BLACKWELL

ENCYCLOPEDIC DICTIONARY OF MANAGEMENT INFORMATION SYSTEMS

（影 印 版）

布莱克韦尔管理信息系统百科辞典

EDITED BY
GORDON B. DAVIS

The Blackwell Encyclopedia of Management editors:
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Edited by Gordon B. Davis

Carlson School of Management

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THE BLACKWELL ENCYCLOPEDIA OF MANAGEMENT

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Foreword

It is a privilege to introduce this book and its contributors to a great new readership – the people of China.

In a transforming economy the challenge is to find new ways of managing and organising that harmonise with national culture. In meeting this challenge the most important tools are ideas and knowledge. This book is a toolbox containing a wealth of powerful and influential ideas. This is knowledge that has been influential in shaping how we think about what goes on in organisations, and which has stood the test of time. You will also find here ideas that are emerging as signposts for the future development of organisations and management. One major barrier to adopting this knowledge has been its restriction to the readers of specialist journals and books. This has led, over the years, to a great proliferation of specialist concepts and terminology – impenetrable jargon to the nonspecialist, making it unnecessarily difficult for lay readers to understand and get full value from the insights of scholars. The present volume solves this problem by providing a systematic inventory of key concepts, with clear explanations of them by a collection of the world's experts.

In a transforming economy like China, it is my hope that a book like this will be immensely valuable to

a) scholars and students who want a source book for key concepts, references to further reading, and linkages with other topics [cross references are indicated by words in SMALL CAPITALS]
b) business leaders and professionals who want clear explanations of management and organisational terms, and ideas about how to apply them in business settings

c) broad-minded and intelligent general readers who want quick digests of the essential academic knowledge on a given topic.

There are many ways of using a book like this. The cross-indexing system allows you to explore at will. If you pick a theme, you can follow a path of interconnected ideas through the main areas of business and management. For readers in China, as a region in the

midst of radical economic and social change, so of these might be as follows:

1. **Management style**. What kinds of leadership seem to work best and why? What are the preconditions for effective authority?
[see, for example, entries on: CEOS; DELEGATION; ENTREPRENEURSHIP; LEADERSHIP, MANAGERIAL BEHAVIOR; MANAGEMENT STYLE; POWER; RISK-TAKING; STRATEGIC MANAGEMENT; SUCCESSION PLANNING; SUPERVISION; TEAMBUILDING; TOP MANAGEMENT TEAMS; TURNAROUND MANAGEMENT; WOMAN MANAGERS]

2. **Organisational design**. How do you get the best out of people through how you organise tasks, communication networks and decision-making systems?
[see, for example, entries on: BUREAUCRACY; COMMUNICATION; DECENTRALIZATION; FAMIL Y FIRMS; INFORMATION TECHNOLOGY; JOB DESIGN; MATRIX ORGANIZATION; MUL TINA TIONAL CORPORATIONS; ORGANIZATION DEVELOPMENT; ORGANIZATIONAL DESIGN; ORGANIZATIONAL EFFECTIVENESS; RESTRUCTURING; SOCIOTECHNICAL THEORY; TECHNOLOGY]

3. **Human Resource systems**. What is current accepted wisdom about the effectiveness of key practices and processes? How do you make them work best?
[see, for example, entries on: ASSESSMENT CENTRES; DISABILITY; HOURS OF WORK; HUMAN RESOURCE STRATEGY; JOB ANALYSIS; MANAGEMENT DEVELOPMENT; NEGOTIATION; PARTICIPATION; PAYMENT SYSTEMS; PERFORMANCE APPRAISAL; PSYCHOLOGICAL CONTRACT; RACE; RECRUITMENT; SAFETY; SELECTION METHODS; TRAINING]

4. **Individual performance and adaptation**. Under conditions of change, which methods work best and how do people's motives translate into productive action?
[see, for example , entries on: ABSENTEEISM; CHANGE METHODS; COMPETENCIES; CREATIVITY; ERRORS; GOAL SETTING; INTERPERSONAL SKILLS; MENTAL HEALTH; MOTIVATION; PERFORMANCE, INDIVIDUAL; PERSONALITY; PRODUCTIVITY; QUALITY CIRCLES; STRESS]

5. **The cultural context for management**. How can we best understand and analyse how values and practices adapt to different national and industrial contexts?
[see, for example , entries on: CRISES; CULTURE; DOWNSIZING; EXPATRIATES; GOVERNMENT AND BUSINESS; INTERNATIONAL MANAGEMENT; MANAGEMENT OF DIVERSI-

TY; ORGANIZATIONAL CULTURE; POPULATION ECOLOGY; PRIVATIZATION; TECHNOLOGY TRANSFER]

6. **Strategic decision making**. What are the hazards and opportunities for how business plans are formulated? How can groups and teams be used to best effect? what biases distort judgement?

[see, for example , entries on: BEHA vIORAL DECISION THEORY; CONSULTANCY INTER VENTION METHODS; DECISION MAKING; DIVERSIFICATION; GROUP DECISION MAKING; INNOVATION; MERGERS & ACQUISITIONS; NETWORKING TOTAL QUALITY MANAGEMENT]

7. **Ethics**. What do we know about how principled business can be achieved in demanding market environments? How can employees be encouraged to act as good corporate "citizens" and businesses as socially responsible forces?

[see, for example, entries on: BUSINESS ETHICS; CONFLICT, CORPORATE SOCIAL PERFORMANCE; DISCRIMINATION; JUSTICE; LEARNING ORGANISATION; MORAL DEVELOPMENT; ORGANIZATIONAL CITIZENSHIP; POLITICS; VALUES]

This list is not exhaustive. There are almost as many ways of using this book as there are entries. For this reason it is my hope and belief that Chinese readers will find their own special interests served by its rich contents.

Nigel Nicholson
London Business School
September 1999

Preface

Computer-based information and communications systems are critical resources for competing successfully in the information age. These systems are vital to products, services, and management processes A new organization function has been established to plan, implement, and manage the information technology infrastructures and systems required by an organization. An academic discipline has emerged to teach and research the use of information technologies in organizations and the management of information resources. The size of investment in information resources and its importance to the effectiveness and efficiency of organizations justify the business function and corresponding academic discipline

A variety of names are applied to the new organization function and academic discipline. The term, Management Information Systems or MIS, is widely used. Other often-used terms are information systems and information management. Management information systems is used for this encyclopedic dictionary of the field both because it is the most widely used and also because it clearly identifies the management and organization context for the systems.

A useful starting point for a user of *The Blackwell Encyclopedic Dictionary of Management Information Systems* is the article, MANAGEMENT INFORMATION SYSTEMS. It defines and describes the scope of the organization function and academic discipline. Historical background is contained in the article, HISTORY OF ORGANIZATIONAL USE OF INFORMATION TECHNOLOGY. Underlying concepts are found in articles on INFORMATION CONCEPTS and SYSTEM CONCEPTS APPLIED TO INFORMATION SYSTEMS.

The focus of this encyclopedic dictionary is on information systems in organizations and the management of information resources. There are articles describing the concepts, processes, and tools employed in planning, building, and managing information systems The coverage does not include technical details of information and communications technologies, However, since management information systems employ these technologies, there are management-level explanations of technical terms that are relevant to organization dialogue about requirements and applications.

The articles and definitions in the dictionary have been written by academic and professional colleagues working in the field of management information systems. They have responded well to instructions to make the descriptions technically correct but understandable to a reader who is not a specialist in the field

Gordon B. Davis

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Contents

— A —

accounting use of information technology The use of information technology in accounting is reflected in an *accounting information system* (AIS). It is an information system that collects, stores, processes, and reports information regarding the financial transactions of an organization. A major objective of an accounting information system is to provide the necessary controls over the processing of transactions to ensure that the organization's financial activities are recorded and reported accurately, fairly, and on a timely basis.

Accounting information systems are the most common information systems utilized in business. Every firm uses at least one. They are a combination of manual (i.e. people-oriented) and automated (i.e. computer-based) components that work together to accomplish the accounting system objectives. Due to the critical and often enterprise-wide role of accounting applications, an organization's set of integrated accounting applications may be its largest information system. The accounting information system can be described in terms of its processing activities and its use in business accounting cycles.

Accounting Information Processing Activities

Accounting information systems are a subset of the broader category of organizational information systems. As such, they perform the basic data processing functions.

In the input stage, the system collects and records data such as sales orders, shipping data, and vendor payments into the system. Forms such as invoices or bank deposit slips that contain the input data are called source documents. If necessary, data from non-machine-readable source documents (such as a hand-written price tag) are entered into machine-readable form for use in subsequent computerized processing. Common AIS input devices include keyboards for manual data entry, scanners to read universal product codes (UPCs, or bar codes), and magnetic ink character readers (MICR) in banking.

In the processing stage, accounting applications perform primary accounting operations, utilizing the data that was collected in the input stage. The most common data processing operation is the updating of organizational files and databases to reflect the completion of a transaction. Transaction processing typically uses one of two modes: batch or online. In batch processing, individual transactions are accumulated over a specified period of time (hourly, daily, weekly, etc.) and are then processed as a group to update the relevant files on a periodic basis. A payroll system is an example of an application that is typically processed in batch mode. In online processing, relevant files are updated immediately, one transaction at a time, as the transaction occurs. Online systems are more complex and expensive than batch systems, but they provide greater database integrity since they reflect a more accurate state of the world. A sales order entry system that updates the inventory file immediately upon completion of a purchase is an example of an application that utilizes online processing.

In the output stage, an accounting system produces documents that describe financial transactions that have been processed. At the single transaction level, a customer's sales receipt or a bank's deposit receipt are examples of outputs. Examples of outputs that depict aggregated transactions include monthly bank statements and packing slips for a product shipment. At an even more aggregate level, and

perhaps most commonly identified as an example of an output from an accounting information system, corporate financial statements summarize the entire set of financial transactions in which an organization has engaged during a specified period of time.

An accounting information system involves a significant amount of data storage. Two major types of data are typically stored in an AIS: master data and transaction data. A master file can be thought of as a record of the *people and things* with which the organization interacts and stores data. Examples include customers (name, address, phone number, etc.), vendors, and products (item number, price, quantity on hand). Transaction data describes *events* that occur about which the organization needs to retain an accurate record. Examples include sales, purchases, and payments.

Business Accounting Cycles

Accounting information systems are used to support the activities that take place in many functional areas of an organization. In general, they support five fundamental business cycles: (a) revenues; (b) purchases; (c) operations; (d) human resources; and (e) financial management/reporting.

The *revenues cycle* is comprised of all transaction activities that bring operating revenue directly into the organization. Focusing on the company's sales and receivables activities, systems that support the revenues cycle include order entry, sales automation, billing, accounts receivable, and cash receipts systems. Since the public interacts most frequently with revenue cycle applications, these components are typically the most visible external accounting applications in an organization.

Purchase, or procurement, cycle transactions bring raw materials and supplies into the organization. Rather than bringing in revenue, the procurement function focuses on obtaining the physical inputs (and incurring the accompanying costs) that are required to produce the organization's goods and services. Applications that support the purchasing cycle include purchase order, accounts payable, and cash disbursement systems. One change in automating the procurement cycle is the use of ELECTRONIC DATA INTERCHANGE (EDI), whereby two trading partners exchange documents such as purchase orders, invoices, and payments electronically (and instantaneously) rather than relying on mailed paper transaction documents.

Operations cycle transactions transform the procurement cycle inputs into the goods and services that are sold through the revenue cycle. A critical component within the operations cycle is inventory management, which links purchasing activities to sales activities. Essentially, all organizations have some form of operational inventory management requirement. In a manufacturing firm, inventory transactions involve purchasing raw materials inventory from suppliers, transforming those raw materials into manufacturing work-in-progress inventory, and eventually producing finished goods inventory that is ready for sale. In a wholesaling or retailing organization, inventory management operations involve acquiring products from suppliers, storing them as necessary, and distributing them to customers.

The *human resources cycle* accounting systems focus primarily on the processing of payroll and related expenses (taxes, benefits, sick leave, etc.). Payroll systems are often processed in batch mode, due to their relatively stable and repetitive nature. Due to processing repetitiveness and simplicity, payroll systems are a common accounting function that many organizations outsource to firms that specialize in such data-processing activities.

Financial management and reporting applications involve the general ledger system and reporting business results through the financial reporting system. It requires recording all transactions (business events) accurately and promptly, maintaining a complete and accurate set of account balances, and compiling and reporting all financial results to appropriate parties on a timely basis. The financial management and reporting system is an integrating application for the accounting system. It combines the financial activities of all the other business cycles into an integrated set of statements that provide a broad and comprehensive view of the organization. These outputs can be used by management and stockholders to evaluate the company's performance and to

make decisions regarding corrective actions that may be needed.

WILLIAM D. NANCE

ACM The Association for Computing Machinery is the largest, broad-based international computer and information system society (*see* ASSOCIATIONS AND SOCIETIES FOR INFORMATION SYSTEMS PROFESSIONALS).

ADA A general purpose programming language sponsored by the United States Department of Defense. It is especially suited for the programming of large, long-lived systems with a need for ongoing maintenance. It supports modern programming structured techniques and concurrent processing.

agency theory applied to information systems Agency theory examines the contracts between a party (the principal) who delegates work to another (the agent). Agency relations become problematic when the principal and agent have conflicting goals and when it is difficult or costly for the principal to monitor the performance of the agent. When goals are incongruent, the agent is assumed to have a different set of incentive structures from the principal; the agent will consume perquisites out of the principal's resources and make suboptimal decisions. These activities produce efficiency losses to the principal. To counter these losses, the principal designs contracts to align the goals at the lowest possible costs. Costs can arise from providing incentives and from monitoring to ensure that the agent is acting for the principal's interests.

Agency theory can offer insights for information systems. First, principals can design information systems to monitor the actions of agents. Electronic communication systems, electronic feedback systems, and electronic monitoring systems are examples of monitoring devices that can be implemented to ensure that agents' behaviour is aligned with principals' interests.

Secondly, information systems professionals themselves often enter into agency relationships with other stakeholders in organizations and agency problems can arise. Important examples of such agency relationships include systems development, outsourcing, and end-user computing.

Systems Development

As principals, users often engage information system (IS) professionals as agents to develop information systems on their behalf. Due to a lack of understanding and knowledge of each other's domain, goal conflict may arise between the two parties. To reduce agency costs, one or both parties must try to narrow goal differences. IS professionals can invite users to participate more actively throughout the development lifecycle. This gives the users more opportunities to verify requirements and ensure that the final system is aligned with user needs. Further, users may request that the information system produce information-rich documentation so that monitoring is made easier and more readily available to users.

Outsourcing

In any outsourcing arrangement, the client company (principal) is usually motivated to shift its IS operations to external vendors who can carry out the work at the lowest possible cost. The vendor, on the other hand, may be looking for high profit in the arrangement. There is thus an economic goal conflict. To protect its interests, the client will increase its monitoring of the vendor. This can be achieved by requesting regular operational performance measures from the vendor, frequent meetings with the vendor to review progress of outstanding projects, and independent auditors to review benchmarks and internal controls of the vendor.

End-user Computing

Agency theory can help explain the dynamics of end-user computing. End users develop information systems themselves with little IS involvement. End-user computing, interpreted in agency theoretic terms, is a mechanism for reducing agency problems by eliminating the

agency relationship between the user and IS professional.

SOON ANG

AIS The Association for Information Systems is an international society for information system academies (*see* ASSOCIATIONS AND SOCIETIES FOR INFORMATION SYSTEMS PROFESSIONALS).

artificial intelligence The attempt to program computers to perform tasks that require intelligence when performed by humans is known as *artificial intelligence*. Examples of such tasks are visual perception, understanding natural language, game-playing, theorem-proving, medical diagnosis, and engineering design.

Beginning in the late 1950s, AI researchers have modeled a variety of problems (such as playing checkers or proving theorems in mathematics) in terms of state space search. A *state* denotes a particular configuration of the components of a problem. The position of pieces on a chess board and the structure of terms in a mathematical expression are examples of states (for the problems of chess-playing and theorem-proving, respectively). The application of a permissible operator (such as a legal move in the game of chess or an expansion of terms in a mathematical expression) alters the state of a problem. The set of all possible states, together with the operators that enable transitions among them, constitutes the *state space* representation of a problem.

The solution of an AI problem consists of a search through the state space, i.e. the successive application of operators until the final state of the problem matches the desired goal state (a checkmate in chess or the simplest expression of a theorem). Unless the problem is very limited in scope (e.g. playing tic-tac-toe), the state space is hopelessly large for an exhaustive search (the game of chess has more than 10^{120} states). Additional knowledge (beyond the rules of the game) is required to guide the state space search in promising directions. This search control knowledge is commonly called *heuristic knowledge*. The process of problem-solving in AI described above is called *heuristic search* (Newell & Simon, 1976).

Chess-playing and theorem-proving are examples of tasks where the careful application of logic has to be supplemented by heuristic knowledge to produce an efficient solution. As AI research progressed, it was discovered that specialized tasks, such as diagnosis, design, and planning, require even more knowledge to formulate (in state space terms) and solve (through heuristic search). In order for knowledge to facilitate the solution of an otherwise intractable problem, the knowledge must be represented in a suitable form for use by a computer program. Methods of reasoning about the knowledge to apply it to a particular situation must also be specified. The representation of domain knowledge and efficient methods of reasoning with it have become central concerns of AI since the 1970s (Feigenbaum & McCorduck, 1983). Certain formalisms, including if–then rules, semantic networks, frames, and predicate logic, have been developed to represent and utilize knowledge efficiently in problem-solving.

AI methods have been successfully applied to problems in computer vision, robotics, knowledge-based systems (*see* EXPERT SYSTEMS; KNOWLEDGE BASE), understanding natural language and machine learning (the extraction of patterns from large volumes of data). AI-based computer systems have been successfully deployed in manufacturing to support the design and diagnosis of products and processes. In services, AI has been applied to a variety of tasks, including medical diagnosis, financial statement analysis, and logistics management. In addition to dedicated AI systems, AI techniques have also been used to improve the user interfaces of conventional information systems.

See also **Cognitive science and information systems**

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AMIT DAS

ASCII A commonly used code for alphabetic, numeric, and special characters is the American Standard Code for Information Interchange (ASCII). The original ASCII standard code used seven bits. An extended ASCII code employs eight bits (*see* CODING OF DATA FOR INFORMATION PROCESSING

assessment of management information system In order to evaluate the resources being spent on information management and whether or not it is meeting organizational needs, assessment of the MANAGEMENT INFORMATION SYSTEM function can be performed periodically. The evaluation should be carried out within the context of the organization and its strategies and plans.

There are two persistent questions relative to the information systems of an organization:

1 How much should be spent on information systems? (allocation of organizational resources to information systems).
2 How good are the information systems and the function that supports them? (evaluation of organization, management, and services of the information systems function).

Within industries, spending levels on information systems differ substantially among successful companies. Within the constraints of resource availability, how much should be spent depends on two factors: (1) what the organization wants to achieve with information technology; and (2) how much it must spend to be competitive. Companies differ in culture, capabilities, and the way they use information technology, so what organizations wish to achieve will differ; industries differ in their use of information technology, so what organizations must spend to be competitive will differ by industry. This suggests that information systems can only be evaluated within their organizational and environmental context.

An in-context approach to information system assessment provides the framework for investigating these key management questions. The in-context assessment framework is presented as a complete assessment approach. A company may wish to perform a complete, comprehensive assessment, but it is more likely that the assessment will be targeted at a high-level evaluation or at a specific problem area. The value of the in-context assessment framework is in identifying factors to be included in assessment and in defining the overall context for targeted assessments.

The Context for Information Systems

The information architecture of a company serves an organization which: (1) exists in an industry with a competitive environment; (2) has a specific organizational structure, management style, and culture; and (3) has specific information requirements. These define the overall context for assessment of the information management function and the portfolio of information system applications.

The existing *industry context and competitive environment* define what is expected of information systems at the current time. This can change as new applications and new information products (and other innovations) are used to change the industry structure and basis of competitive advantage. The relevant assessment questions should do more than merely determine whether information systems meet industry and environmental norms. Since information technology can help achieve competitive advantage by changing the way the organization or the industry operates, the MIS function and information systems should also be assessed on participation in competitive innovation and change.

Organizations differ in the way they approach problems and the way they respond to competitive pressures. These differences are reflected in the *organizational structure, culture, and management style* of the organization. This context is important in an assessment of how well the information systems fit the organization as it currently exists. The assessment can also identify changes in information systems that are necessary to support strategic changes in culture and organization.