

E-enabling Systems Analysis and Design: A Case for Extending the IS Curriculum

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Abstract

This paper argues that as information technology and organizational forms rapidly evolve, so must the domain of competencies of systems analysts and designers also evolve. The new economy, e-commerce and the concurrent rise of disruptive technologies are characterized and then a specific example is then provided using business webs as a new context in which systems analysts must effectively operate. To e-enable systems analysis and design, it is argued that the IS curriculum (both IS'97 and ISCC'99) be extended to include two additional competencies analysts and designers must possess to be able to innovatively and strategically contribute in this new Internet-based context: value proposition analysis and design and web-based business modeling.

Keywords: Systems analysis and design, b-webs, e-commerce, disruptive technology

1. INTRODUCTION

As information technology continues to rapidly evolve, so must the domain of competencies of systems analysts also evolve if they are to continue to significantly contribute towards leveraging technologies for competitive advantage. Currently, systems analysts are being inundated with information, ideas, concepts and theories on emerging technologies and new organizational forms, as well as changing business conditions and strategies. Academicians are also being challenged to revise curricula and update courses in an ever increasingly difficult struggle for currency of content. Terms such as the *information superhighway* (I-way), *intranet*, *electronic commerce*, *e-commerce*, *e-business*, *e-tailer*, *clicks and mortar*, *b-webs*, *cyberacracy*, *cyberspace* and *cyber-corps*, *disruptive technologies*, the *digital economy*, *digital capital*, the *new economy*, *virtual communities*, *virtual teams*, *virtual corporations*, *virtual alliances*, *value streams* and *chains*, *value creation*, *extraction* and *migration*, and the *marketspace*,

among other terms, increasingly appear in literature. In addition, scenarios and prescriptions regarding corporate reinvention and repositioning to take full advantage of the revolution occurring in cyberspace abound. Naturally, systems analysts and academicians view these as a continuing challenge for relevancy; academicians have the added burden of having to help develop appropriate tools and methodologies for incorporation into the IS curriculum.

The purpose of this paper is to argue that while we are now into a new economy and the impact of e-commerce has become increasingly pervasive, the IS curriculum has not proactively changed significantly enough to address these transformations. In all fairness to the framers of the IS'97 Curriculum Guidelines and the ISCC'99 IS-Centric curriculum, the activities and implications of the Internet were not yet as pervasive then as they are now. Thus, how must the IS curriculum be extended to e-enable future systems analysts and designers to develop e-relevant competencies?

2. THE NEW ECONOMY AND E-COMMERCE

According to James Martin, a premiere strategist on management and information technology, we are in the early stages of a total revolution (Martin 1996). Many authors concur. For example, Tapscott indicates that “today, we are witnessing the early, turbulent days of a revolution as significant as any other in human history” (Tapscott 1996). Porter and Millar refer to this revolution of tsunami proportion in their classic article as the “information revolution” (Porter and Millar, 1985).

This revolution is predicted to be long-lived and its impact to be widespread. The new economy and e-commerce are now upon us, and it has impacted businesses in radical ways: it has changed the industry structure, altered the rules of competition, opened up new ways to compete, spawned whole new businesses, and opened up new ways to create *ad hoc* alliances. For example, McGowan indicates, “the armada of information technologies driving new structures and other changes is formidable [and] there is no end in sight” (McGowan 1991). Martin says “the genie is out of the bottle ... there is no turning back ... cyberspace does not have an off-switch ... [the] revolution is at warp speed, and by the time it has run its course, it will be larger than the Industrial Revolution” (Martin 1996). This revolution also has the potential for fundamentally changing the way business is done. For example, Kalakota and Whinston indicate that the efforts of the 1980’s and the early 1990’s focused primarily on automating nonelectronic methods and procedures to an electronic platform to improve internal business process efficiencies (Kalakota and Whinston, 1996). However, today’s emphasis has shifted from this narrow focus to the invention of entirely new business applications for reaching and getting close to the customer. In addition, this revolution is far from over. McGowan insightfully indicates that “we are firmly locked in a cycle of technology driving strategy driving technology ... [in which] each opportunity that new technologies create demands in turn more technology” (McGowan 1991). At issue, therefore, is how widely and how deeply this revolution will transform how we do business and consequently, how we do systems analysis and design.

Businesses must strategically change in order to harness the potential of this dramatic revolution. How then must systems analysis and design curricula be strategically extended in order to remain relevant? Answers to questions and issues such as this are crucial. We argue that it is time to extend systems analysis and design so that we can proactively enlarge its domain of competencies to include e-relevant skills.

To extend the domain of competencies we need to understand the implications of “disruptive” technolo-

gies and the new context in which systems analysts and designers must operate.

3. DISRUPTIVE TECHNOLOGIES

Fundamental changes are continuously occurring in the IS/IT domain. It is sometimes difficult for academics to analyze the implications of these changes, let alone remain current in his/her domain of knowledge and expertise. We regularly are impacted by disruptive technologies (Koff, Gustafson and Braun, 2000) that result in a completely changed marketplace. These technologies render obsolete the way things have been done in the past, displacing existing products and services, causing layoffs, making stock prices tumble, unseating entire industries, and causing academics to teach subject matter that is too dated to be reasonably relevant. Over the next five years it is expected that the disruptive technologies will rapidly increase in ferocity, due almost entirely to the impact of the Internet. Koff, Gustafson and Braun (2000) have identified some far-reaching implications that we, as SAD instructors, need to also address in our ever-evolving curriculum:

- The enabling of organizations to operate in “ultra-real time,” such that the business knows to the second *exactly* where it stands.
- The spawning of the “extended enterprise,” an enterprise of enterprises that makes markets more efficient.
- The fostering of a wide range of business strategies that leverage information assets and capabilities.
- The creation of a new and fully interactive channel for business-to-consumer and business-to-business commerce.
- The redefining of customer service, to enable shifts in the customer-supplier relationship and what it means to get closer to customers.
- The opening of the free flow of information within and between organizations.

Just as businesses must be ready to exploit the next set of disruptive technologies, so too must the IS curriculum prepare its graduates for the eventuality of these technologies. To wait until the technologies become firmly entrenched is to be curricularly reactive at a time when we should be curricularly proactive. Table I shows the emerging trends and underlying technologies that are expected to be opportunities, and thus an opportunity for businesses and academics to begin to address these disruptions before they become universally accepted disruptions.

Technology Driver	Trend
1 Ubiquitous bandwidth	Anytime, anywhere digital services will be the norm.

2 Smart environments	Homes, offices and everyday objects will become networked and intelligent
3 Net-centric computing	The Internet permeates all systems, spawning new products, applications and services.
4 Knowledge discovery and exploitation	Corporate knowledge will become a tangible asset; decision-making will be faster and more informed.
5 High-performance computing	Ultrafast computers will enable us to model reality and question it, to mine a huge amount of data and prosper from it.
6 Digital money and electronic micropayments	Programmable currency will reshape how we buy and sell.
7 Privacy, security and information survivability	Keeping our secrets secret and our business processes fail-safe will be even more critical as the digital age advances.
8 Virtual spaces and simulation	We will test ideas and experiences virtually - i.e., really but not really
9 Human-computer connection	Everyone will communicate more naturally and effortlessly with computers; ultimately, technology disappears.
10 Miniaturization	Microscopic machines will revolutionize our lives and the way work is done.

Table 1 Emerging trends and underlying technologies expected to be disruptive to business (from Koff, Gustafson and Braun, 2000)

The IS graduates of the next half decade or so will be called upon to address the rapid development of the Internet and the impact of disruptive technologies in the development and deployment of systems.

In a review of the IS'97 and ISCC'99 curricula, no distinct emphasis was placed on the preparation of students for deliberate involvement in the Internet beyond some basic technology-driven knowledge. Certainly, technology can be grouped into such terms as networks and telecommunications, programming, scripting, and databases, but there is no well-defined effort to place them within the context of the Internet, let alone e-commerce.

4. BUSINESS WEBS: A NEW CONTEXT FOR SAD

We have, in general terms, presented the impact of electronic commerce on business organizations and,

by extension, the need for e-competencies that systems analysts must possess. We now use a specific example involving the weaving of a *b-web* to specify some new competencies that naturally emerge from this action.

A **b-web** (business web) is defined as *a distinct system of suppliers, distributors, commerce service providers, infrastructure providers, and customers that use the Internet for their primary business communications and transactions* (Tapscott, Ticoll, and Lowy 2000). The universe of the b-web is composed of three primary structures: 1) inter-networked enterprises, teams, and individuals; 2) the b-webs themselves; and 3) the industry environment. The b-web is set of virtual alliances that are enabled by advances in technology and is a new platform for competition. Business-webs seek to harness the power of strategic partnering via the Internet. It is distinguished from the industrial-age corporation and the virtual corporation by the type of resources required and the type of value created. An industrial corporation requires physical resources that may be scarce and create a value that is supplier driven and mass-produced. The b-web utilizes abundant digital resources and creates value that is *customer-driven* and *service-enhanced*. The virtual corporation lies between these two extremes.

B-webs can be characterized by nine features (Tapscott, et. al. 2000):

- 1) Internet infrastructure - serves as the primary infrastructure for business communications and transactions.
- 2) Value proposition innovation - renders the old way of doing things obsolete or ineffectual.
- 3) Multienterprise capability machine - marshals the contributions of many participating enterprises and relies on partners to maximize return on invested capital.
- 4) Participants, of which there are five classes:
 - a. Customers - receive and contribute value to the b-web
 - b. Context providers - provide the interface between the customer and the b-web that involves choreography, value realization, and rule-making activities of the system.
 - c. Content providers - design, make, and deliver the "intrinsic" forms of value (good, services, and information) that satisfy customer needs.
 - d. Commerce service providers - enable the flow of business, including transactions and financial management, security and privacy, information and knowledge management, logistics and delivery, and regulatory services.
 - e. Infrastructure providers - deliver communications and computing, electronic and physical records, roads, buildings, offices, etc.

- 5) Coopetition - participants cooperating and competing with one another.
- 6) Customer-centricity - build mutual relationships that focus on and respond to customer value.
- 7) Context reigns - the context provider that manages relationships and choreographs the value-creating activities of the entire system.
- 8) Rules and standards - key participants know and adhere to the b-web's rules of engagement.
- 9) Bathed in knowledge - the variety of data, information, and knowledge are exchanged among participants.

The emergence of organizational forms such as business webs is going to dramatically transform how *work processes* and activities are enacted and how *work relationships* are formed and sustained. For example, the design and deployment of products and services will greatly shift from being accomplished in a single location to being virtually coordinated across geographic locations, time, corporate and national cultures, and between and across organizations. Processes and activities to perform work will become more complicated since they will involve more participants, e.g., customers, context providers, content providers, commerce services providers, and infrastructure providers (Tapscott et al, 2000). A key challenge in this context is how to effectively integrate and enable all participants, each of whom will be performing certain processes, to work together as smoothly as they would if they were all one enterprise (Hammer, 2000). Also, work will increasingly be performed by work groups (also known as virtual teams) whose members are in dispersed locations who will need to exchange and share a variety of data, information and knowledge yet may never meet to accomplish collective goals (Avolio, Kahai, Dumdum & Sivasubramaniam, 2000; Duarte & Snyder, 1999; Lipnack & Stamps, 1997). In such work groups, task interdependencies and issues involving tradeoffs among members may have to be worked out in virtual space to develop solutions and approaches that build upon their diversity of expertise (Mohrman, Cohen, & Mohrman, 1995). In this new context, the ability to (1) integrate, coordinate, and streamline/redesign work processes and activities and (2) form and sustain effective work relationships will become a vital core competence (Hammer, 2000).

5. NEW COMPETENCIES

Much of the IS'97 and ISCC'99 curricula is technology-driven. However, according to Slywotzky (1996), technology alone, not embedded in an effective business design, is no longer a viable approach to generating sustained corporate growth.

To innovatively and strategically contribute in this new context, we suggest that systems analysts and designers extend their competencies to include **value proposition** analysis and design and **business modeling** (Tapscott et al., 2000; Slywotzky, 1996, 1997; Seybold, 1998). The value proposition is that which is offered to the customer and includes products and services and its delivery system. The value proposition is what customers need, want, and are willing to pay for (Slywotzky, 1996). It is the reason why the system exists.

5a. Value Proposition Analysis and Design

The value proposition is customer-centric and requires owning the customer's total experience (Seybold & Marshak, 1998): learning about the products, making a selection, purchase, delivery, setup, installation, after-care, purchasing follow-on products, taking delivery, receiving accurate bills, and resolving disputes. If the delivery system works through channels, the b-web is still responsible for that portion of the customer's total experience with that channel partner. If some parts of the delivery system are outsourced, the b-web is still responsible for the quality of that component of the total customer experience (Seybold and Marshak, 1998). Value proposition analysis and design is important because the business model and its corresponding delivery system are derived from it. Value proposition analysis and design includes the following steps (Tapscott, et. al. 2000):

1. Describe the current value proposition from the customer's viewpoint, that is, why this system exists.
2. Consider the five classes of participants and their contributions, strengths, and weaknesses. Compare the parts and capabilities of the business to those in other systems.
3. Envision b-web-enabled value through brainstorming and other creative design techniques. Decide what the new value proposition will be.
4. Define what it will take to deliver the new value proposition, including processes, contributors, contributions, applications and technologies, and other success factors.
5. Prepare a value map: Design a visual map that depicts value exchanges in the b-web.
6. Design the b-web mix: Define a b-web strategy that will improve the business competitive advantages.

5.b Business Modeling

Slywotzky (1997) defines a business model as "the totality of how a company selects its customers, defines and differentiates its offerings (or response), defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers, and captures profits. It is the *entire system for delivering utility to customers and earning a profit from that activity.*"

In essence, business modeling requires that technology be embedded in effective business design. We limit our discussion of business modeling to the design and development of the Internet-based delivery system.

The design of an Internet-based delivery system includes the following: web-based business processes and a strategy to meet the information requirements of the five classes of participants of the b-web. Web-based business process design involves the identification and development of processes that, together, will create an Internet infrastructure that is highly responsive to customer requirements. The design of a corporate-wide information strategy involves the identification of the types of interfaces and interactions among the five classes of b-web participants and their corresponding information requirements.

6. Conclusion

This paper has identified two competencies that will help e-enable future systems analysts and designers. We argue that the IS curriculum must be extended to include competencies in value proposition analysis and design and business modeling. Specifically, we believe that the following skills must be developed within these two competencies.

1. To analyze and design a value proposition and translate it into a business model and its corresponding Internet-based delivery system.
2. To view the Internet-based delivery system from a holistic, rather than piecemeal, perspective.
3. To help streamline the business processes that impact the five classes of participants.
4. To develop a corporate information strategy to support the information requirements of the five classes of participants: customers, context providers, content providers, commerce services providers, and infrastructure providers.

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