2000

# Systems Analysis and Design for eBusiness: Implications for Research

John D. Wells
*Washington State University*, jwells@wsu.edu

# Systems Analysis and Design for EBusiness:
# Implications for Research

John D. Wells, School of Accounting, Information Systems, & Business Law,
Washington State University, jwells@wsu.edu

## Abstract

*Electronic business has fundamentally altered the way in which organizations attain and sustain competitive advantage. The goal of systems analysis and design is to develop a technical infrastructure that is tightly coupled with an organizations strategic plan. The systems development life cycle (SDLC) is a primary means to achieving this goal. The purpose of this paper is to view each step in the SDLC from an EBusiness perspective to gain insight into how this emerging environment is affecting the methods, techniques, and tools that are used to facilitate the steps within the SDLC. Current research is discussed as well as future research issues that are considered to be pertinent to the development of methods, techniques, and tools that will facilitate an EBusiness-oriented SDLC methodology.*

## Introduction

Electronic business (EBusiness) has emerged as a revolutionary means to conduct business. The implications for this shift in how organizations interact with its employees, business partners, and customers are far reaching. Practitioners and academicians have been blind-sided by this new arena. Practitioners are scrambling to uncover the fertile areas of sustainable competitive advantage while academicians are attempting to figure out where and how EBusiness fits into their discipline. With this volatile new environment comes opportunity. As academicians, it is our responsibility to undertake research endeavors that allow us to understand this new way of conducting business. The goals for this research direction are three fold: 1) advance the body of knowledge within our discipline, as well as related ones, to understand the issues and impacts of EBusiness, 2) prepare students, both undergraduate and graduate, to successfully navigate and succeed in the emerging world of EBusiness, and 3) to provide organizations, both public and private, with theoretical and pragmatic insight into this new business environment.

The purpose of this paper is to provide a research orientation for the MIS discipline and how it will meet these goals. It is our contention that it is the role of MIS to create and maintain the IT infrastructure that facilitates the execution of EBusiness strategies. This orientation will be framed in the context of the systems development life cycle (SDLC) which provides an aggregate view of the issues and concepts that encompass the MIS

discipline. With this in mind, the SDLC was selected as the research framework to include, not exclude, all relevant system development approaches such as object-oriented (e.g., Unified Modeling Language) and iterative development (e.g., Rapid Application Development). Each phase will be analyzed from an EBusiness perspective. As a result, relevant research questions/issues will be identified and discussed. The paper will conclude with a summary of these research questions/issues.

## Traditional SDLC

The SDLC is "the traditional methodology used to develop, maintain, and replace information systems" (Hoffer, et al. 1999). While there are a number of different SDLC models (Kendall and Kendall 1998; Whitten and Bentley 1998), they encompass the same basic set of methods, techniques, and tools. The Hoffer, et al. (1999) SDLC methodology will be used within the context of this paper. Table 1 provides an overview of the primary deliverables and outcomes from each phase of the SDLC. The following section will use these deliverables and outcomes to derive a set of research questions that examine the impact of EBusiness on each phase.

## EBusiness SDLC

The goal of this section is to discuss how EBusiness will fundamentally alter how the methods, techniques, and tools within the SDLC are applied. Each subsection will identify a few key research questions and they will be summarized in the final section of the paper.

### EBusiness Project Identification and Selection

A key challenge for any organization that is planning on competing in the EBusiness arena is identifying IS development projects that will align its technical infrastructure with its strategic goals. EBusiness presents a business environment that is fundamentally different from the traditional model (Evans and Wurster 2000). There are strategic differences between pure EBusiness (e.g., Amazon) and traditional (e.g., Barnes & Noble) organizations (Modahl 2000). Also, there is an increasing need to alter the organization's strategic focus to become more customer-centric (Seybold 2000).

These strategic implications present a number of interesting research issues that relate to the project identification and selection phase of the SDLC. How does

an organization objectively evaluate projects on their basis for being strategically aligned in an EBusiness environment? Are the criteria different for a pure EBusiness versus a traditional organization? Does the relationship between the corporate strategic planning and information planning processes change? If so, how? The next section will discuss how EBusiness has affected the project initiation and planning phase of the SDLC.

### EBusiness Project Initiation and Planning

Project initiation and planning in the world of EBusiness appears to be very different than it has been in the traditional sense. If one looks at Ebusiness stocks, one can infer that feasibility, particularly economic feasibility, has taken on a long-term and somewhat ambiguous focus. This is because many organizations are justifying investment in EBusiness infrastructure in terms of strategic impact rather than ROI (Informationweek 1999). Forrester research provides evidence as to how a sound technical infrastructure can dramatically reduce an organization's marginal costs (Modahl 2000). However, investment in technical infrastructure builds revenue momentum, but does not produce benefits that will be realized in the short-term.

These trends and issues have a direct impact on the project initiation and planning phase of the SDLC. How will feasibility be assessed for EBusiness related projects? Will the criteria used for cost-benefit analysis be fundamentally affected? Will organizations assume higher degrees of technical risk? The next section will discuss how EBusiness has affected the analysis phase of the SDLC.

### EBusiness Analysis

The analysis phase in the SDLC will be fundamentally affected when approached from an EBusiness vantage point. A fast-emerging methodology for system design in this environment is the customer-centered approach (Seybold 2000; Kalakota and Robinson 1999; Beyer and Holtzblatt 1998). This perspective alters the traditional methods, techniques, and tools that are used in the analysis phase. For example, there has been some tools/techniques that have been presented for deriving requirements for EBusiness systems. These include a value-based approach (Gordijn, et al. 2000), storyboarding (Beyer and Holtzblatt 1998), scenario modeling (Jarke 1999), and reverse value chain analysis (Kalakota and Robinson 1999).

The customer-centered approach has implications for many of the methods, techniques, and tools associated with the analysis phase of the SDLC. Other than the aforementioned techniques, how can system requirements be effectively and accurately identified? Are data- and process-modeling techniques affected (e.g., new symbols/terminology)? Is the sequence of these

techniques of any significance (e.g., data-oriented vs. process-oriented)? The next section will discuss how EBusiness has affected the logical design phase of the SDLC.

### EBusiness Logical Design

Within the context of EBusiness, the logical design phase of the SDLC has been one of the most visible. This is mainly because of a sense of urgency by organizations to establish an Internet presence, thus presenting a number of web interface design issues. With the emergence of the Internet, there are web interface issues that pertain to all web sites (Nielson 1999). However, web interface design for EBusiness requires special consideration (Lohse and Spiller 1998; Palmer and Griffith 1998). The widespread use of email and web pages to distribute information has a fundamental impact on form and report design. Finally, access to external data (e.g., supplier information) can potentially affect logical data design.

With respect to logical design, there are a number of different research opportunities. How will EBusiness-related interface design techniques continue to evolve? How will the interactive nature of the Internet affect form and report design? Will logical data design methods be affected?

Another issue to consider is the use of alternative design techniques. For instance, with UML standards continuing to evolve (Kobryn 1999), object-oriented techniques will continue to gain momentum as a viable means for EBusiness logical design. The next section will discuss how EBusiness has affected the physical design phase of the SDLC.

### EBusiness Physical Design

The goals for physical design in the context of EBusiness are basically the same as they have been in traditional systems analysis and design efforts. These goals include the specification of physical database design, module structure and design, and system architecture. However, EBusiness has affected the manner in which these goals are met. A primary example is extensible markup language (XML). This is a standard for web documents that "enables the definition, transmission, validation, and interpretation of data between applications and between organizations" (webopedia.com). One example of research in this area is the definition of a framework for agent-based system to utilize XML standards (Glushko, et al. 1999). EBusiness system architecture issues are another fruitful area for consideration. While this has been approached from a pragmatic perspective (Treese and Stewart 1998), more narrowly focused empirical work has been performed that draws upon observations in the distribution industry (El Sawy, et al 1999).

The effect of EBusiness on the physical design phase of the SDLC presents a number of different research issues. How will emerging data definition standards (e.g., XML) affect physical design specifications for data and processes? How will system infrastructure issues continue to evolve? How will extranet and intranet interactions impact system architecture design? The next section will discuss how EBusiness has affected the implementation/maintenance phase of the SDLC.

### *EBusiness Implementation/Maintenance*

At this point in time, there has been very little research on the impact of EBusiness on the implementation and maintenance phases of the SDLC. This is not to imply that robust research opportunities are not to be mined from these phases.

A major issue for implementation is the "buy vs. build" dilemma. While outsourcing is not a new concept, implications for the EBusiness arena need to be examined. Also, because the customer has emerged as a primary user of these applications, the effect on testing and training should also be considered. This has been addressed to a degree with the emergence of beta testing. Other issues for implementation include installation/conversion plans and user support. Therefore, the following EBusiness-related research issues should be considered. How do organizations solve the "buy vs. build" dilemma for implementations (e.g. CRM packages)? How should the customer be included in testing and training plans? Will installation/conversion plans be fundamentally altered? How will user (i.e., customer) support techniques change?

Because EBusiness is in its infancy and the technology is changing so rapidly, the focus on maintenance issues has been very limited. Relevant issues include change management techniques and the identification of maintenance metrics. The following are research issues that pertain to the effect of EBusiness on the maintenance phase of the SDLC. How should maintenance requests be managed? How will change management procedures evolve? What types of maintenance metrics need to be identified to accurately measure progress?

## Summary/Research Questions

At a certain level of abstraction, the sequence and structure of the SDLC remains intact. However, EBusiness has a significant effect on the methods, techniques, and tools within each phase of the SDLC. The list of research issues presented (see Table 2) was not intended to be comprehensive. The primary goal of this paper was to present the SDLC as a framework for identifying relevant research issues that must be addressed in order to effectively design systems that meet the challenges of EBusiness. As practitioners and academicians learn more about the dynamics of EBusiness, this area of research will only grow in scope and opportunity.

## References

"Rethinking ROI," *InformationWeek Online* (www.informationweek.com), May 24, 1999.

www.webopedia.com, Copyright 1999-2000 internet.com Corp.

Beyer, H. and Holtzblatt, K. *Contextual Design: Defining Customer-Centered Systems*, Morgan Kaufmann Publishers, San Francisco, California, 1998.

El Sawy, O.A., Malhotra, A., Sanjay, G., and Young, K.M. "IT-Intensive Value Innovation in the Electroninc Economy: Insights from Marshall Industries," *MIS Quarterly* (23:3), September 1999, pp. 305-335.

Evans, P. and Wurster, T.S. *Blown to Bits: How the New Economics of Information Transforms Strategy*, Harvard Business School Press, Boston, Massachusetts, 2000.

Glushko, R.J., Tenenbaum, J.M., and Meltzer, B. "An XML Framework for Agent-based E-commerce," *Communications of the ACM* (42:3), March 1999, pp. 106-114.

Gordijn, J., Akkermans, H., and van Vliet, H. "Value Based Requirements Creation for Electronic Commerce Applications," *Proceedings of the Thirty-Third Hawaii International Conference on System Sciences*, 2000.

Hoffer, J.A., George, J.F., and Valacich, J.S. *Modern Systems Analysis and Design (2nd Edition)*, Addison-Wesley, Reading, Massachusetts, 1999.

Jarke, M. "Scenarios for Modeling," *Communications of the ACM* (42:1), January 1999, pp. 47-48.

Kalakota, R. and Robinson, M. *E-Business: Roadmap for Success*, Addison-Wesley, Reading, Massachusetts, 1999.

Kendall, K.E. and Kendall, J.E. *Systems Analysis and Design (4th Edition)*, Prentice Hall, Upper Saddle River, New Jersey, 1998.

Kobryn, C. "UML 2001: A Standardization Odyssey," *Communications of the ACM* (42:10), January 1999, pp. 29-37.

Lohse, G.L. and Spiller, P. "Electronic Shopping," *Communications of the ACM* (41:7), July 1998, pp. 81-88.

Modahl, M. *Now or Never: How Companies Must Change Today to Win the Battle for Internet Consumers*, HarperCollins Publishers, New York, New York, 2000.

Nielsen, J. "User Interface Directions for the Web," *Communications of the ACM* (42:1), January 1999, pp. 65-72.

Palmer J.W. and Griffith, D.A. "An Emerging Model of Web Site Design for Marketing," *Communications of the ACM* (41:3), March 1998, pp. 45-51.

Seybold, P. *Customers.Com: How to Create a Profitable Business Strategy for the Internet and Beyond*, Random House, New York, New York, 1998.

Treese, G.W. and Stewart, L.C. Designing Systems for Internet Commerce, Addison-Wesley, Reading, Massachusetts, 1998.

Whitten, J.L. and Bentley, L.D. *Systems Analysis and Design Methods (4th Edition)*, Irwin McGraw-Hill, Boston, Massachusetts, 1998.

## Appendix

### Table 1: Deliverables/Outcomes of the Traditional SDLC

| SDLC Phase | Deliverable/Outcome |
|---|---|
| Project Identification and Selection | * A schedule of specific IS development projects<br>* A clear understanding of the overall organizational business strategy and objectives |
| Project Initiation and Planning | * Baseline Project Plan (BPP)   * Cost-Benefit Analysis<br>* Statement of Work (SOW)   * Risk Assessment |
| Analysis | * System requirements   * Process models   * Design strategy<br>* Logic models   * E-R diagram |
| Logical Design | * Report and form design specifications   * Logical data model<br>* System interface and dialogue design specifications |
| Physical Design | * Physical file and database design specifications<br>* Structure charts   * Module specifications<br>* Physical distributed system design specifications |
| Implementation/Maintenance | * Code   * Test plan<br>* Documentation   * User training plan<br>* Training material   * Installation and conversion plan<br>* User support plan   * Maintenance request management<br>* Change management procedures   * Maintenance metrics |

### Table 2: Summary of SDLC EBusiness Research Issues

| SDLC Phase | EBusiness Research Issue |
|---|---|
| EBusiness Project Identification and Selection | * How does an organization objectively evaluate projects on their basis for being strategically aligned in an EBusiness environment?<br>* Are the criteria different for a pure EBusiness versus a traditional organization?<br>* Does the relationship between the corporate strategic planning and information planning processes change? If so, how? |
| EBusiness Project Initiation and Planning | * How will feasibility be assessed for EBusiness related projects?<br>* Will the criteria used for cost-benefit analysis be fundamentally affected?<br>* Will organizations assume higher degrees of technical risk? |
| EBusiness Analysis | * How can system requirements be effectively and accurately identified?<br>* Are data- and process-modeling techniques affected (e.g., new symbols/terminology)?<br>* Is the sequence of the modeling techniques of any significance (e.g., data-oriented vs. process-oriented)? |
| EBusiness Logical Design | * How will EBusiness-related interface design techniques continue to evolve?<br>* How will the interactive nature of the Internet affect form and report design?<br>* Will logical data design methods be affected?<br>* How will alternative design techniques (e.g., OO) fit into EBusiness design? |
| EBusiness Physical Design | * How will emerging data definition standards (e.g., XML) affect physical design specifications for data and processes?<br>* How will system infrastructure issues continue to evolve?<br>* How will extranet and intranet interactions impact system architecture design? |
| EBusiness Implementation/Maintenance | * How do organizations solve the "buy vs. build" dilemma for implementations?<br>* How should the customer be included in testing and training plans?<br>* Will installation/conversion plans be fundamentally altered?<br>* How will user (i.e., customer) support techniques change?<br>* How should maintenance requests be managed?<br>* How will change management procedures evolve?<br>* What types of maintenance metrics need to be identified to accurately measure progress? |