

The Evolving Role of Information Systems and Technology in Organizations: A Strategic Perspective

نقش رو به توسعه سیستمها و تکنولوژی اطلاعات
در سازمانها

Jamshid Nazemi

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factors affecting effectiveness of IS/IT?

- the capabilities of the technology;
- the economics of deploying the technology;
- the applications that are feasible;
- the skills and abilities available, either in-house or from external sources, to develop the applications;
- the skills and abilities within the organization to use the applications;
- the pressures on the particular organization or its industry to improve performance.

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INFORMATION SYSTEMS (IS) AND INFORMATION TECHNOLOGY (IT)

The UK Academy of Information Systems (UKAIS) defines information systems as *the means by which people and organizations, utilizing technology, gather, process, store, use and disseminate information*. It is thus concerned with the purposeful utilization of information technology.

INFORMATION SYSTEMS (IS) AND INFORMATION TECHNOLOGY (IT)

IT refers specifically to technology, essentially hardware, software and telecommunications networks. It is thus both tangible (e.g. with servers, PCs, routers and network cables) and intangible (e.g. with software of all types). IT facilitates the acquisition, processing, storing, delivery and sharing of information and other digital content. In the European Union, the term Information and Communication Technologies or ICT is generally used instead of IT to recognize the convergence of traditional information technology and telecommunications, which were once seen as distinct areas.

Application

Another term that is frequently used along with IS and IT is *application*. Essentially, an application refers to the use of IT to address a business activity or process. There are essentially two types of application:

- general uses of IT hardware and software to carry out particular tasks such as word processing, electronic mail or preparing presentation materials;
- uses of technology to perform specific business activities or processes such as general accounting, production scheduling or order processing.

INFORMATION SYSTEMS (IS) AND INFORMATION TECHNOLOGY (IT)

Checkland and Holwell⁶ have pointed out that many people find difficulty in distinguishing between IS and IT, because technology seems to overwhelm their thinking about the fundamental information system that the technology is to support. Checkland⁷ also notes that information systems exist to serve, help or support people taking action in the real world. He asserts that, in order to create a system that effectively supports users, it is first necessary to conceptualize that which is to be supported (the IS), since the way it is described will dictate what would be necessary to serve or support it (the IT).



شناخت ارزش افزوده تکنولوژی

We have heard stories recounted of senior executives returning from business trips abroad demanding that a new technology be purchased or a new application be implemented because they have seen an advertisement in an airline's in-flight magazine. It is important to remember that IT has no inherent value—the mere purchase of IT does not confer any benefits to the organization; these benefits must be unlocked.

E-business and E-commerce

There are two other concepts that we believe are important to discuss up front, particularly given the prominence both have received: *e-business* and *e-commerce*. Since the mid-1990s, both concepts have entered the everyday vocabulary of managers and, having observed activity in many organizations such as the appointment of 'Directors of e', 'e-managers' and 'e-Czars' and the fact that many have developed 'e-strategies', suggests that e-commerce and e-business are being treated as something new and different from seeking out opportunities to deploy IS/IT. This should not be the case.

E-business and E-commerce

Data interchange

EDI standards emerged. Industries such as automotive, banking and retail had their own standards to define message structures. The United Nations did attempt to bring some uniformity to these diverse standards through UN/EDIFACT (United Nations/EDI for Administration, Commerce and Transport), but with mixed success.

E-business and E-commerce

New business model

E-business, on the other hand, has come to refer to the automation of an organization's internal business processes using Internet and browser technologies. At one extreme, we have the 'pure play' dot.coms, whose business models are often portrayed as being totally web- or Internet-enabled, often reaching out directly to customers. However, unless the product is digitizable, such companies do not exist totally in the virtual world. In industries such as retailing, manufacturing and transportation, the physical aspects overpower the virtual—logistics still wins the day,





Growth of new economy

Right up until the Nasdaq crash in March 2000, we could not fail to pick up a newspaper or magazine without reading a story about the Internet and its impact. Attention grabbing headlines such as ‘The ‘net’ changes everything’, ‘Log on or log out’ or ‘The death of the job’ and articles spotlighting the 21st century economy with promises of change in the lives of everyone ensured that the Internet became a popular topic of conversation. Acronyms such as B2B (business-to-business), B2C (business-to-consumer), B2E (business-to-employee) and P2P (peer-to-peer) entered the business vocabulary.



The fundamental challenge

any organization is still to identify opportunities to deploy this new technology, as with any other. As Porter¹⁷ noted ‘[w]e need to move away from the rhetoric about “Internet industries”, “e-business strategies”, and a “new economy” and see the Internet for what it is: an enabling technology—a powerful set of tools that can be used, wisely or unwisely, in almost any industry and as part of almost any strategy’.

Misleading IT

It should also be noted that IT is *not* the business strategy. Statements like ‘in this new age, IT is not about the business—it is the business’¹⁸ are misleading and unhelpful.¹⁹ Rangan and Adner²⁰ have dispatched sound advice in this regard. ‘The sooner firms stop being distracted by the hype of new technology, the sooner they can focus on the key strategy lessons that business experience of the past couple of decades has taught us: regardless of the industry that a firm operates in, it can achieve and sustain profitable growth to the extent that it grasps and delivers on two strategy fundamentals—product advantage :

E or I

Hamel, in his book *Leading the Revolution*,²¹ is quite forthright in stating that ‘[t]he real story of Silicon Valley is not “e”, but “i”. not electronic commerce but innovation and imagination. . . . It is the power of “i,” rather than “e,” that separates the winners from the losers in the twenty-first century economy’.

EARLY VIEWS AND MODELS OF IS/IT IN ORGANIZATIONS

The use of computers in business began in the early 1950s but really only became significant in the mid- to late 1960s with the development of multi-purpose mainframe computers. Major increases in processing speed, cheaper memory and improved storage capacity afforded by magnetic disk and tape, plus better programming languages, made 'batch' data processing a viable option for many tasks and activities in organizations.

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Nolan Model

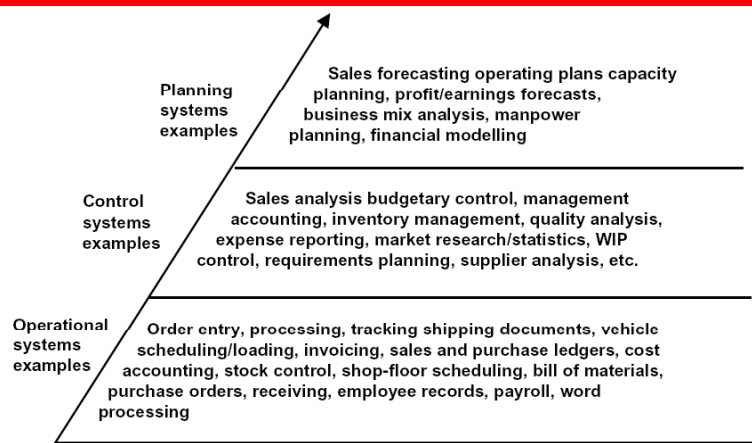


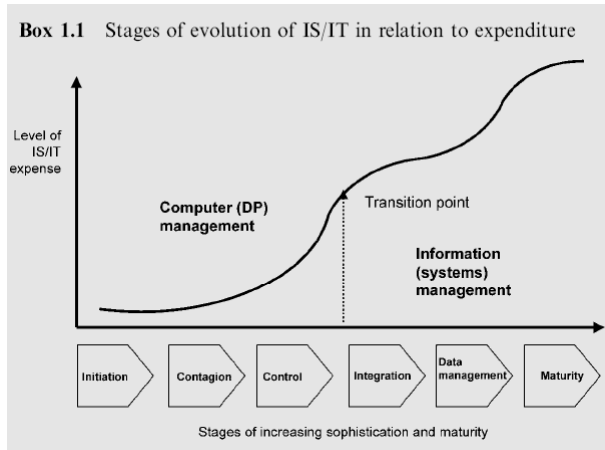
Figure 1.1 Typical planning, control and operational systems

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Nolan and Gibson proposed an evolutionary model

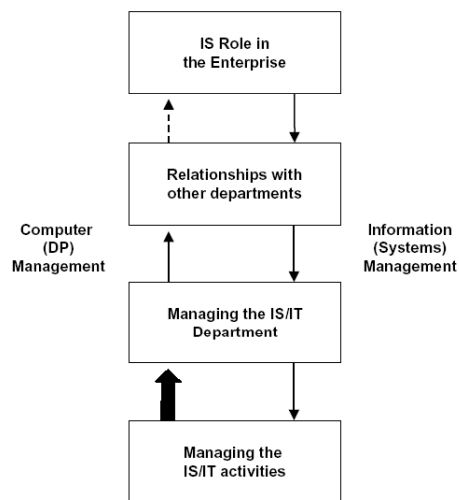


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IS / IT Role transition



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EARLY VIEWS AND MODELS: UP TO 1980

It can be concluded that, from the 1960s to the early 1980s, IS/IT and its deployment in organizations passed through a major transition, which linked two eras. These two eras can be summarized as:

1. data processing from the 1960s onwards—the DP era;
2. management information systems (MIS) from the 1970s onwards—the MIS era.

DP versus MIS

	<i>Operational and control systems (data processing)</i>	<i>Control and planning systems (management information systems)</i>
<i>Objectives</i>	Efficient transaction handling and effective resource control	Effective problem resolution and support for decision making
<i>Life cycles</i>	3–12 years, depending on rate of change	From hours to months and occasionally recurring
<i>Information time frame</i>	Recent history, current and short-term future	Consolidated history, current and extended future
<i>Information sources</i>	Internal plus external transactions	Internal plus external 'research' data
<i>Logical processes</i>	Strictly algorithmic	Probabilistic and 'fuzzy'
<i>Users</i>	Operators, clerical staff and first line supervisors	Professionals and middle to senior managers
<i>Technologies</i>	Mainframe/minicomputer-controlled processing at workstations	Local processing linked to information resources

Role changes

- *data processing* to improve operational efficiency by automating information-based processes;
- *management information systems* to increase management effectiveness by satisfying their information requirements for decision making;
- *strategic information systems* to improve competitiveness by changing the nature or conduct of business (i.e. IS/IT investments can be a source of competitive advantage).

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The trend

Aspects	'Era'		
	DP	MIS	SIS
Nature of the technology	'Computers'	'Distributed process'	'Networks'
	Fragmented	Interconnected	Integrated
	Hardware limitation	Software limitation	People/Vision limitation
Nature of operations	Remote from users controlled by DP	Regulated by management services	Available and supportive to users
Issues in systems development	Technical issues (programming/project management)	Support business users needs (information management)	Relate to business strategy?
Reasons for using the technology	Reducing costs (esp administrative) (technology driven)	Supporting the business (manager) (user driven)	Enabling the business? (business driven)
Characteristics of systems	Regimented/ Operational (internal)	Accommodating/ Control	Flexible/ Strategic? (external)

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STRATEGIC USES OF IS/IT: CLASSIFICATION, FACTORS FOR SUCCESS AND MANAGEMENT IMPLICATIONS

The four main types of strategic system appear to be:

1. those that share information via technology-based systems with customers/consumers and/or suppliers and change the nature of the relationship;
2. those that produce more effective integration of the use of information in the organization's value-adding processes;
3. those that enable the organization to develop, produce, market and deliver new or enhanced products or services based on information;
4. those that provide executive management with information to support the development and implementation of strategy (in particular, where relevant external and internal information are integrated in analysis).

Strategic information system defined

Other classifications are somewhat similar in their analysis. Benjamin *et al.*⁵³ divided the types of potential opportunity between those that focus on either the competitive market place or internal operations. Within each, IS/IT can be used to improve traditional ways of doing business or to cause 'significant structural changes' in the way the company does business. Notowidigdo⁵⁴ divided strategic information systems into:

- internal systems that have direct benefit for the company;
- external systems that have direct benefits for the company's customers.

Revolutionary usage of technology

1. *business process redesign*—using IS/IT to realign business activities and their relationships to achieve performance breakthroughs;
2. *business network redesign*—changing the way information is used by the organization and its trading partners, thereby changing how the industry overall carries out the value-adding processes;
3. *business scope redefinition*—extending the market or product set, based on information or changing the role of the organization in the industry.

Environment effect

Purpose Focus	Operational efficiency	Management effectiveness	Business advantage through change
Internal	1. Data processing—automation of business tasks and processes	2. Management Information Systems (and 'Executive and Information Systems')	3. Internal business integration by process, job and organization redesign
External	4. Electronic links between organizations automating data exchanges	5. Sharing information by direct access from one company to another's information resources	6. External business integration, changing the roles of the firms in the industry

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SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

1. *External, not internal, focus:* looking at customers, competitors, suppliers, even other industries and the business's relationships and similarities with the outside business world. Traditionally IS/IT was focused on internal processes and issues. Toshiba is using wireless technology for remote monitoring of photocopiers, so that technicians can be dispatched as soon as there are signs of a problem. This reduces servicing costs and, since machines are out of action less often, increases usage and revenue.

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SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

2. *Adding value, not cost reduction:* although cost reductions may accrue due to business expansion at reduced marginal costs, 'doing it better, not cheaper' seems to be the maxim. This is consistent with the requirements of companies to differentiate themselves from competitors—better products, better services—to succeed. Historically, IS/IT was seen as a way of increasing efficiency—doing it cheaper—and, while this is obviously important in any business environment, it is not the only way to succeed. At Svenska Cellulosa Aktiebolaget, a Swedish pulp and paper company, foremen use a wireless system to send instructions to loggers in the field, specifying which trees to cut and in what order. This enables the company to coordinate harvesting decisions with inventory and transport requirements and match those decisions to market needs.

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SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

3. *Sharing the benefits*: within the organization, with suppliers, customers, consumers and even competitors on occasion! In many cases in the past, systems benefits have not been shared even within an organization, but used instead to give departments or functions leverage over each other. This reduces the benefits and does not allow them to be sustained. Sharing benefits implies a 'buy in', a commitment to success, a switching cost. Almost all of the examples involve sharing the benefits, with suppliers, customers, consumers and competitors, to provide barriers of entry to the industry.

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SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

4. *Understanding customers* and what they do with the product or service: how they obtain value from it, and the problems they may encounter in gaining that value. In the 1980s, McKesson, the pharmaceutical wholesaler, followed this principle very closely in providing a range of information-based services to drugstores, starting from a simple problem of stock control, solved by delivering products in shelf-sized batches. Black and Decker, a low-cost producer, supplied a value-added service to retailers to enable them to 'swap' goods they had over or understocked for the season. They did not want returns, but the retailer could not be expected to predict precisely how many lawnmowers, for instance, would be sold. It helped to solve a customer's problem. Federal Express has built on its original customer-service system, which tracks every movement of every package, and extended access direct to customers.

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SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

5. *Business-driven innovation, not technology-driven:* the pressures of the marketplace drove developments in most cases. This tends to cast doubt on the idea of competitive advantage from IT, but, in practice, it means that new or existing IT provides or enables a business opportunity or idea to be converted into reality. The lead or the driving force is from the business, not necessarily a traditional route to using IS/IT, which has often been driven by technology, pushed by the IT suppliers and professionals, not pulled through by the users. It is only relatively recently that the latest technology has become of interest to business managers. But the business issue does not change: why take two risks at the same time—that is, a new business process based on new technology? It is a recipe for failure! Keen⁵⁶ summed it up well by saying, ‘Major failures in using IT are often based on much better technology and bad business vision. Successes come from good enough technology and a clear understanding of the customer.’ An early prediction of the demise of many dot.com ventures?

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SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

6. *Incremental development,* not the total application vision turned into reality. Many examples show a stepped approach—doing one thing and building on and extending the success by a further development. To some extent, this is developing applications by experimentation but also not stopping when a success is achieved but considering what could be done next. This, again, is against the traditional notion of clarifying all requirements, defining all boundaries and agreeing the total deliverables of the system before embarking on the expensive, structured process of design and construction, freezing the requirements at each stage. Prototyping of systems obviously has a key role to play here.

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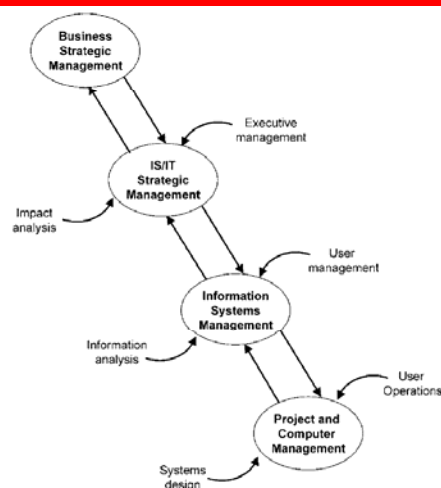
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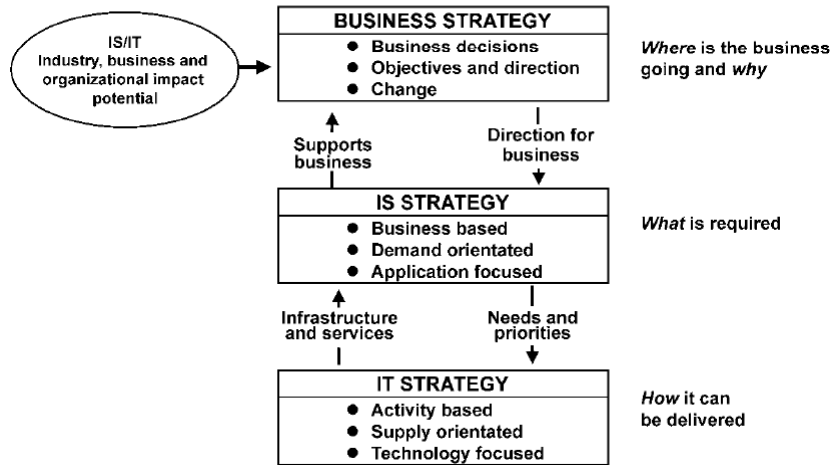
SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

7. *Using the information gained* from the systems to develop the business. Many mail order and retailing firms have segmented their customers according to the purchasing patterns shown by transactions and then providing different, focused catalogues or special offers. Product and market analyses plus external market research information can be merged and then recut in any number of ways to identify more appropriate marketing segmentation and product mix.

DP to SIS relationship



Business Strategy to IS/IT strategy



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