

THE BLACKWELL ENCYCLOPEDIA OF MANAGEMENT

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The Blackwell Encyclopedic Dictionary of Management Information Systems

Edited by Gordon B. Davis

Carlson School of Management

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Business

impractical for portable or laptop computers. These PCs use flat-panel monitors. The most common type of flat-panel display is the liquid crystal display (LCD). This is the same technology used in some digital watches and calculators. There are three types of LCD monitors: passive matrix, dual-scan matrix, and active matrix. The basic difference between the three is the number of times the screen is refreshed and the size and shape of the matrix elements. Active matrix has the highest refresh rate and uses matrix elements that generate sharp, clear images that can be seen from almost any orientation of the screen. Passive and dual-scan matrix screens are more difficult to read.

Plotters are often used when a hard copy of a graphic image is required. Charts, blueprints, maps, and drawings are some of the items a plotter can produce. Plotters use multicolored pens to draw, rather than print, graphic images. They are slower than printers, but capable of much more detail. While laser and ink-jet printers have all but replaced smaller plotters, large plotters are still required to create large documents such as maps and schematic drawings.

There are several assistive output devices that enable handicapped users to use computers. Such a specialized printing device is a Braille, which produces output in Braille format for the visually impaired. Voice synthesizers, or voice response units, convert digital output into versions of the spoken word. Output can be either mechanically synthesized or actual human speech that has been prerecorded and stored. Telephone information systems are one example of voice response units. Another is speech output devices for the voiceless or visually impaired.

Computer output microfilm (COM) is used to reduce images of hard copies to microfilm or microfiche. This reduces the amount of space needed to store documents, and is commonly used in the insurance and banking industries. However, this is a mature technology and is gradually giving way to optical disk technology.

Output devices can also extend beyond the printer and monitor into the 3D world. Drilling, milling, and machining devices associated with computer-aided design and computer-aided manufacturing (CAD/CAM) can convert data into finished or semi-finished products. Virtual

reality (VR) systems use output devices such as head-mounted displays, large projection screens, and headphones or speakers to enhance simulations.

As more and more emphasis is placed on using computers in our work and leisure activities, users will demand more natural means for interacting with these devices. Effective input and output devices are essential elements of information systems today and in the future.

DENNIS ADAMS

outsourcing of information systems Outsourcing of information systems refers to the contracting out of some or all of the IS services of a firm. Although "outsourcing" came into common parlance only in the late 1980s, the concept of contracting out for IS services is not new. Even in the early 1960s, when computers were first introduced to businesses, outsourcing was characterized by the presence of service bureaus that offered application-specific transaction-processing services to firms. A notable example is ADP which provided payroll processing to a wide variety of businesses. In the 1960s and 1970s, outsourcing was restricted to a small number of standard applications within a firm's application portfolio. These applications included payroll, inventory control, general ledger, etc.

IS outsourcing of the late 1980s represented a new twist. Taking Kodak as a model, firms embraced a "total outsourcing" approach, characterized by high dollar value deals (ranging from \$100 million to \$3 billion) and long-term contracting (e.g. 10-year contracts). Under such contracts, firms relinquished the entire IS function, including data center operations, network and communications management, disaster recovery, and PC acquisitions and maintenance, to vendors. In extreme cases, systems development was also contracted out. In total outsourcing, a firm legally transfers IT assets and human resources to the vendor. For example, in the \$2 billion IS contract between General Dynamics and Computer Services Corporation, General Dynamics recovered \$20 million from IT assets sold to CSC.

By the mid-1990s, the total outsourcing approach has given way to "selective outsourcing." Companies adopt a more conservative approach to outsourcing by retaining the ownership and control over IS function and contracting out only for one or a few IS services. Common IS services to outsource include production-oriented activities, such as data center operations, network management, and PC acquisitions and maintenance. Design-oriented activities such as systems development are commonly retained in-house.

Variations of Outsourcing

According to Apte and Mason (1995), companies have three options for IS outsourcing: co-location outsourcing; domestic multi-location; and global multi-location. The Kodak-IBM arrangement is an example of co-location outsourcing, where IBM built a data center facility locating physically on Kodak's premises. The Chevron's US data networking contract with AT&T is an example of domestic multi-location where the network operations are managed out of AT&T's facilities; while GE Appliances outsourcing of some of its programming projects to Infosys, a software house in India, is an example of global outsourcing.

Rationale for Outsourcing

Two primary reasons jointly drive a firm toward outsourcing one or all of its IS services. First, a company will outsource if it does not deem IS to be a core competence of the firm, or if it does not deem IS to have strategic value to the organization. The firm will outsource IS so that it can channel its resources into other activities that are more central to the firm's business. Secondly, a company will outsource its IS function if vendors are more efficient in performing the services in-house. To the extent that vendors can offer the quality services more efficiently, firms should outsource to reap the economies of scale and scope of the vendors.

Managing Outsourcing Contracts

The key to successful long-term IS outsourcing is the management of relations between the client organizations and the vendor. Turnover and rapidly declining price-performance ratios of IT products and services threaten to make obsolete initial contractual agreements (McFar-

lan & Nolan, 1995). Sufficient flexibility and control structures must be embedded in the initial contractual agreement to ensure a smooth working partnership between the client and the vendor even as technologies and prices change. According to Ang and Beath (1993), any IS outsourcing contract must include five major elements:

- 1 *Authority structures* where rights and responsibilities are assigned to either the client or vendor to make discretionary decisions, issues orders, or demand performance. Examples of these decisions include identifying and changing key personnel; making price adjustments; and changing the scope of the contract as price-performance ratios of IT drop.
- 2 *Rule-based incentive systems* where rewards and punishments are tied to vendor performance, and not to the market. Market incentives work well under conditions of certainty, where all performance contingencies are considered prior to contractual agreement. Rule-based incentive systems dissociate compensation from market-determined forces. They reflect locally determined inducements for desirable future performance. For example, if timely delivery is vital, penalties for delays beyond agreed completion date and bonuses for early completion may be incorporated into the contract.
- 3 *Standard operating procedures* where routines are followed by parties in the contract to ensure that the contract progresses as planned. Examples of routines include requiring the vendor to produce formal progress reports; to conduct regular face-to-face meetings with clients; and to bring to the attention of the client potential IT operational problems and project delays.
- 4 *Nonmarket-based pricing systems* where pricing algorithms are designed to accommodate cost uncertainties in long-term IS contracts. Nonmarket-based systems are market-price established by competitive bidding but modified by cost-recovery procedures. A combination of market pricing and cost-recovery algorithms is designed to ensure a reasonable balance

between price risk for the client and compensation risk for the vendor.

- 5 *Informal mechanisms for resolving disputes* where procedures are developed to settle conflicts without direct referral to court sanction. Unlike any typical arms-length contractual arrangement, a series of private and informal appeals is embedded in the contract to ensure that parties survive disputes. In the event of any disagreements, parties should agree to discuss and resolve the dispute informally and privately between top management of the client and vendor organizations. In the event that such negotiation is not successful, parties should submit the dispute to mediation by a third party arbitrator – a mutually agreed-upon computer professional. Only if the arbitration fails, formal legal litigation commences.

The act of outsourcing is not a panacea for all IS problems. The success or failure of out-

sourcing depends in large part on how one manages the relationship between the client and the vendor. Flexibility and control structures must be in place at the beginning of the long-term contractual arrangement to ensure that partners to the contract survive technological changes, declining price-performance ratios, personnel turnover, and other environmental jolts.

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