a Decision-Making System. It is clear that Web-based IS can be simple information retrieval systems or complex business-to-business supply-chain centres, making it difficult to sustain an argument that Web-based IS are a new “classification” of information system. Indeed the analysis reveals that “Web-based” is little more than an adjective that could easily be replaced by “Client/server” or “GUI-based” and that the “Web-based IS” are just Web-based examples of applications for each of the “Types of Information Systems” above. A similar perspective can be achieved when Alter’s taxonomy of decision support systems is analysed (Alter, 1977). More elaborated models such as Sprague’s framework for the development of decision support systems (Sprague, 1980) or Scott Morton’s three-part taxonomy (Scott Morton, 1985) can also be used to illustrate the ubiquitous nature of Web-based IS.

5.5 Interpretation of the Analysis

The analysis above tells us that Web-based IS are many and varied. They are not homogenous and range across Gorry and Scott Morton’s framework

and Mason's continuum effortlessly. Some are data processing oriented, some decision support oriented and others are strategically oriented applications. That well established IS theories and frameworks accommodate Web-based IS so well is reassuring. Web-based IS seem to be everywhere within the models because the common denominator is the platform on which they are delivered. Nonetheless many aspects of Web-based IS need to be conceptualized within the context of other types of IS. Indeed, researchers need to develop models and frameworks that are as enlightening as the work of those discussed above.

6. CONCLUSIONS AND KEY ISSUES FOR THE IS COMMUNITY

This paper started out with a simple question – are Web-based IS new and wholly innovative? In the discussion the author has deliberately chosen illustrations that reflect parallels with non-Internet cases. The three dimensions of Web-based IS discussed above all reveal credibility gaps between promise and reality, between fact and fiction and indeed between paradigmatic claims and practice.

On the potential of the Web to deliver new and exciting business applications there have undoubtedly been, and will continue to be, enormous opportunities. While many applications might simply be the Web-based delivery of well-established systems such as libraries, auctions and direct marketing systems, others present new business models such as industry portals, digital distribution and elaborate business-to-business systems. Intranets allow flatter organizations to more easily implement multifunctional teamwork adding hugely to productivity. Cairncross has predicted that “the most widespread revolution will come from the rise in collaboration and the decline of the organizational hierarchy” (2002). While these opportunities are of critical interest to business managers and strategists, apart from natural curiosity, the IS development community should remain largely neutral. To put it another way – “Web-based anything” is just another application!

The discussion on systems development on how Web-based IS are actually built does suggest significant transgression from more conventional IS development. While multimedia information systems never achieved the growth anticipated in the early 1990s, Web-based applications have quickly been embedded into mainstream organizational systems. Although the multimedia content of many Websites remains limited, improvements in bandwidth and backend processing may soon remove technical barriers. If as it seems likely, and some research suggests (Barry and Lang, 2001), there

will be significantly increased multimedia content in organizational Web-based IS in the near future, the assistance needed by practitioners to develop and implement them successfully will become more urgent. More research such as that conducted by Baskerville et al. (2003) that gets close to developers and delivers fresh insights needs to be conducted.

Perhaps most telling, and of most interest to academics, might be the analysis of the theoretical foundations of Web-based IS. From a theoretical perspective, the IS literature has been able to absorb Web-based IS into the family of information systems without too much difficulty. The nature and characteristics of such systems are satisfactorily explained and therefore Web-based IS are not conceptually new.

It is time for some revisionism. The goldrush is over and the IS community should now be ready for some real debate on the fundamental nature of Web-based IS and innovation, what are their organizational significance and how can improvements be made to the development process? Researchers also need to uncover why there are inadequacies in the use of traditional approaches, how practitioners are developing systems and how they might be further assisted by methods, techniques and tools firmly based on their needs during development? Lastly, in the world of Web-based IS development, the distance between prescriptive methods and usable ones needs to be bridged.

REFERENCES

- Alter, S. (1977), A Taxonomy of Decision Support Systems. *Sloan Management Review*, 19(1), 39-56.
- Aoyama, M. (1998), Web-based Agile Software Development. *IEEE Software*, Nov/Dec, 56-65.
- Barry, C. and Lang, M. (2001), A Survey of Multimedia and Web Development Techniques and Methodology Usage. *IEEE Multimedia*, 8(3), 52-60.
- Barry, C. and Lang, M. (2003), A comparison of 'traditional' and multimedia information systems development practices. *Information and Software Technology*, 45(4), 217-227.
- Baskerville, R. and Pries-Heje, J. (2002), Information Systems Development @ Internet Speed: A New Paradigm in the Making! Tenth European Conference on Information Systems, 282-291, Gdansk, Poland.
- Baskerville, R., Ramesh, B., Levine, L., Pries-Heje, J. and Slaughter, S. (2003), Is Internet-Speed Software Development Different? *IEEE Software*, 20(6), 102-107.
- Booth, M. and Philip, G. (1996), Technology driven and competency-driven approaches to competitiveness: Are they reconcilable? *Journal of Information Technology*, 11(2), 143-159.
- Brache, A. and Webb, J. (2000), The Eight Deadly Assumptions of e-Business. *Journal of Business Strategy*, 21(3), 13-17.

- Britton, C., Jones, S., Myers, M. and Sharif, M. (1997), A Survey of Current Practice in the Development of Multimedia Systems. *Information & Software Technology*, 39(10), 695-705.
- Cairncross, F. (2002), *The Company of the Future: How the Communications Revolution is Changing Management*, Harvard Business School Press.
- Ciborra, C. (1999), A Theory of Information Systems Based on Improvisation, in W. Currie & B. Galliers (Eds.), *Rethinking Management Information Systems*, 136-155, Oxford University Press.
- Clemons, E. (1991), Corporate strategies for information technology: A resource-based approach. *Computer*, 24(11), 23-32.
- Cusumano, M. and Yoffie, D. (1999), Software Development on Internet Time. *Computer*, 32(10), 60-69.
- De Troyer, O. and Leune, C. (1998), WSDM: a user centered design method for Web sites. *Computer Networks and ISDN Systems*, 30, 85-94.
- Earl, M. J. (1992), Putting IT in its place: A Polemic for the 1990's. *Journal of Information Technology*, 7(2), 100-108.
- Fitzgerald, B., Russo, N. and O'Kane, T. (2000), An Empirical Study of System Development Method Tailoring in Practice. Proceedings of Eighth European Conference on Information Systems, 187-194, Vienna.
- Galliers, R. (2000), A Manifesto for the Future of Information Systems as a Topic of Study, in P. Finnegan & C. Murphy (Eds.), *Information Systems at the Core: European Perspectives on Deploying and Managing Systems in Business*, 13-29, Dublin: Blackhall Publishing.
- Garzotto, F., Paolini, P. and Schwabe, D. (1993), HDM - A Model-Based Approach to Hypertext Application Design. *ACM Transactions on Information Systems*, 11(1), 1-26.
- Gellersen, H., Wicke, R. and Gaedke, M. (1997), WebComposition: An Object-Oriented Support System for the Web Engineering Lifecycle. Proceedings of the Sixth International WWW Conference, 1429-1437, April, Santa Clara, CA, USA.
- Ginige, A. and Murugesan, S. (2001), Web Engineering: A Methodology for Developing Scalable, Maintainable Applications. *Cutter IT Journal*, 14(7), 24-35.
- Ginzberg, M. and Stohr, E. (1981), *Decision Support Systems: Issues and Perspectives*, Amsterdam, The Netherlands: North-Holland.
- Gorry, G. and Scott Morton, M. (1971), A Framework for Management Information Systems. *Sloan Management Review*, Fall, 55-70.
- Howcroft, D. (2001), After the goldrush: deconstructing the myths of the dot.com market. *Journal of Information Technology*, 16(4), 195-204.
- Howcroft, D. and Carroll, J. (2000), A Proposed Methodology for Web Development. Proceedings of the Eighth European Conference on Information Systems, 290-297, Vienna.
- Huang, A. (2003), Web-based Information Systems Requirements Analysis. *Information Systems Management*, Winter, 50-58.
- Iansiti, M. and MacCormack, A. (1997), Developing Products on Internet Time. *Harvard Business Review*, 75(5), 108-117.
- Isakowitz, T., Stohr, E. and Balasubramanian, P. (1995), RMM: A Methodology for Structured Hypermedia Design. *Communications of the ACM*, 38(8), 34-44.
- Lang, M. (2003), Reconsidering the "Software Crisis": A Study of Hypermedia Systems Development. Proceedings of IADIS International WWW/Internet 2003 Conference, November 5-8, Algarve, Portugal.

- Mason, R. (1969), Basic Concepts for Designing Management Information Systems. *AIS*, Research paper no. 8.
- McGrath, L. and Heiens, R. (2003), Beware the Internet panacea: how tried and true strategy got sidelined. *Journal of Business Strategy*, 24(6).
- Porter, M. (1985), How information gives you competitive advantage. *Harvard Business Review*, 65(4), 149-160.
- Porter, M. (2001), Strategy and the Internet. *Harvard Business Review*, 79(3), 62-78.
- Porter, M. and Dent-Micallef, A. (1997), Information technology for competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, 18(5), 375-405.
- Rosenfeld, L. and Morville, P. (1998), Information Architecture for the World Wide Web, Sebastopol, CA: O'Reilly & Associates.
- Saloner, G. and Spence, M. (2002), Creating and Capturing Value - Perspectives and Cases on Electronic Commerce, New York: John Wiley & Sons.
- Sano, D. (1996), Designing Large-scale Websites: A Visual Design Methodology, New York: John Wiley & Sons.
- Scott Morton, M. (1985), The State of the Art of Research, in F. McFarlan (Ed), The Information Systems Research Challenge, 13-41, Cambridge, MA: Harvard Business School Press.
- Sprague, R. (1980), A Framework for the Development of Decision Support Systems. *MIS Quarterly*, December, 1-26.
- Sprague, R. and Carlson, E. (1982), Building Effective Decision Support Systems, Englewood Cliffs, NJ: Prentice-Hall.
- Tapscott, D., Ticoll, D. and Lowy, A. (2000), Digital Capital: Harnessing the Power of Business Webs, London: Nicholas Brealey.
- Turoff, M. and Hiltz, S. (1998), Superconnectivity. *Communications of the ACM*, 41(7), 116.
- Vidgen, R. (2002), What's so different about developing Web-based Information Systems? Tenth European Conference on Information Systems, 262-271, Gdansk, Poland.
- Vidgen, R., Avison, D., Wood, B. and Wood-Harper, T. (2003), Developing Web Information Systems, Oxford: Butterworth Heinemann.
- Watson, H., Houdeshel, G. and Rainer, R. (1997), Building Executive Information Systems and other Decision Support Applications, New York: John Wiley & Sons.
- Whitten, J. and Bentley, L. (1998), Systems Analysis and Design Methods, Boston, MA: Irwin McGraw-Hill.