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Does the Trend toward E-Business Call for Changes in the Fundamental Concepts of Information Systems? A Debate

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DOES THE TREND TOWARD E-BUSINESS CALL FOR CHANGES IN THE FUNDAMENTAL CONCEPTS OF INFORMATION SYSTEMS?
A DEBATE

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ABSTRACT

A debate at ICIS 2000 asked whether the trend toward e-business calls for changes in the fundamental concepts of information systems. This article summarizes viewpoints presented in the debate. It also presents audience feedback in the form of a vote about whether new concepts are needed and selected comments submitted by the audience about key issues in the debate. Among others, these issues include questions about what are the fundamental concepts of IS, different views of about the meaning and implications of e-business, and questions about the nature of the user in e-business.

Keywords: e-business, e-commerce, IS concepts, types of IS, IS development and operations, IS evaluation and description, IS usage, history of IS, IS as reference discipline

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Invitation For Reader Response from the Editor: Because this topic is significant and current, CAIS requests reader responses, either as complete articles that could be published separately or as "Letters to the Editor" that would be appended to the end of this article. In either case, decisions about whether or not to publish a response will strongly favor discussions of new ideas and clarifications related to information system and e-business concepts rather than comments about the debate itself.

Note: A companion to this article by S. Alter, expanding on the ideas in this debate, appears as the next article, Volume 5, Number 11.

I. ORGANIZING THE DEBATE

This debate was inspired by the theme of ICIS 2000, "Fundamental Concepts for the New Millennium." It asked whether the fundamental information system concepts developed and used during the past millennium are becoming inadequate and should therefore be supplanted by new information system concepts as e-business becomes more commonplace throughout most businesses.

Steven Alter originally submitted this topic to the ICIS 2000 program committee in the form of the panel proposal. The committee suggested that it might be more interesting to cover this question in the form of a debate. To find participants who were interested in the topic Alter sent an-mail inquiry to around 60 attendees of ICIS 1999 whom he knew and believed might have interesting views on the topic. Based on the content of the responses and further guidance from the conference committee, the debate was organized in terms of propositions related to two separate topics,

(1) evaluation and description of systems and

(2) processes for building and maintaining systems.

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Although each participant in the debate could probably make a case for or against either proposition, for purposes of staging the debate we agreed to divide the debate into two separate sections:

1. *The trend toward e-business calls for changes in fundamental concepts regarding the evaluation and description of information systems.* Judy Scott argued for the proposition that current concepts in this area are inadequate and need to be modified or extended significantly. Philip Ein-Dor argued that current concepts for describing and evaluating systems are basically adequate and will remain adequate as the trend toward e-business unfolds.

2. *The trend toward e-business calls for changes in fundamental concepts regarding the building and maintaining of information systems.* M. Lynne Markus argued that existing concepts should be modified or extended significantly. Iris Vessey argued that current concepts about processes for building and maintaining systems are adequate and will remain adequate as the trend toward e-business unfolds.

Contrary to what might have been done in a panel, the debate was not rehearsed and the participants were asked not to share their presentations in advance, although they did receive the moderator's introductory slides several days before departing for the conference. Following the debater's arguments the audience filled out a feedback form which asked them to vote on the two propositions and to provide comments about what they saw as important issues in the debate. The article proceeds as follows:

II. Background about Information Systems and E-Business (Steven Alter, moderator)

III. Describing and Evaluating Systems: The Need for New Fundamental Concepts (Judy Scott, proponent)

IV. Describing and Evaluating Systems: Why Existing Concepts Should not Be Supplanted (Phillip Ein-Dor, opponent)

V. Building and Maintaining Systems: The Need for New Fundamental Concepts (M. Lynne Markus, proponent)

VI.Building and Maintaining Systems: Why Existing Concepts Suffice (Iris Vessey, opponent)

VII. Results of the Vote: Not Convinced New Concepts Are Needed

VIII. Issues Raised in the Audience Comments

IX. Conclusion

References

Appendix

Note: These section titles are hyperlinks that readers can activate to move directly to the section.

II. BACKGROUND ABOUT INFORMATION SYSTEMS AND E-BUSINESS (STEVEN ALTER, MODERATOR)

A debate about whether the trend toward e-business calls for new fundamental concepts needs to start with a definition of e-business and a characterization of the trend toward e-business.

DEFINITION OF E-BUSINESS

The term "e-business" was popularized as the slogan for a conscious strategy launched by IBM. The day before IBM's e-business ad campaign appeared on Oct. 7, 1997 the *Wall Street Journal* said Louis Gerstner, IBM's CEO, wanted "to position IBM as a cutting-edge company and shake off for good

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its image as a stodgy, if reliable, supplier of computers to giant corporations."
[Narisetti, 1997]   IBM owns the trademark on a styled lower case "e," but a useful definition of e-business should not depend on hype or a particular company's marketing message. The definition should not be posed as a "strategy" because strategies are notoriously susceptible to retrospective interpretation. It should not be an impossible dream that 95% of companies could not possibly attain. It should not be an either-or classification scheme because being "e" or not being "e" is not the question. An ideal operational definition would have been valid 10 years ago, before the Internet was commercialized, and should be valid 10 years from now, when the current Internet may be obsolete and when almost every business of any scale will probably qualify as an e-business to some extent.

Table 1 presents a set of formal or implied definitions of e-business presented in a number of books and articles found in 1999 and 2000. These definitions are organized in order of similarity to the following definition:

"E-business is the practice of performing and coordinating critical business processes such as designing products, obtaining supplies, manufacturing, selling, fulfilling orders, and providing services through the extensive use of computer and communication technologies and computerized data." [Alter, 2002]

This definition tries to focus on things that can be described, measured, and compared. Reasons for specific aspects of the definition are as follows:
- "the practice" ... E-business should be observable and measurable. It should be possible to compare different organizations in terms of their relative degree of e-business application within specific business functions and across the entire organization.

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- "performing and coordinating critical business processes" .... E-business is not just using Web sites. It is about doing and coordinating important work.

Table 1: Alternative Definitions and Views of e-Business:1999 to 2001

"Electronic business" … "includes everything having to do with the application of information and communication technologies (ICT) to the conduct of business between organizations or from company to consumer." [Huff et al, 2000]
"E-business includes e-commerce but also covers internal processes such as production, inventory management, product development, risk management, finance, knowledge management and human resources. E-business strategy is more complex, more focused on internal processes, and aimed at cost savings and improvements in efficiency, productivity and cost savings." [Bartels, 2000]
"The use of the Internet and other digital technology for organizational communication and coordination and the management of the firm." [Laudon and Laudon, 2001]
"E-business is the complex fusion of business processes, enterprise applications, and organizational structure necessary to create a high performance business model." [Kalakota and Robinson, 1999]
"It is important to note that e-business is much more than electronic commerce. E-business involves changing the way a traditional enterprise operates, the way its physical and electronic business processes are handled, and the way people work." [El Sawy, 2001]
IBM defines e-business as "a secure, flexible and integrated approach to delivering differentiated business value by combining the systems and processes that run core business operations with the simplicity and reach made possible by Internet technology." [Stolee, 2000]
"E-business is about using Internet technologies to transform the way business processes are performed. Its most visible form is online purchasing, both wholesale and retail." [Shurety, 1999]
"In its simplest sense, e-business is the use of Internet technologies to improve and transform key business processes. Most companies understand this and have begun the evolution from traditional business practices to e-business." [IBM, 2000]
"E-business: any Internet initiative – tactical or strategic – that transforms business relationships, whether those relationships be business-to-consumer, business-to-business, intrabusiness, or even consumer-to-consumer. … E-business is really a way to drive efficiencies, speed, innovation, and new value creation in an organization." [Hartman, Sifonis, and Kador, 2000]
"By connecting your traditional IT systems to the Web you become an e-business." [Amor, 2000]

Note: definitions are organized based on similarity to the definition used here

- "such as designing products, ..." ..... The enumeration of critical processes emphasizes that e-business includes much more than e-commerce.

- "extensive use of computer and communication technologies and computerized data" .... E-business is not just about using the Internet. Although using the Internet affords important convenience and cost savings, focusing on the Internet in the definition of e-business confuses the messenger with the message.

## HOW INFORMATION SYSTEMS CHANGED WITH THE TREND TOWARD E-BUSINESS

The definition of e-business in terms of "the practice of performing and coordinating critical business processes" says that e-business relies on information systems even though the unit of analysis for understanding e-business is not really the information system, but rather, the "work system" in which the critical business processes are occurring. Without mentioning e-business, a previous *CAIS* paper argued that even a basic understanding of most information systems from a business viewpoint starts from an understanding of the work system the information system supports or is part of.

"A work system is a system in which human participants and/or machines perform a business process using information, technology, and other resources to produce products (and/or services) for internal or external customers. Work systems may exist and produce their outputs over extended time spans or may be created as temporary systems (projects) designed to produce a particular output and then dissolve. ….An information system is a particular type of work system that processes information by performing various combinations of six types of operations: capturing, transmitting, storing, retrieving, manipulating, and displaying

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information. …. An information system exists to produce information or to support or automate the work performed by other work systems. An information system may be a subsystem of a work system, but may also exist external to work systems that use the information it produces."[Alter, 1999]

Figure 1 illustrates some of the possible types of overlap between information systems and related work systems. The earliest computerized information systems were used though patterns A, B, and C in Figure 1. The trend toward greater integration through e-business relies on more complicated forms of overlap such as D and E.

The evolution of manufacturing information systems illustrates how the role of information systems expanded over time. The earliest manufacturing information systems applied pattern A in Figure 1 by using paper log sheets to record events in the work system (such as items completed at each step or items scrapped) and later compiled and reported that information to accountants and management for subsequent use. These information systems collected information about the work being done but did not directly help production workers perform manufacturing operations. Subsequent developments incorporated the other patterns. Interactive computing made it possible for the information system to help manufacturing workers by immediately checking for detectable errors in data inputs and by making up-to-the-second information available whenever workers or managers needed it for current decisions. Highly automated manufacturing took the next step by automatically collecting data whenever a work step is completed, automatically making decisions about what item to work on next, and automatically downloading the correct machine recipe. In these situations, the information system and the work system overlap so much that the manufacturing is largely controlled by the information system. Turn off the information system and this type of manufacturing grinds to a halt.
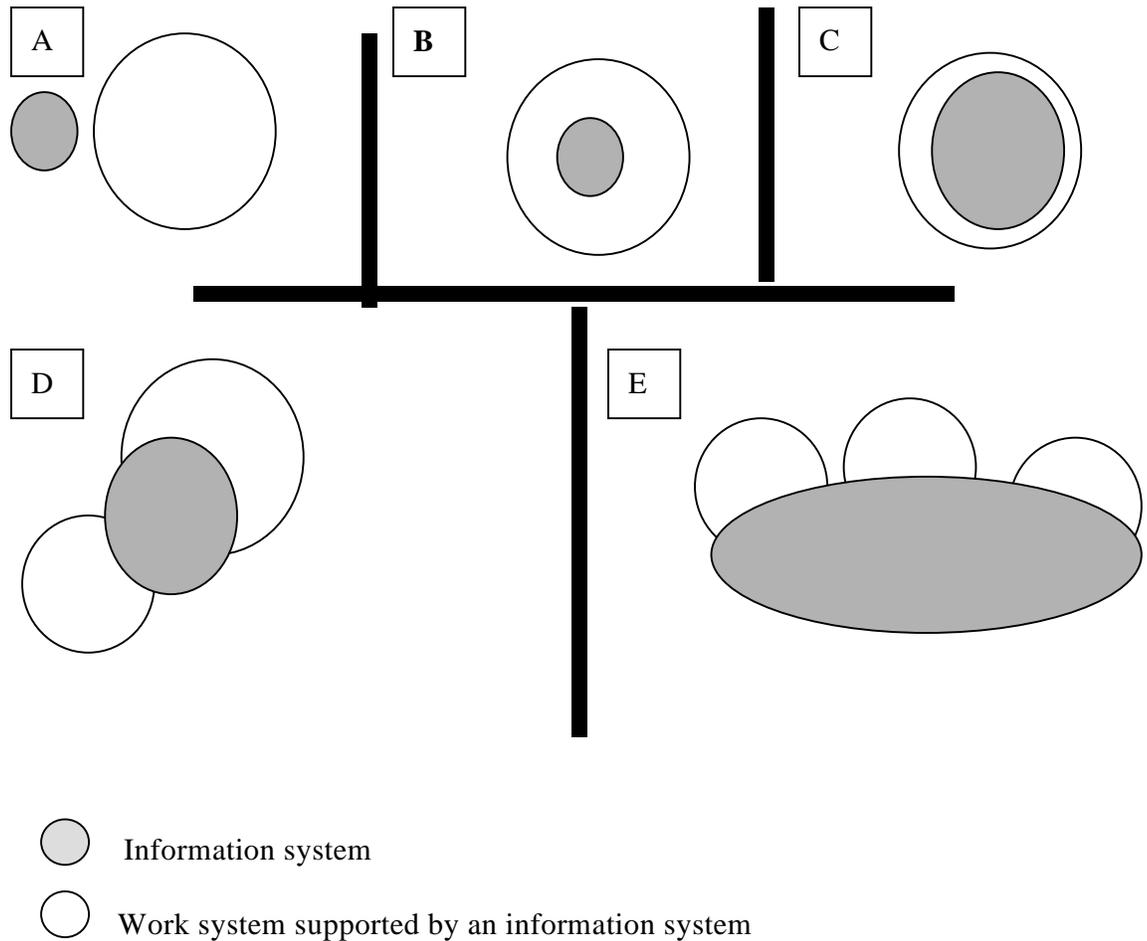
A. Comparatively small IS provides information for a WS but is not part of it. Example: An MIS that collects production data and generates a weekly production summary report for management.

B. Comparatively small IS is a dedicated component of a WS. Example: A real time dispatching system helps workers decide what lot to process next in a factory.

C. WS is primarily devoted to processing information and the IS and WS are almost identical. Examples: billing system, payroll system, loan approval system.

D. One IS overlaps with several separate WSs. Example: An IS for sales call tracking might be used by the sales force for tracking sales progress and by the finance department for financial projections.

E. A large IS supports a number of different WSs and might be larger than any of them. Example: An airline reservation system used for deciding what flights to take, booking reservations, yield management calculations, frequent flyer promotions, etc.

Figure 1: Some of the Alternatives for Deploying Information Systems in E-Business [Alter, 2002]

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Since e-business ("the practice of performing and coordinating critical business processes…") might employ any of the alternatives in Figure 1 (and possibly many others), fundamental concepts of information systems should provide insights for describing and evaluating information systems and for building and maintaining information systems in each of these situations (and others). The question for the debate is whether existing information system concepts suffice as the trend toward e-business continues to unfold.

III. DESCRIBING AND EVALUATING SYSTEMS: THE NEED FOR NEW FUNDAMENTAL CONCEPTS (JUDY SCOTT, PROPONENT)

The trend to e-business triggered change for organizations, industries and society. Organizational boundaries became more permeable as technology enabled business partners and consumers to access information systems that were traditionally confined to internal users. The change in access to organizational information systems and other changes such as widespread digital distribution of information not surprisingly impacted the information systems themselves. In this debate, using three main themes, I argue that with the trend to e-business, academics need new fundamental concepts for describing and evaluating information systems.

The first theme is that traditional information systems (IS) evaluation concepts, such as user information satisfaction (UIS) measurement and technology adoption rate, are now inadequate. New fundamental concepts for evaluating IS in e-business are needed that take into account increased complexity due to permeable boundaries of both organizations and IS as well as the expansion of the number of stakeholders.

In the second theme, I argue that since e-business extends use of an IS outside organizations, we need to extend the description of IS and extend related

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fundamental concepts. The boundaries of the IS in e-business are no longer well defined.

In the third theme, I explain how e-business is more like a business web than a discrete information system. The IS is considered an integral part of the business web and inseparable from the organization itself and the organization's business partners. In the business web, information systems often serve as cybermediaries in e-marketplaces. As a result, organizations can do what was infeasible before the e-business revolution.

EVALUATION OF INFORMATION SYSTEMS

Although researchers and practitioners use several concepts to evaluate IS, for purposes of this debate I focus on UIS and user adoption. UIS is widely accepted as a measuring instrument for IS evaluation. Papers go back to 1983 [Bailey and Pearson 1983, Doll and Torkzadeh 1988, Galletta and Lederer 1989, Ives, Olson and Baroudi 1983]. I assume that IS evaluation with UIS is a fundamental concept in IS.

E-business threatens the usefulness of the UIS evaluation instrument, which was designed for evaluating IS inside an organization where users are finite in number and easily identified. E-business extends outside the organization and introduces uncertainty about the identity and the number of users. Because they do not meet face-to-face, Internet users can hide their true identity. As a result, trust is at risk and there is the potential for fraud. Authenticity, confidentiality and identification are important issues for e-business, which require solutions such as public-key cryptography, digital signatures and digital certificates. Without reassurance about user identity, UIS evaluation becomes meaningless because one does not know who is doing the evaluation. A new concept is the need to verify user identity prior to IS evaluation.

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Typical IS in the past involved relatively homogeneous users. The users belonged to the same organization and often to the same functional area such as sales for an IS that was designed for the sales force. Organizational culture provided common ground for employees. The mission, rules and norms of an organization unite internal users, giving them similar goals and ways of conducting business. In contrast, many e-business examples extend far beyond the enterprise. For example, Napster gained 38 million registered users in one year and reported over 56 million prior to its legal problems, and eBay reported 18.9 million registered users in December 2000. The magnitude of these numbers overwhelm the typical IS used to develop the UIS instrument. This change is not only quantitative but also qualitative. In both cases, users are outside the organization that owns the IS. Also, despite rapid user adoption, usually considered a positive evaluation of IS, other stakeholders, such as the Recording Industry Association of America, evaluate Napster negatively.

Another example is Covisint, an online marketplace for the automotive industry formed by GM, Ford, Daimler Chrysler and Renault/Nissan. It is basically an information system that can function as an online clearinghouse for components, such as steel, glass, or paint, and which will "permit a purchaser to contract for price, quality, and delivery dates with a few clicks of a mouse." [Tapscott et al. 2000]. Covisint, established as an independent company, offers products and services designed to achieve efficiencies throughout the supply chain. How do we evaluate this "information system", especially since some suppliers formed their own marketplace, fearing price erosion by Covisint? It is not really possible to separate the company from the information system. Since "business value from IT is realized through the orchestrated interplay of complementary IT and business capabilities" [Barua and Mukhopadhyay 2000, Sambamurthy and Zmud 2000], one should not examine the IS in isolation.

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Again, the evaluation varies with the stakeholders. The automotive firms are enthusiastic about the potential savings in time and money from streamlining procurement, product development and supply chain management processes. However, most suppliers are not confident that Covisint will benefit them. To overcome supplier resistance, Covisint recently changed its proposition to a collaborative exchange which gave 40 suppliers profit-sharing stakes [Wise and Morrison 2000].

Enterprise systems (ES) are the backbone for e-business [Norris et al. 2000]. Evaluation of ES is complex. User resistance is widespread, yet adoption was rapid and, despite several fiascos, many organizations reported significant benefits [Davenport 1998]. Numerous stakeholders are involved in ES implementations. External stakeholders such as consultants and software vendors show a positive bias for the IS and add to the complexity of the evaluation. Top management in most Fortune 1000 organizations, motivated by access to enterprise-wide information such as global inventory, evaluates the ES positively if the implementation project is successful. Users, thrown into turmoil by reengineered business processes and new roles, often oppose the Enterprise System, especially if training is inadequate. Traditional IS evaluation tools, such as UIS and technology adoption rate, are inadequate for ES.

In summary, traditional IS evaluation concepts, which focused internally on the UIS and adoption of the IS by the organization's users, need to be extended because they are not adequate for externally focused e-businesses. The new external focus increases the number and type of stakeholders. This change in focus, in turn, increases the complexity and uncertainty of IS evaluation. We need new concepts that emphasize permeable organizational and IS boundaries.

THE DESCRIPTION OF IS ALSO NEEDS NEW FUNDAMENTAL CONCEPTS.

Many traditional definitions of IS, such as the following, restrict the description of IS to inside an organization. "An information system can be defined technically as a set of interrelated components that collect (or retrieve), process, store and distribute information to support decision making, control, analysis and visualization *in an organization*" [Laudon and Laudon 2001]. Since e-business extends use of an IS outside organizations, we need to extend the description of IS and extend fundamental concepts. The boundaries of the IS in e-business are no longer well defined.

The Internet is called the "web" and in e-business the IS is actually a web of information systems. For example, Fruit of the Loom hosts a niche portal for its small and medium size distributors and suppliers [Fingar, Kumar and Sharma 2000]. Descriptions of business webs are fundamentally different from descriptions of traditional IS in two ways [Tapscott, Ticoll and Lowy 2000].

- First, the IS is considered an integral part of the business web and inseparable from the organization itself and the organization's business partners.
- Second, hardware, software, communications and users extend beyond the enterprise and may not be easily identified.

This lack of definition makes precise description of the IS difficult and potentially impossible. For example, Napster's[1] hardware, software, communications and users are difficult to describe since they vary over time. At any point in time, the Napster server will find different users with different hardware and music files.

An example of a business web and a dominant information system for e-business is the electronic marketplace. An electronic marketplace lowers

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[1] This example refers to the situation before Napster was declared by the courts to be in violation of copyright.

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transaction costs such as search costs [Malone, Yates and Benjamin 1987; Tapscott et al. 2000]. Electronic marketplaces use information systems as intermediaries, which search, coordinate and aggregate providers/sellers and buyers/seekers [Bakos 1997].

For example, users search for music files on Napster, paraphernalia on eBay and auto industry parts on Covisint. Other users provide music files on Napster, paraphernalia on eBay and auto industry parts on Covisint. The IS on Napster, eBay or Covisint aggregates the providers/sellers and buyers/seekers and tries to match their requirements. Users belong to the business web but are not members of the organizations that provide the IS. Napster users do not work for Napster, eBay users do not work for eBay and Covisint users do not work for Covisint.

In contrast, traditional IS provide information for internal users and capture information from internal users. Typically, users enter data for transactions such as accounting and use reports such as movement of inventory [Davis and Olson 1985, Laudon and Laudon 2001]. With the trend to e-business, the primary unit of business becomes the business web rather than the corporation [Tapscott et al. 2000]. Fundamental concepts for the new millennium need to be extended to include business webs such as electronic marketplaces in descriptions and definitions of IS.

WHAT ARE THE FUNDAMENTALS OF IS?

Systems concepts are relatively stable and continue to be important. However, when you analyze more deeply, applying these systems concepts to IS changes in the context of e-business. The "system" of interest changes from the organization to the business web.

E-business, in particular electronic marketplaces, enables order of magnitude improvements in the quality and timeliness of information in ways that

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were not possible without recent technology [Kalakota and Robinson 2001]. Information becomes available much faster and more accurately than traditionally. Many types of accurate, real-time information are readily available over the Internet, such as inventory, order tracking, flight delays, price comparisons and financial information. Organizations, for example, can do what was infeasible before the e-business revolution. "What is truly new about the Internet is its ability to generate different pricing mechanisms, and in particular to allow price and product comparisons to be made and various kinds of auctions and exchanges to take place" [The Economist 2000]. Organizations can customize their IS interface (my Yahoo, my SAP.com); let customers track orders in real-time (pioneered by Fedex); let employees maintain their own personal information online (instead of filling out paper forms for HR); comparison shop with bots or software agents (check competitor prices); procure supplies through customized electronic catalogs (instead of paper-based documents going through delay prone approval processes); and personalize customer service (different web pages for different customers).

Almost every organization and industry in the United States is embracing e-business. Industry transformation occurred in music (e.g., Napster), media, financial brokerage, software and automotive domains [Kalakota and Robinson 2001; Norris, Hurley, Hartley, Dunleavy and Balls 2000]. The upheaval in the music industry is like "the canary in the mine", issuing a warning to other industries [Seybold 2001]. Widespread change in several industries impacted organizations, who see the need for change and the need to adopt e-business. As e-business becomes ubiquitous, some academic IS concepts will need to change and be extended or risk becoming irrelevant to practitioners.

The need for information was considered a fundamental concept several years ago [Davis and Olson 1985]. Today, organizations rely on information in ways that were inconceivable then. How information is used, delivered and

provides value changed. Some new concepts, restricted to evaluation and description of IS, include

- the importance of permeable boundaries for evaluation and description of IS;

- empowerment of non-technical users (as well as consumers) who now use information more extensively;

- some information, such as software and multimedia, may be delivered digitally through architectures such as P2P;

- information provides value through personalization, real-time price and product comparisons, and different pricing mechanisms.

CONCLUSIONS

My arguments show how some current concepts in evaluation and description of IS are inadequate and need to be modified or extended significantly with the trend to e-business. Of course, it is still necessary to understand systems, types of information systems, business processes, data, technology, IS planning, and IS development. I am not suggesting that we throw all prior concepts out.

Research, because of its nature and purpose of creating knowledge, will modify and extend concepts over time. Important issues for e-business that need research include trust, security, confidentiality, identification, intellectual property, ethics, and antitrust and regulatory issues. While some of these issues are not unique to e-business, they do need more attention now because these concerns were not as critical for traditional IS.

These issues inevitably impact the fundamental concepts of IS. Although concepts, laws and rules are relatively stable, sometimes they may need to change. For example, "prior research about the design of effective IT organizational architectures might be inadequate in shaping appropriate insights

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for contemporary practice" [Sambamurthy and Zmud 2000]. Similarly, prior research in other areas of IS and IT may also become inadequate for practitioners.

In industry after industry, practitioners see the need for change. " The risk of ignoring the new world or trying to make it fit the rules of the old is far greater than learning how to change with the times or how to lead change" [Fiorina 2000]. To meet the challenge from e-business, we need to have open minds to the need to change, modify or extend significantly any inadequate current concept in evaluating and describing IS.

IV. DESCRIBING AND EVALUATING SYSTEMS: WHY EXISTING CONCEPTS SHOULD NOT BE SUPPLANTED (PHILLIP EIN-DOR, OPPONENT)

In addressing the proposition that "The fundamental information system concepts developed and used during the past millennium are becoming inadequate and should therefore be supplanted by new information system concepts as e-business becomes more commonplace throughout most businesses", four issues need to be addressed.

- The nature of the traditional information system concepts.
- The degree of ubiquity of e-commerce. Is it indeed so commonplace that e-commerce should direct the development of theory concerning information systems?
- Even if e-commerce is indeed becoming ubiquitous, does this mean that new concepts are necessary?
- If new concepts are required, should they supplant existing information system concepts?

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INFORMATION SYSTEM CONCEPTS

Information systems, as traditionally accepted in the field, are computerized person-machine systems operating in organizational settings to achieve organizational goals. Consequently, the main concepts used to describe information systems until now have been:

- Technology - hardware, software, data bases, communications, architecture

- Content - data, information, knowledge - collection, validation, storage, and use

- Human Factors - users, managers, technical staff - satisfaction, participation, use

- Strategy - planning and adaptation to organizational needs and opportunities

- Environment - general attitude towards technology in society, government, competing firms, within organizations.

- Economics - magnitude of investment and alignment with organizational budgets, contribution to organizational effectiveness, efficiency, and profitability

- Interactions among the above which determine the outcomes of information system use.

UBIQUITY OF E-BUSINESS

Electronic business as defined in the terms of this debate is clearly increasing. In fact, it has been increasing ever since computers were first employed in business organizations. Every business application of computer technology is e-business as here understood and as time passes and the field develops, e-business becomes increasingly ubiquitous. Will it become universal? That is questionable, and the particular form of e-business known as e-commerce may demonstrate the lack of universality.

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Electronic commerce is undoubtedly growing in volume. The Department of Commerce reports that retail electronic commerce sales in the fourth quarter of 1999 totaled $5.3 billion, or 0.64 percent of all retail sales [U.S. Department of Commerce 2000]. Growth seems to be somewhat faster in business-to-business transactions, but even there the rate of growth is less than earlier predictions. NAPM and Forrester Research [2001] report that "Most organizations are just beginning to use the Internet for their procurement activities. As a result, they are not reporting much online buying for either indirect or direct materials." Furthermore, the spate of failures of business-to-consumer e-commerce companies seems to indicate that some caution is required in making assessments of this field. In any case, there is room for doubt over how ubiquitous e-commerce will become; it clearly lends itself to certain kinds of transactions and less to others. From the point of view of information systems, it is safe to assume that well into the future there will be numerous kinds of information systems that are not e-commerce. Manufacturing, medicine, education, and command and control come immediately to mind. While not e-commerce, these last kinds of systems are nevertheless fertile ground for e-business applications. However, in none of them will such applications become ubiquitous. Far into the foreseeable future, parts of such systems will not be completely electronic.

In view of developments in e-business, one might argue that new business models are required more urgently than new information system concepts (see e.g. *The Economist* [Feb. 1, 2001])

IS THERE A NEED FOR NEW CONCEPTS?

Clearly the growth of e-commerce calls for some new concepts to cover those aspects of information systems dominant in that field. Some examples are:

- Trust (human factors, technology)
- Cooperative systems (technology, environment)
- Multimedia interfaces (technology, human factors)

Let us briefly examine each of these to draw some implications.

Trust. The trust concept became important in recent years, especially in the context of e-commerce because participants in a transaction have no personal contact whatsoever. Thus, the age-old mechanisms for generating trust by personal interaction need to be replaced by something else. Whatever the new mechanisms may be, they belong in the realm of human factors and will utilize human factor concepts as currently understood.

Cooperative systems. As information systems become more sophisticated, they increasingly interact among themselves with little or no human intervention. Business-to-business transaction networks are an excellent example. The development of such systems requires a receptive environment and new technological solutions, Again, these areas are part of the existing repertoire of IS concepts.

Multimedia interfaces. The application of World Wide Web technology to electronic commerce led to widespread use of multimedia interfaces. The role of such interfaces and their optimal application are as yet little understood and extension of existing concepts of human-computer interfaces is required.

Each of these new concepts is hardly a replacement for any of the previous information system concepts. In fact, each of them fits into the concepts

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listed in the previous section. They are somewhat special in that each of them spans the boundary between the major factors. Thus, trust is largely within the bounds of human factors but became prominent because of the technological basis of e-commerce. Cooperative systems are largely in the domain of technology but, because of their role in linking multiple organizations, they also impact the environment. Multimedia interfaces were made possible by technological innovations but their successful application relies heavily on human factors.

SHOULD EXISTING CONCEPTS BE REPLACED?

It would be necessary to replace existing concepts of information systems if indeed e-commerce is a revolutionary development in information systems. This is the crux of the issue; is e-commerce dependent on some previously unknown types of information systems or are we witnesses to an evolutionary process which is at a particularly turbulent juncture? The argument here is based on the latter proposition.

Information systems developed over the last fifty odd years by gradual evolution, which expresses itself in the addition of new functions or technologies and new attributes to existing types of systems. Ein-Dor and Segev [1993] examined the past development of IS. At the time, they identified seventeen different kinds of IS and showed that the later the appearance of a type of system, the more attributes and functions it exhibited.

As the moderator's definition determines, "The trend toward e-business is a trend toward an operating style in which most of an organization's significant work systems make extensive use of both computer and communications technologies in order to operate efficiently and effectively." But surely this has been the trend ever since computers were first used in business organizations. Initially, only a few work systems employed computers and communications, but

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as technology became cheaper and organizations became more sophisticated, the number of computerized work systems and the depth of computerization increased. The Internet gave increased impetus to this trend by allowing new functionality - especially universal access by people outside the organization - at a very reasonable cost. Thus new systems became viable, especially B-2-C e-commerce. In other words, the Internet made possible new applications thanks to the new attributes now possible in systems.

Just as most new types of IS required new concepts to facilitate our understanding of them, so new e-business modalities require new concepts as detailed above. However, it would seem to be foolhardy to throw out the existing fundamental concepts just because a few new attributes were added to systems. IS will still be developed and used by people, so human behavioral aspects will continue to be important. The IS developed in the e-business environment will still be technology based, so an understanding of the diffusion and economics of technology is still important. Managers will still be responsible for developing and maintaining e-business work systems and so the concepts of management roles in IS will continue to be central.

Thus, in conclusion, it is argued that the proposition that "The fundamental information system concepts developed and used during the past millennium … should … be supplanted by new information system concepts as e-business becomes more commonplace throughout most businesses" is false. New IS concepts will become necessary - those listed above and new ones not yet envisioned - but these will in no way supplant the older concepts. Just as concepts of GDSS did not supplant DSS concepts, which did not supplant MIS concepts, so the new concepts of e-business will not supplant the existing IS concepts, but will be added to them.

Shapiro and Varian [1999] write that "Technology changes. Economic laws do not." To paraphrase that statement from the same context: technology changes, the rules of information systems, i.e. fundamental information system concepts, do not.

V. BUILDING AND MAINTAINING SYSTEMS: THE NEED FOR NEW FUNDAMENTAL CONCEPTS (M. LYNNE MARKUS, PROPONENT)

The fundamental concepts in the IS field — such as system, user, and system development life cycle — reflect a set of basic assumptions that were appropriate at the time our field was founded but are increasingly outmoded now. It is important to articulate these assumptions at the outset, because otherwise the need for change will not be clear. In my view, these assumptions are: Our primary constituency (those whom we teach and for whom we conduct research) is the in-house IS department (analysts, programmers, technology specialists, their managers, and ultimately the CIO) of an organization that is buying information technology (e.g., servers and software packages) and building information systems (order processing and decision support systems) *to support the organization's internal operations*, *including* those that involve interfacing with customers and suppliers. In other words, the focus is on the IT-related activities of companies like Ford and Amazon.com and on the internal systems of companies like IBM and Andersen Consulting (now Accenture), but not on the IT-based products and services that the latter types of companies produce *for sale to other companies*. A secondary constituency is the business managers of IT-using companies (ultimately the CEO) who are concerned with the effective investment in and use of IT as a "process technology" (as opposed to "product technology") inside their organizations. For the sake of simplicity, I'll refer to our primary constituency as "in-house IS specialists in IT-using companies" to

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distinguish them from external IS specialists and from operations related to the production of IT for external sale.

My argument is that major changes in the nature and locus of IT work, occasioned by e-business, mean that our basic assumptions are no longer as appropriate as they once were. Our constituents are changing, and therefore our field needs some new fundamental concepts to address these changes, in addition to the evolution of new methods and procedures.

I am not saying that the old concepts are wrong or that they need to be entirely discarded. I am saying, however, that, as our field expands into new areas, the importance of the old concepts will diminish. Put differently, one of two things will happen. Either today's concepts will get less space in future IS textbooks, crowded out by new ones that are not yet fully articulated and developed, or our textbooks (and teaching and research) will become increasingly less relevant to the world of our students and their employers.

I have three arguments about the changes *we can already observe* in the nature and locus of IS work that portend the need for changes in the fundamental IS concepts related to developing and maintaining systems. They are:

1.   In-house IS specialists in IT-using companies are no longer building and maintaining internal systems the way we describe and prescribe in our textbooks.

2.   In-house IS specialists in IT-using companies are increasingly providing IT support for the *external* customers of the organization rather than just for internal "users". Therefore in-house IS specialists must act like, and compete with, *external* IS specialists.

3.   Systems that were traditionally developed and managed as internal resources are now increasingly being developed and managed as external resources.

Below I develop these arguments more fully.

BUILDING AND MAINTAINING SYSTEMS

Our traditional IS textbooks present a world in which in-house IS specialists interview users to determine their requirements, then build custom systems tailored to the exact needs of businesses. Once the systems are built, another group of specialists within the IS organization runs them and maintains them, responding to users' requests for changes.

With ERP systems, which have been adopted in at least some divisions of nearly every major US company, the process of implementation and maintenance is very different. Teams of users and IS specialists evaluate software packages supplied by leading vendors by conducting a gap analysis. Unlike clean-sheet requirements analysis, gap analysis starts with the capabilities of the packages. Once a package is selected, it is necessary to "configure" the package to fit the basic features of the organization (number of plants and sales offices, for example). This activity differs so substantially from traditional analysis and programming that it is usually performed by user teams, not by IS specialists. Instead, the IS specialists handle "*systems integration*", that is, providing the IT infrastructure on which the package will run and handling the inevitable interfaces between the ERP system and the company's legacy systems. The ERP system vendor has the role of software maintenance (fixing bugs and developing enhancements to the software). The in-house IS department "implements" the vendor's changes in the form of periodic software upgrades and releases. Many organizations make extensive use of external consultants during ERP implementation, so the character of IS project management is quite different than in traditional in-house development, where the project head is managing the firm's employees. (See [Brehm and Markus, 2000] and [Brehm, Heinzl and Markus, 2001] for a fuller discussion of these issues.)

The old world of custom in-house development and the new world of package implementation are completely different. Not only do our textbooks *not* tell our students "how it is", they do not provide our students the necessary skills to deal with the new world. Particularly missing is advice about how to deal with the technical challenges of systems integration. Consulting firms are amassing expertise in this area and are teaching it to their new hires, but little of this expertise shows up in our texts.

One important implication of this change is that IT-using organizations are hiring fewer internal IS specialists. More of our students are working for consulting firms and to a lesser extent for IT products firms. There, as I will explain below, they build and maintain systems in very different ways than we teach our students.

SUPPORTING EXTERNAL USERS

As companies move toward e-business, they are increasingly developing systems (e.g., web sites, extranets) whose intended users are *external* customers, suppliers, investors or the public at large rather than the traditional "internal customers" of the organization's employees and managers. An example is Cardinal Health, a drug wholesaler that is developing an increasingly broad range of information products and services for sale its external customers [Bashein and Markus, 2000].

This shift is significant in at least two key respects:

1.   Internal customers can be influenced through the internal authority system; external customers cannot. For instance, IS specialists can sometimes rely on senior executives to require employees to use in-house systems. External customers have much more discretion. Research shows that even large powerful organizations have had limited success in mandating the use of EDI among their suppliers. Some suppliers to the

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retail industry chose to find their customers elsewhere rather than make the EDI investment [Bouchard, 1992]. Other suppliers "adopted" EDI but failed to integrate it with their internal systems; consequently, the buyer-supplier chain failed to reap the full benefits of integration [Markus, 2000].

2. The level of software quality and customer service required to support external customers successfully is many times higher than the levels that are typical provided to, and accepted by, internal customers.

Together, these two factors suggest that in-house IS specialists need to behave more like external IT products and services providers in their internal technical processes and in their customer-facing support activities. Research shows that external IT products and services providers develop and maintain systems very differently than we teach our students in basic texts.

For example, Grudin [1991 a and b] and Poltrock [Poltrock and Grudin, 1994] argue that the SDLC of software products (package) developers differs very substantially from that of the in-house IS department. External developers have much less direct access to the potential users of their products than do internal IS specialists. Consequently, they use different strategies for conducting what we in IS call "requirements analysis."

External software product developers try to provide generic products that users can easily adapt to their unique requirements, whereas the traditional in-house approach is to tightly tailor the software to the users' unique requirements and to provide them with little flexibility in how to use the software. Further, rather than interviewing potential users, external developers are more likely to rely on personal experience and intuition; their marketing and research departments may also use focus groups, comparisons of competing products, ethnographic observations of people performing work, feedback from alpha and beta test users, and formal software usability testing as strategies for software

development. In-house software development does not commonly employ these techniques.

Likewise, Cusumano and Selby [1995] articulated the "secrets" of how Microsoft develops its software packages. The process they describe bears little resemblance to the traditional IS SDLC.

If, as a recent article in *Earthweb* [Levin, 1999] proclaimed, success for internal IS specialists increasingly involves "thinking and acting like an [independent software vendor] and adopting the proven practices and development methodologies that have separated successful vendors of shrink-wrapped apps from abject market failures", then we in the IS field have a long way to go in changing what we teach. In addition to adopting new practices and methodologies, we need to adopt and/or develop some new fundamental concepts to reflect the important changes in our constituencies and activities.

MANAGING SYSTEMS

Of the many definitions of "e-business" in Table 1, the one with which I most resonate is by Huff et al. [2000]: "electronic business [is] the application of … (ICT) to the conduct of business *between organizations or from company to consumer.*" This definition squarely focuses attention on the key change facing IS field: The systems that organizations are implementing now do not just support an individual business's internal operations: They *connect between and among enterprises* and other entities.

At the simplest level, this trend means that the IS field needs to add *new* concepts—related to *interorganizational* behavior—to the traditional concepts—about individuals, groups and teams, and organizations—already in use in the field. At a deeper level, this trend means rethinking the fundamental worldview of the IS field.

The traditional IS worldview assumes that individual enterprises will design and implement systems that reflect how they wish to complete and do business with other firms. But if you try to imagine what would happen if every organization followed this view, you can see that it won't work. Organizations need *common ground* on which to transact business with one another. One obvious way to provide common ground is through common or shared information technology.

Many trends in information technologies for e-business suggest that the future may bring *the sharing among organizations* (perhaps by industry groups, perhaps not) of IT infrastructure and applications development, operation, and management. Some organizations may remain large enough, rich enough, and powerful enough to manage their own infrastructures and applications and perhaps even to impose them on others, but many other organizations will not. Increasingly, organizations will make use of shared infrastructure and applications provided for them by specialist third party organizations, who may be technology companies, business service providers, or even consortia of several firms in an industry. Thus, in-house IS departments may give way to external interorganizational IT services providers.

Consider, for example, ECnet, a purchasing exchange for parts in the electronics industry. Among its web site "FAQs" are the assertions that
1. in-house systems like ERP systems *are not enough* to address companies' needs to conduct business with each other and
2. in-house systems like ERP systems *are not needed* for companies to use the IT-enabled services of ECnet.

In other words, ECnet provides a package of IT-enabled business services that may obviate the need for in-house IT infrastructure and services.

Even the largest and most powerful organizations may discover the value of cooperation, rather than competition, where IT infrastructure and e-business applications are concerned. *Infoworld* recently reported that the big three automakers reluctantly agreed to develop a common infrastructure for their dealer networks. The entire history of US automaking has conditioned these firms to pursue proprietary solutions and to attempt to use their considerable market power to induce suppliers, channel partners, and customers to adopt these solutions. But their business partners are striking back. "'Most dealers work with multiple manufacturers and nobody wanted to support more than one system.'" [Nov. 17, 2000] Ultimately, across the economy, IT may become the shared infrastructure for interorganizational business, versus a competitive weapon in inter-firm rivalry. The locus of competition may shift from individual firms to supply chains or inter-organizational networks—a shift that will require new concepts for IT-related strategic analysis and planning.

Today, Internet standards make it possible to access traditional desktop services (e.g., word processing and email) via browsers. ASPs (applications services providers) are trying to make a go of providing ERP *services* to multiple firms on a per transaction basis. It is not inconceivable that, in the future, many organizations will be able to satisfy all IT-related needs with almost no local software development, equipment operation or services management. [Forrester Research [2000] recently made this claim in a report entitled "The Death of IT", where "IT" meant the in-house IT organization in computer-using companies, not information technology per se.) In such a world, nearly all IS professionals would be employed by IT products and services selling companies (as opposed to IT-using companies). This shift involves a profound shift in the basic assumptions and orientations of our field. ("Who are our customers? And what do they consider value?" Peter Drucker reminds us to ask). Accompanying this shift is the need for new concepts related to system development and maintenance.

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In short, my argument is that e-business has occasioned a shift of IS activity from the intraorganizational to the interorganizational level of analysis, which requires the *addition* of fundamental new concepts related to system development and maintenance. Perhaps it is a good time to retire some old concepts, too.

VI. BUILDING AND MAINTAINING SYSTEMS: WHY EXISTING CONCEPTS SUFFICE (IRIS VESSEY, OPPONENT)

In addressing the issue of whether e-business systems call for fundamental changes in IS concepts, I limit my arguments to the specific concepts needed to build and maintain such systems. While it is clear that e-business brings with it revolutionary changes from a number of different perspectives (for example, business models, provision of IS/IT services, who plays the development role), it is also clear that the basic systems (i.e., technical) concepts for building and maintaining such systems that evolved over the past 30-40 years, and more particularly, over the past 10-15 years, suffice to develop and maintain the systems that currently support e-business. I take the position, therefore, that the concepts needed to build and maintain information systems in the e-business era are evolutionary rather than revolutionary.

I demonstrate the evolutionary nature of e-business concepts specifically through knowledge that existed prior to the inception of such systems. My principal arguments are based on the fact that many of the fundamental IS concepts necessary to e-business were developed during a period of unprecedented change immediately preceding the e-business era; that is, the IS concepts essential to e-business evolved and will continue to evolve from the fundamental concepts underlying the client-server technologies that facilitate the cooperation and collaboration inherent in today's e-business models.

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DISTINGUISHING TYPES OF E-BUSINESS

To highlight what I see as the key to e-business systems, let me present a slightly different, yet complementary, definition from the ones presented in Table 1:

> *e-Business* automates all business processes and integrates them with e-commerce applications to create one seamless, digital enterprise serving customers and partners.

Because the terms e-commerce and e-business are sometimes, but not always, used interchangeably, it is important also to distinguish between e-business and e-commerce.

> *e-Commerce* is viewed here as the online exchange of goods, services, and/or money within firms, between firms, between firms and their customers, and between consumers.

The key to the above definitions is three-fold. First, these definitions focus on business transactions. According to these definitions, then, the majority of web-based systems, for example, those that simply make announcements, as in mysummervacation.com, or provide a service by facilitating downloading of information, such as the IRS web site that allows users to download forms for filing tax statements, or course web sites from which students can download Powerpoint class notes, assignments, and more are not viewed as e-commerce systems.

Second, these definitions highlight the fact that two quite different types of functionality are needed to support e-business: the web-based systems that form the user interface and the transaction processing systems needed to support the resultant activities. e-Commerce systems, contrary to early beliefs, are now regarded as lacking the robustness to handle the volume of transactions

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necessary to conduct effective e-business in enterprises of any size [Kalakota and Robinson 2001; Norris et al 2000]. While such systems may use server-side programming to capture data in a database, both the data and processing capabilities are unsophisticated.

e-Business applications, on the other hand, require significant processing systems and a reliable source of data. The e-business applications of primary interest in 2000-2001 are supply chain management systems, which link suppliers and customers in an extended supply chain relationship, customer relationship management systems, which aim to provide an integrated view of all of a customer's transactions with the business, and e-procurement, which is commonly understood as B2B and B2C e-commerce, as well as C2B e-commerce [Kalakota and Robinson 2001; Norris et al. 2000]. Hubs, exchanges, and marketplaces, which offer different ways of doing business, are variants on web-based transaction processing systems and require similar Information Systems concepts.

Third, the definition of e-business highlights the fact that internal business processes must be integrated with e-commerce systems in order for business to be conducted seamlessly. This type of integration means, for example, that a web-based sales order entry system must be integrated with the enterprise's accounting systems so that credit history and the availability of discounts can be checked at the time of placing an order. It must also be integrated with the inventory system to check whether the required products are in stock or must be manufactured; if products must be manufactured, then these systems must also be connected to the system that schedules production, and so on, through distribution, billing, and receipt of payment.

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CONCEPTS UNDERLYING E-BUSINESS SYSTEMS

So the question then becomes: What needs to be done to provide e-business systems such as those described above, what are the underlying concepts, and do the necessary concepts represent revolutionary or evolutionary changes to existing concepts? We address these issues in terms of distributed systems architectures, prototyping the web-based systems component (e-commerce sub-system), and business and systems integration.

Distributed Systems Architectures

e-Business systems are distributed systems. Distributed systems concepts came to fruition with the deployment of client-server systems in the 1980s. By the time the IS community focused on e-business systems, therefore, such concepts were well understood. A colleague in IS at Indiana University highlighted this notion in stating:

"Nothing is fundamentally different. I utilized my knowledge of client-server systems development concepts to understand and develop web-based systems. I did not have to learn anything that was fundamentally new."

"Client-server" systems are most often implemented in a three-tier architecture with centralized application and database servers, and distributed desktop clients. In the e-business era, a web browser takes the place of a client and the three-tier client-server system becomes an n-tier system with at least one additional tier in the form of a web server. Hence, although e-business systems may no longer be described as client-server systems, their genesis is obvious.

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Prototyping in Web-Based Systems Development

The web-based systems that form the user interface portion of e-business systems are typically custom-developed using a prototyping methodology. Prototyping is the methodology of choice when the information requirements are not well understood. Hence the concepts associated with developing the web-based portion of an e-business system are not new.

Typically, small teams, often of only three or four people, are responsible for developing such systems in development times reportedly from 45-90 days. The requirements, design, and implementation of the web-based system tends to be a heavily iterative process, which has been characterized as a variant on the JAD, RAD stream of acronyms: FAD, i.e., "frantic application development" (see report in [Glass, 2001]]. The client who is championing and sponsoring the development effort is responsible for the information requirements. More iterations are necessary as the working prototype becomes the production system and who the "end-clients" are becomes clearer. The prototyping process thus continues into the modification, and therefore the maintenance phase, and such systems are viewed as being in "permanent beta test" with the users being "only a mouse click away from leaving you" [Glass, 2001]; (see, also, [Norris et al. 2000]].

Perhaps the most frequent argument behind the suggestion that fundamental concepts will not suffice in the e-business era is that "e-commerce systems need to be developed at internet speed." The very short development times achieved by very small project teams suggest that the scope of such systems is very small indeed, further supporting the use of a prototyping methodology. Clearly, then, the term "internet speed" in the development of e-business systems applies only to very small web-based systems, and not to the development/implementation of a complete system for e-business.

Development of the web-based portion of an e-business system does not therefore call for a new methodology, but rather the application of an existing methodology to a different setting.

Business and Systems Integration

Alter's definition of e-business in Section II highlights the fact that web-based systems depend on internal business processes for much of their processing and data requirements: "e-business is "the practice of performing and coordinating critical business processes such as designing products, obtaining supplies, manufacturing, selling, fulfilling orders, and providing services… " Hence, to conduct effective e-business, web-based systems must be fully integrated with enterprise systems that are also fully integrated. Both internal, enterprise integration and integration between the web-based system and the enterprise systems are therefore key to e-business systems. As we shall see, both of these types of integration are facilitated by technologies that became available with client-server systems. Hence, the concepts associated with integrating such systems evolved from those developed in the client-server era and are not new to the e-business era.

Enterprise Integration. Enterprise resource planning systems (ERPs) represent perhaps the best solution to integrated enterprise systems because they result in a higher degree of integration than alternative approaches [Norris et al. 2000]. ERPs are on-line, interactive, cross-functionally integrated systems that facilitate both process and data integration across the enterprise. Client-server versions of ERP systems, such as SAP R/3, have been available since the early 1990s.[2] The concept of enterprise integration via ERPs was therefore already well established before such systems were used in broader e-business systems. That ERP systems predated e-business systems is also evidenced by the fact that of the many ERP implementations performed as the result of a

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[2] Major ERP vendors include SAP, PeopleSoft, Oracle, and J.D. Edwards, among others. SAP R/3, SAP's client-server software, was released in 1992.

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desire to avoid Y2K remediation [Brown, Vessey, and Powell, 2000], few, if any, involved an e-business component. Although SAP, for example, had advertised its product, R/3, as being internet-enabled since 1997, ERPs emerged as integrated enterprise platforms for performing e-business only following the completion of Y2K projects, i.e., since 1999. Hence, integrated enterprise systems in the form of ERPs were available prior to their use in e-business systems.

The second approach to achieving enterprise integration is based on existing applications. If an enterprise's legacy systems that are appropriate though not integrated, it may choose to integrate them using middeware technologies in an approach known as enterprise application integration (EAI). Middleware originated with the need to link diverse computers that first arose in the client-server era: application servers were linked to database servers, as well as to desktop computers. Middleware was therefore well understood prior to the e-business era.

EAI is a strategy that allows unrestricted sharing of data among any connected applications and data sources within an enterprise [Linthicum 1999]. EAI software permits applications, existing or new, to exchange data via messages governed by the rules of the business model [Orenstein 1999]. XML, for example, supports the definition of integrated metadata, which reconciles the data definitions (of the "same" data) used for different purposes by different areas of the business. In this way it facilitates the synchronization of different versions of the data via XML messaging [Finkelstein 2000]. Relevant communication technologies include Enterprise Java Beans or ActiveX, distributed objects such as those of CORBA or COM, message-oriented middleware and remote procedure calls, or message brokers.

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As we have seen, middleware technologies arose as a natural progression from technologies first developed in the client-server era. Hence the e-business era has not demanded changes in the fundamental concepts of systems integration already established prior to the advent of e-business systems.

Integration of Web-Based Systems and Enterprise Systems. The need to link web-based systems to the enterprise's internal systems is new with e-business. These links can be achieved via middleware technologies such as active server pages, Java server pages, and Java servlets.

The importance of the seamless integration between the web-based system and the integrated enterprise systems, is highlighted by the following comment from a Cap Gemini-Ernst and Young consultant [Blake, 2000]:

> "When we are requested to develop a quote for an e-business solution, we assess whether their internal systems are fully integrated. If they are not, we will bid for their work only if they are willing to implement an ERP at the same time."

WRAP-UP

The above analysis shows that distributed systems architectures, prototyping web-based systems, and the integration of the business and the underlying IS system that supports it are key to implementing effective e-business systems.   Interestingly, with the exception of the prototyping methodology, which is almost as old as the information systems field itself, we can trace the origins of the majority of the concepts underlying e-business systems to client-server systems. The middleware technologies used to facilitate data transfer between disparate computer systems in the client-server era evolved into technologies to transfer data between web-based systems and enterprise systems in the e-business era. Further, integration of the enterprise's internal systems can be achieved either via enterprise application integration, which uses middleware to share data among otherwise unintegrated legacy

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systems, or by implementing enterprise resource planning systems (ERPs), which are client-server based. Hence, the fundamental Information Systems concepts needed to build and maintain e-business systems have been part of our toolkits since before the advent of the Web, and e-business does not therefore demand fundamentally new IS concepts.

We cannot rest on our laurels, however. Although we can find no evidence of revolutionary changes in concepts for building and maintaining IS in the e-business era, the technologies as we now know them will continue to evolve over time, as has been true throughout the history of computing, and we can expect that such systems will look very different in a further five or ten years' time.

VII. RESULTS OF THE VOTE: NOT CONVINCED NEW CONCEPTS ARE NEEDED

Before the debate the audience received a response form requesting that they vote on the two propositions, provide additional comments about whether the trend toward e-business calls for changes in the fundamental concepts of information systems, and supply their year of Ph.D., academic rank, and main area of research. Of the estimated 200 to 300 people in the audience, 89 returned the form and 86 of the forms contained votes on one or both of the propositions. This section reports the results of the vote. The next section discusses some of the main points that emerged from written comments on the audience response forms.

The audience was asked to vote on two questions:

1. Evaluating and describing systems: Were you convinced that the trend toward e-business calls for changes in the fundamental concepts related to

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evaluating and describing systems?   1= definitely agree, 5 = definitely disagree.

Figure 2 shows that the 60 of the 86 votes were either 4 or 5, i.e., disagreeing with the proposition that changes are needed in fundamental concepts related to describing and evaluating systems. One ballot had a hanging chad.

Fundamental Changes are Needed in Evaluating and Describing Systems
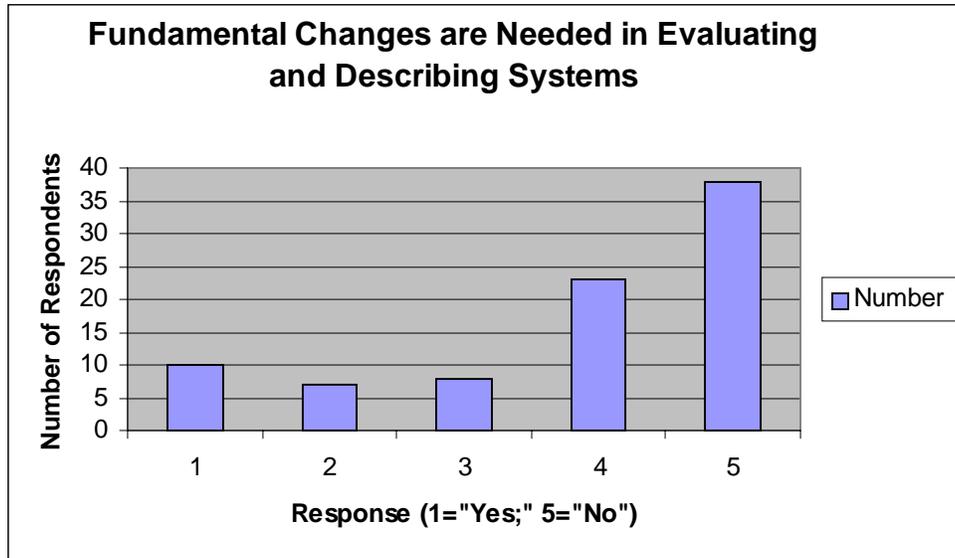
Figure 2: Audience Responses on Evaluation and Description of Systems.

2. Building and maintaining systems: Were you convinced that the trend toward e-business calls for changes in the fundamental concepts related to building and maintaining systems?   1= definitely agree, 5 = definitely disagree

Figure 3 shows that the 48 of 82 votes were either 4 or 5, i.e., disagreeing with the proposition that changes are needed in fundamental concepts related to building and maintaining systems.

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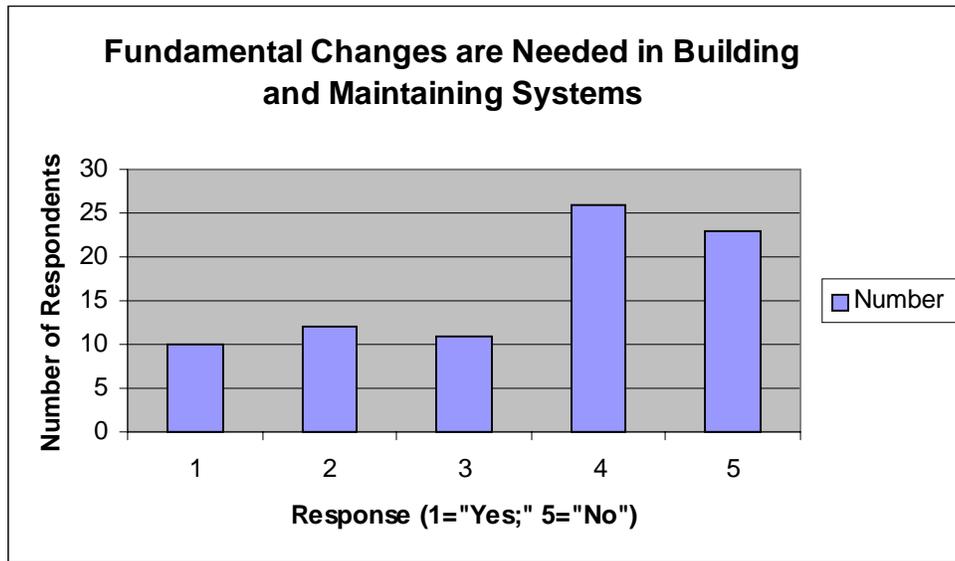
Figure 3: Audience Responses about Building and Maintaining Systems.

Votes about the two propositions were highly correlated. Votes for both propositions were the same for 45 of 82 audience response forms containing votes for both propositions. Individuals' views on the two propositions diverged by 2 or more (on the 1 to 5 scale) in only 11 of the 82 forms.

The numerical data is not analyzed in more detail because of the informal data collection method and the fact that many responses about year of PhD and academic rank were left blank.

VIII. ISSUES RAISED IN THE AUDIENCE COMMENTS

The audience comments were more interesting than the vote itself because the comments revealed some of the issues audience members were concerned with instead of just saying how much they agreed with a particular proposition.

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Selected audience comments for five issues are listed in separate tables in the Appendix at the end of this article. In some cases the audience comments were slightly reworded, abbreviated, or divided into several different comments in order to present the ideas as clearly as possible. Comments that basically repeated ideas covered in the debate, such as "I believe this is (or is not) an evolution (or a revolution)" were not included.

AUDIENCE ISSUE #1: WHAT DO WE REALLY MEAN BY FUNDAMENTAL CONCEPTS?

As shown in the first table in the Appendix, a comparatively large number of audience responses mentioned lack of clarity about what is meant by "fundamental concepts." Most of these comments stated that changes in practices or methods or techniques do not necessarily result in changes in fundamental concepts. One comment pointed out that the debate was designed to accentuate differences in opinion instead of the possibly more valuable task of trying to find common ground about what is fundamental.

AUDIENCE ISSUE #2: IS THE IS FIELD COHERENT ENOUGH TO HAVE FUNDAMENTAL CONCEPTS?

A number of comments noted that the IS field does not have an agreed upon set of fundamental concepts. Other disciplines such as economics may have disagreements about the boundaries of the discipline, but the information system field has particular difficulties in this area. In response to audience issues #1 and #2, the debate moderator wrote an accompanying article that attempts to identify fundamental IS concepts. Perhaps surprisingly, that article argues that the fundamental concepts of IS are mostly about work systems. [Alter, 2001]

AUDIENCE ISSUE #3: HOW HAS THE DESCRIPTION AND EVALUATION OF INFORMATION SYSTEMS CHANGED WITH THE TREND TOWARD E-BUSINESS?

Audience comments related to this issue focused primarily on why existing terms such as process, user, and technology are still the fundamental concepts, whether terms such as digital goods and electronic commerce have taken on new importance, and whether changes in organizational structure, operational strategy, and division of labor really call for new concepts.

AUDIENCE ISSUE #4: HOW HAS THE DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS CHANGED WITH THE TREND TOWARD E-BUSINESS?

A number of audience comments focused on the extent to which the system life cycle for e-business situations is similar to or different from the system life cycle for other situations.

AUDIENCE ISSUE #5: IS ANYTHING TRULY UNIQUE ABOUT THE VIEW OF USERS IN E-BUSINESS APPLICATIONS?

Several of the comments from the audience questioned whether e-business presented a truly different situation with regard to users and other stakeholders. For example, is development of an e-business system for a large number of external users really very different from development of an internally directly information system for a large number of widely dispersed users who could not possibly contribute their own ideas to its development?

IX. CONCLUSION

We hope that this report on a debate at ICIS 2000 provides ideas and contrasts that are useful to researchers and practitioners. Although the debate

forced panel members to stake out and defend an artificial position instead of presenting more nuanced personal views, we hope that our attempt to stake out the positions raised useful issues about what e-business means and about what is truly fundamental to the IS field.

On reading the positions taken in this debate, one cannot help but be struck by the essential similarity of views, even though the debaters purportedly adopted contradictory standpoints. The differences were more in emphasis rather than in substance. To paraphrase, the proponents said, "we need new concepts, but should not necessarily abandon the old ones." The opponents said, "the old concepts are still valid, but we need to augment them with new ones." As audience respondent #34 stated "this debate exaggerates the differences in opinion rather than exploring common ground."

The muted differences expressed by the discussants may arise in part from the level of analysis - a view expressed by respondents 24 and 56. When seen from the highest level, encompassing all of IS, much of the activity in IS is still intra-organizational with a multitude of systems requiring integration among themselves and with the new e-business systems. From this level, it is clear that most of the old concepts are still valid and will be with us for a long tine to come.

However, seen more closely from the level of e-business, the need for new concepts for evaluating, describing, and developing the new systems becomes paramount and one may require only a small subset of the old concepts which could then appear to be outdated.

The debate shows that there is considerable room for optimism. It implies that there really is a set of fundamental concepts accepted by most people in the field. Perhaps additional efforts are required to delineate those concepts and efforts are certainly required to expand them to include the new modes of IS use. The concepts themselves will also probably change over time, but at least there is the basis for a common ground for discourse.

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EDITOR'S NOTE: The following reference list contains the address of World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that

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APPENDIX

This Appendix presents selected comments submitted by the audience on audience response forms. The comments are organized around five topics.

1. What do we mean by fundamental concepts?
2. Is the IS field coherent enough to have fundamental concepts?
3. How has the description and evaluation of information systems changed with the trend toward e-business?
4. How has the development and maintenance of information systems changed with the trend toward e-business?
5. Is anything truly unique about information system users in e-business applications?

In some cases the audience comments were slightly reworded, abbreviated, or divided into several different comments in order to present the ideas as clearly as possible. Comments that basically repeated debating points, such as "I believe

this is (or is not) an evolution (or a revolution)" were not included because the point was argued during the debate. The number in brackets following each audience comment refers to the sequence number of the audience response form.

Audience comments on Issue #1: What do we really mean by fundamental concepts?
At the highest level nothing changes (we all breathe air), but this doesn't help. We may need more specific concepts and these may change at some pace. [6]
How fundamental is "fundamental," and what are "concepts"? I would say "fundamental concepts" are communication, trust, security, customer relations, profitability, tracking of information … Only applications change. Yes, fundamental application and approaches need to change. [3]
As most such events do, this debate exaggerates the differences in opinion rather than exploring common ground. I'd like to have heard a discussion of what the panelists understand by "change" and "fundamental." [34]
The surface structure of information systems may change, but not necessarily their deep structure. Also, the relevance of particular concepts may vary but this does not call for new concepts. [89]
Perhaps a change in fundamental concepts is not necessary at the moment, but an exploration and development of concepts from other (reference) disciplines, and amalgamating these concepts and theories in such a way that they can be applied in the IT/ IS context [31]
We may add new concepts, but I don't believe we will change fundamental concepts. That's why we call them fundamental. We build in masonry/concrete using the same concepts as the Egyptians on the pyramids; however we also now build in steel using concepts that Egyptians didn't know. [44]
E-business is essentially a fad in the business arena. If we as researchers were to redefine our concepts every time in new Fed came along our own research would have a seriously short shelf life. Rather, we should focus on lasting fundamental issues that underscore some of these fads or waves. [32]
Both the proponent and the opponent in each part of the debate could be right, depending on what angle or factor we want to emphasize. [24]
This depends on your viewpoint and level of analysis. [56]
New ways of working develop all the time but I don't think that will change concepts. [5]
Applications may change in content, but fundamental concepts don't change. [12]
Fundamental concepts may need augmentation or may need to be applied in new ways, but the essential concepts are still the same. [16]

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Practices, not concepts, need to change. [20]
Principles are the same. Applications are changing. [25]
Methodologies or system building approaches may change, but concepts remain the same. [26]
A method is not a concept. Changing methods does not necessarily imply changing concepts. [89]
Fundamental concepts are not driven by trends. [41]
New technology may call for new techniques, but not necessarily new concepts. [27]
Concept labels are pretty consistent, yet meaning is expanding. [48]
Fundamental concepts may need clarification, but do not need to change. E-business bridges the barrier of space (geography) and time, but the operational processes remain the same. [27]
E-business requires a fundamental extension of existing practices. [10]

Audience comments on Issue #2: Is the IS field coherent enough to have fundamental concepts?
Has there ever been an agreed set of fundamental concepts? [9]
Maybe we need to agree/debate [about] what are the fundamental concepts of IS. [7]
The panel made it obvious that the participants did not share the same frame of reference, for example, the user and IT's role in relation to information system. [5]
We do not have an explicit, well-defined, or universally accepted conceptual core. We need to sharpen our concepts. [13]
The question is poor because it assumes that the field, practice, and discipline of IS is cohesive enough to describe it as having a coherent set of "fundamental concepts." Perhaps more important is the mix of varied terminologies, e.g., IT is not IS and IS is not systems. [1]
Maybe IS has too little knowledge about paradigms and "fundamental" concepts. [47]
The debate did not [focus much] on concepts. It was mostly about methods and surface [topics] rather than deep issues. [89]
We need to develop tools and procedures to account for new or phenomena. I guess we have to first determine what the fundamental concepts are. [15]
How firm are our concepts? [38]
I have never been completely satisfied with existing definitions of information systems. [51]

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There are sociological implications of the new phenomena, less for the [IS] discipline. [15]

Audience comments on Issue #3: How has the description and evaluation of information systems changed with the trend toward e-business?

Certain aspects of evaluating and describing e-business based systems required new methods and procedures. However, if we talk about fundamentals, the same criteria are still used to evaluate and describe e-business based systems. [11]
Convergence of digital media, hence ICT, software, finance, digital goods, electronic commerce are new social technical phenomenon. We now need to incorporate additional disciplines in addition to technology, management. [9]
To add what level of analysis? What constitutes a system? People have always use tools to perform work. While changes in the technology artifacts may not be significant, qualitative changes in the way we work required new concepts, vocabularies, and evaluation criteria. … While the management, development, and operation of systems may have changed, the information systems strategy regarding ownership and control of information systems has not changed. [9]
What is an information system is not changed, just examples of the constraints that create the form…. Attributes are descriptive while constraints are predictive of optimality. Development (building) focuses on optimal behavior, which depends on the constraints. The constraints represent where we sit on the dimensions of the attributes. E-business is pushing these dimensions to new extremes. Thus, what is optimal is changing radically. [8]
A different division of labor or re-drawing of system boundaries does not undermine the concepts of the tasks involved or systems concepts. [13]
Fundamental concepts of IS may not change, but organization structure may change. [24]
[The trend toward e-business] brings up/ highlights new issues, e.g., privacy, security, perceptions and needs of users. [28]
B2C might introduce some new ideas, but these are basically extensions to existing concepts. [29]
There are still users, processes, data, technology, etc. in any e-business system, and it is just as logical to divide up "users' into classes (e.g., customers, employees, suppliers, etc.) with e-business as with other information systems. [51]
Trust is now of paramount importance. [49]

Audience comments on Issue #4: How has the development and maintenance of information systems changed with the trend toward e-business?

The biggest change is that we recognize external component-based integration vs. internal building and programming. In many ways, the world's has changed but we have not. Although

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you can argue this is not a concept but practice, think the way we make operational concepts calls for rethinking the concepts themselves to begin to reinforce the need for change in the way we do things. [6]

[Several statements in the debate seem to just be untrue, such as:] ERP is "different." The concept of packaged software is not new. Once everyone gets ERP they will realize that "different" software is needed to achieve a competitive advantage. Then the pendulum will swing back to custom development. If we change our curriculum from technical and development skills we will miss the wave. [2]

How differently are e-business systems developed? Don't we go through the same sort of stages, e.g., requirement gathering, analysis, etc.? Yes, the way of doing it requires a change to adapt to the situation, but the fundamentals do not change. As for ERP, how innovative is the premise of ERP as compared to, say, an expert system in terms of the way they view the role of the user's, role of information and knowledge, etc.? [11]

Are requirements irrelevant? If you are buying Office 2000 may so, but they are important for Microsoft. [15]

Concepts are the same need to be applied differently. For instance, the development life cycle still applies in integration projects, where analysis, design, implementation, and testing are still carried out, but indifferent ways and on much smaller time scales. [16]

We may need some new techniques associated with new technology, but no change in fundamental concepts of the software development and maintenance process. [27]

The discussion of within-enterprise development is important but irrelevant to the point at hand. Students of IS have been and will be employed within and outside the enterprise. But that is not e-commerce phenomenon. At an ICIS more than five years ago, one speaker said "our top students are being hired by the consulting firms." IS as a supplier of within enterprise people is an obsolete concept. [17]

Maintenance includes content maintenance to greater degree, probably not the role of IS professionals. However, new roles are emerging. [18]

In-house systems are increasingly built as tailored collections of existing components. This requires new techniques. [25]

Audience comments on Issue #5: Is anything truly unique about the view of users in e-business applications?

[Several statements in the debate seem to just be untrue, such as:] "We don't know who our e-business customers are." If we can't speculate on users and do a good job of querying focus groups, we are just not very smart. What was difficult about development in the past is that developers didn't have the functional knowledge of the system. That is no longer true, since we all know what we'd like to happen when we buy CD's for example. We as developers can do a better job since we are, almost, the customer. [2]

Throughout the entire evolutionary history of MIS the set of people referred to as users has been constantly changing. … Consideration of the users of MISs and creating user satisfaction has always been banned will always be important -- fundamental.   … Pleasing a much broader

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population is more difficult but not fundamentally different. …. Someone is still building and maintaining, not just configuring systems, whether in-house or not. Those builders are still part of the information system field. [4]
The scope of the stakeholders is changing. [12]
A new paradigm of IS systems with a very different user base. [49]
A large customer base, often global, has always been part of many information systems. (e.g. international purchasers of goods). Many information systems permitted transactions being referred elsewhere (e.g. customer decides to purchase directly from supplier). [The IS field] has traditionally included inter-organizational systems. B2B is already covered. [51]

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