

EXISTING APPROACHES TO INFORMATION SYSTEM DESIGN

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Information Integrity/Integrity Information System/Management Information System

Course Lecture # 8-10

2006-2007

- Lecture # 8: MIS-An Overview
- Lecture # 9: Survey of Information Systems Technologies
- Lecture # 10: Development, implementation and management of IS resources

Management Information Systems

- Brief Course description

Unit 1: Introduction to MIS for Large and Complex Engineering Enterprise

- Unit Objective
 - Introduction to the definition of a management information system (MIS),
 - Its relationship to other concepts (e.g., data processing, decision support system),
 - Its scope as an academic discipline, and
 - Its description from the perspective of a user.
 - Also introduction to the concepts of: life cycle of development, quality assurance and information resource management.
 - Further, introduction to convergence technologies and their implications for MIS in enterprises.
- (VVM to edit)

Lecture # 1

Management Information System – An Overview

Structure

DEFINITION OF A MIS

- Lack of consensus on definition of the term “management information system.”
- Various alternative terminologies:
 - Information processing system,
 - Information and decision system,
 - Organizational information system,
 - Information system
- All these terminologies are used interchangeably to refer to computer-based information processing system, which supports the operations, management, and decision functions of an organization.

- A definition of a MIS, as the term is generally understood, is
 - an integrated, user-machine system
 - for providing information
 - to support operations, management, and decision-making functions in an organization.

The system utilizes

- computer hardware and software;
- manual procedures;
- models for analysis, planning, control and decision-making; and
- a database.

- The fact that it is an integrated system does not mean that it is a single, monolithic structure; rather it means that the parts fit into an overall design.
- MIS has been described as a pyramid structure made of decreasing complexity information processing layers of:
 - MIS for strategic and policy planning and decision-making,
 - Management information for tactical planning and decision-making,
 - Management information for operational planning, decision-making, and control, and
 - Transaction processing, Inquiry response.

Key concepts supporting MIS: Computer based User-Machine System, Integrated System

- **Computer-based User-Machine System**

- Some tasks are performed by humans, while others are best done by machine.
- Interface formed generates ambiguity, which is both cause and consequence of loss due to error as well as benefit from the opportunity recognized and utilized (acted upon).

- **Integrated system**

- MIS provides the basis for integration of organizational information processing.
- Even though individual applications within information systems are developed one at a time for and by diverse sets of users, their design can be guided by the overall plan, which determines how they fit in with their functions (System Dynamics modeling achieves this). In essence, for systematic integration, the information system is (should be) designed with Information Integrity (I*I) as a planned federation of small systems.
- IS integration is (also) achieved through standards, guidelines, and procedures set by the MIS function. Proposition is the enforcement of such standards and procedures permits diverse applications to share data, meet audit and control requirements, and be shared by multiple users.
- The trend in information system design is toward separate application processing from the data used to support it. The separate database is the mechanism by which data items are integrated across many applications and made consistently available to a variety of users.

Key concepts: Need for a Database

- Need for a Database
 - Data and information are different. Data is a raw material and data processed is information.
 - The underlying concept of a database is that data needs to be managed in order to be available for processing and have appropriate quality. This data management includes both software and organization. The software to create and manage a database is a database management system (DBMS).
- (VVM: Thought here can be effectively developed to present IBMS as a need of integrity IS and underlying concept of IBMS – DBMS in the presence of environmental complexity and ever changing nature.)

Key concepts: Utilization of Models

- Utilization of models
 - Data is processed and presented in such a way that the results is directed toward the decision to be made.
 - To do this, processing of data items is based on a decision model.
 - Capital expenditure decision model for investment decision
 - Personnel search and ranking-of alternatives model for personnel selection
 - New product introduction model for new product pricing
 - Budgetary control model for expenditure control
 - Optimization model to make a choice.

MIS AS AN EVOLVING CONCEPT

- Not a single, highly integrated system but federal, i.e., decentralized, distributed system,
- Extension of MIS
 - Decision Support System (DSS)
 - Information resource management (IRM)
 - End-user computing

MIS versus Data processing

- MIS versus Data Processing
 - A data processing system processes transactions and produces reports. It represents the automation of fundamental, routine processing to support operations.
 - A management information system is more comprehensive; it encompasses processing in support of a wider range of organizational functions and management processes. However, every MIS will also include transaction processing system as one of its functions.
 - One important aspect of the difference between MIS and routine data processing is the capability to provide analysis, planning, and decision making support.

MIS and Decision Support System

- MIS and Decision Support System
 - A decision support system (DSS) is an information system application that assists decision making. DSS tend to be used in planning, analyzing alternatives, and trial and error search for solutions. They are generally operated through terminal-based interactive dialogs with users. They incorporate a variety of decision models. DSS represent a significant class of MIS applications, namely, File drawer systems, Data Analysis systems, Analysis information systems, Accounting models, Representational models, Optimization models, and Suggestion models.

MIS and Information Resource Management (IRM)

- MIS and Information Resource Management (IRM)
 - IRM is an approach to approach to management based on the concept that information is an organizational resource. Given that view, the task of the information system executive is to manage that resource. The resource is defined very broadly. The scope of IRM includes data communications, word processing, and personal computers as well as well as traditional data processing. The IRM concept tends to emphasize the organizational effectiveness of the information system resource rather than the technical sophistication or efficiency of the hardware and software. The MIS concept, as defined in this course, includes the resource view of information.

Key Concepts: End-User Computing

- End-user computing

- A recent major development affecting the structure and design of MIS is end-user computing. Users are provided with terminals or personal computers and powerful software for accessing data, developing models, and performing information processing directly. This development, made possible by the increasing power and decreasing cost of the technology, is a significant force for a change in the way information resources are organized, provides, and used. In many organizations, the MIS function is undergoing a transition from centralized control of information systems resources to toward provision of support to users who control their own development and operation of information systems. This brings in the issues of system support for end-user computing and of MIS management in the end-user environment.

MIS AND OTHER DISCIPLINES

- **MIS AND OTHER DISCIPLINES**

- **Managerial accounting**

- Financial accounting (example: balance sheet) reports are oriented toward investors; As a result they have limited usefulness for managerial decision making. Managerial accounting, on the other hand, is concerned with determining relevant costs and performing other analysis useful for managerial control and managerial decisions. It tends to be the focus for the preparation of budgets and performance analysis based on budgets. The MIS concept includes much of the content of managerial accounting; however, the support systems which provide users with access to data and models are beyond the scope of traditional managerial accounting. Current organizational practice is usually to retain cost and budget analysis within the managerial accounting function and to have the MIS function provide data and model support.

- **Operations Research**

- Emphasis on systemic approach to problem solving
 - Use of mathematical models and mathematical and statistical procedures in analysis
 - Goal of seeking optimal decisions or optimal policy

- **Management and Organization Theory**

- Behavioral theory of organizational and individual decision making
 - Individual motivation
 - Group processes and group decision making
 - Leadership techniques
 - Organizational change processes
 - Organizational structure and design

- **Computer Science**

SUBSYSTEMS OF AN MIS

- SUBSYSTEMS OF AN MIS
 - MIS is often introduced as a broad concept referring to a federation of subsystems. Two approaches to defining the subsystems of an MIS are according to:
 - The organizational functions, which they support, and according to
 - The managerial activities for which they are used.

Organizational Function Subsystems

- Because organizational functions are somewhat separable in terms of activities and are defined managerially as separate responsibilities, MIS may be viewed as a federation of information systems- one for each major organizational function. There may be common support systems used by more than one subsystem, but each functional system is unique in its procedures, programs, models, etc.
- Next slide gives typical major subsystems for a business organization engaged in manufacturing.

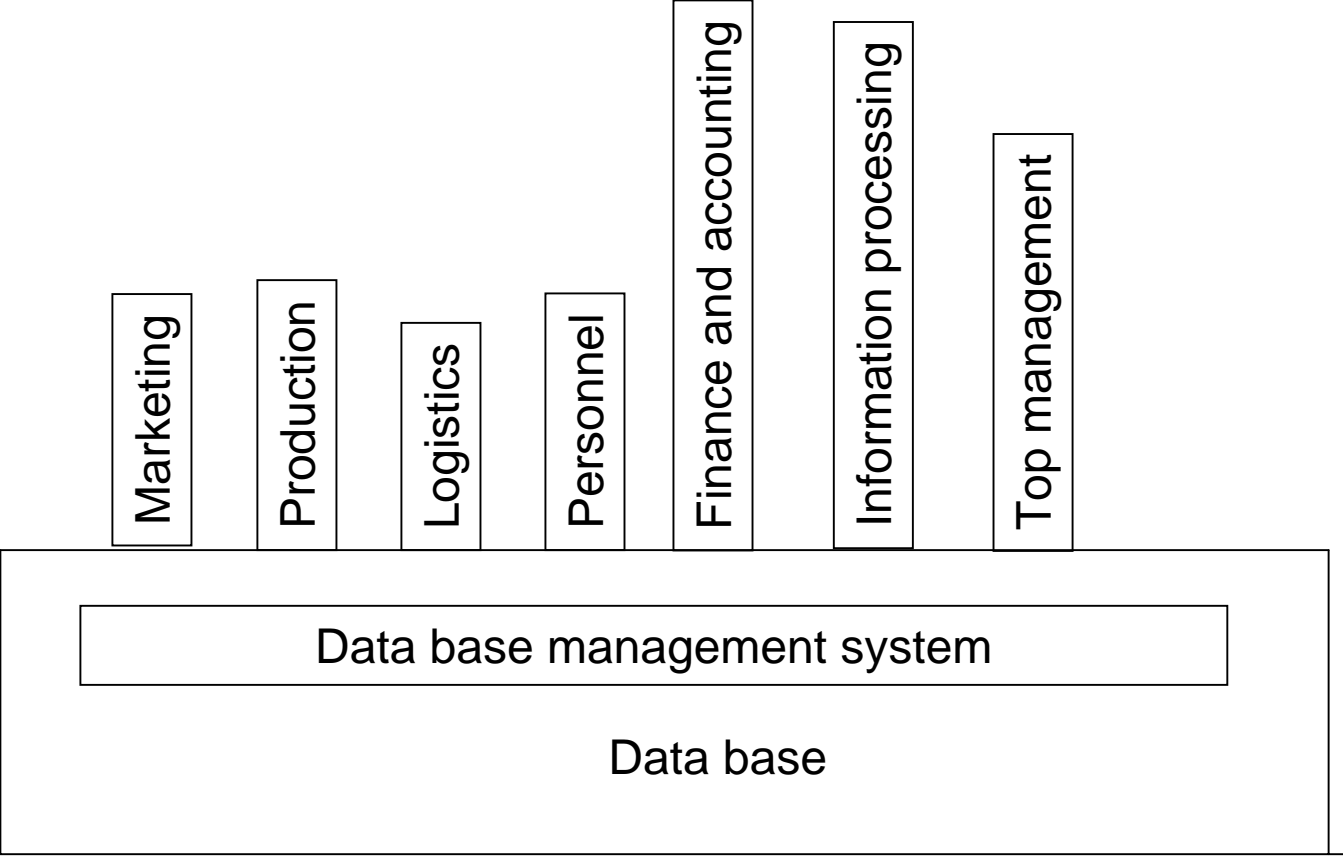
Organizational Function Subsystems

- Major functional subsystem
 - 1. Marketing
 - 2. Manufacturing
 - 3. Logistics
 - 4. Personnel
 - 5. Finance and accounting
 - 6. Information processing
 - 7. Top management
- **Some typical uses**
 - 1. Sales forecasting, sales planning, customer and sales analysis
 - 2. Production planning and scheduling, cost control analysis
 - 3. Planning and control of purchasing, inventories, distribution
 - 4. Planning personnel requirements, analyzing performance, salary administration
 - 5. Financial analysis, cost analysis, capital requirements planning, income measurement
 - 6. Information system planning, cost-effectiveness analysis
 - 7. Strategic planning, resource allocation

Organizational Function Subsystems

- The database is the primary integration of the various subsystems. A data item that is stored or updated by one subsystem is then available to the other subsystems. For instance, the sales and inventory information used by the marketing subsystem is supplied through the logistics subsystem; the same data is used by the manufacturing subsystem for production and scheduling (see Figure on the next slide).

Figure: Functional subsystems in an MIS used by a manufacturing concern



Activities Subsystems

- Another approach to understanding the structure of an information system is in terms of the subsystems which perform various activities. Some of the activities subsystems are will be useful for more than one organizational function subsystem; others will be useful for only one function.

Examples of major activities subsystems

- Activity subsystem
 - Strategic planning
 - Management control
 - Operational control
 - Transaction processing
- Some typical uses
 - Formulation of objectives and strategic plans
 - Formulation of budgets and resource allocation
 - Scheduling of activities and performance reports
 - Processing of orders, shipments, and receipts

Figure: Relation of activities to functional subsystems

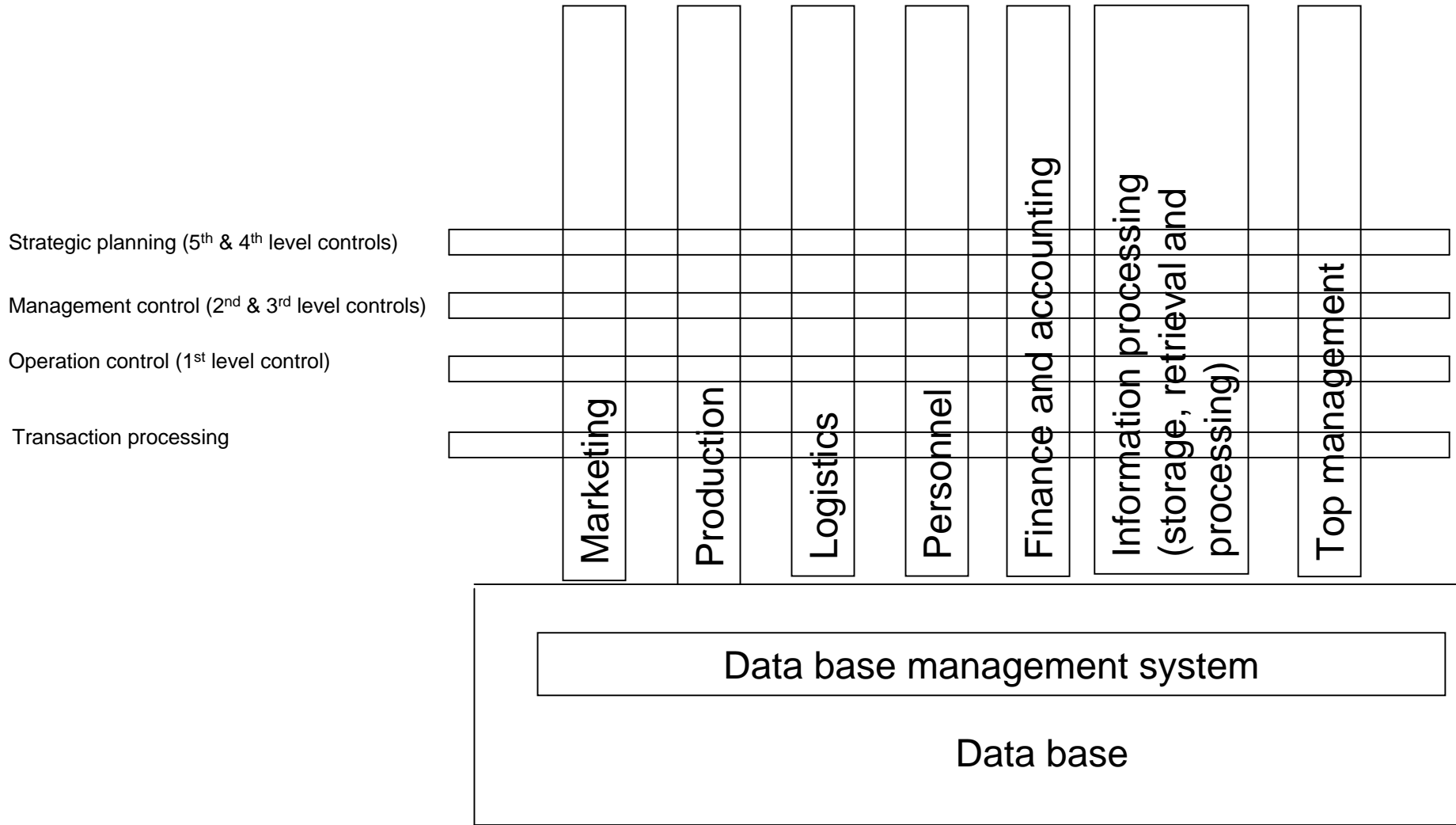


Figure: Relation of activities to functional subsystems

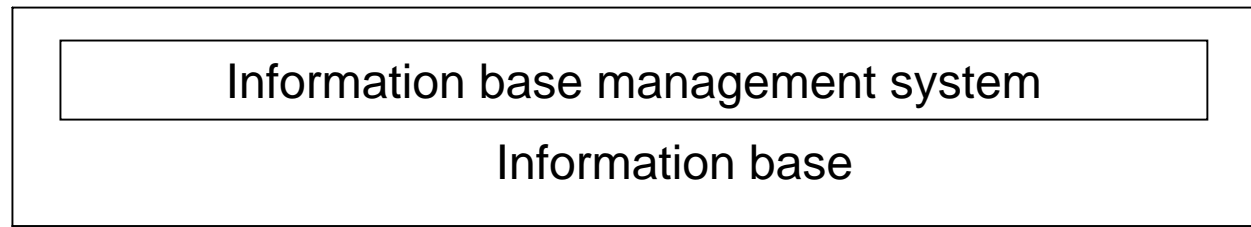
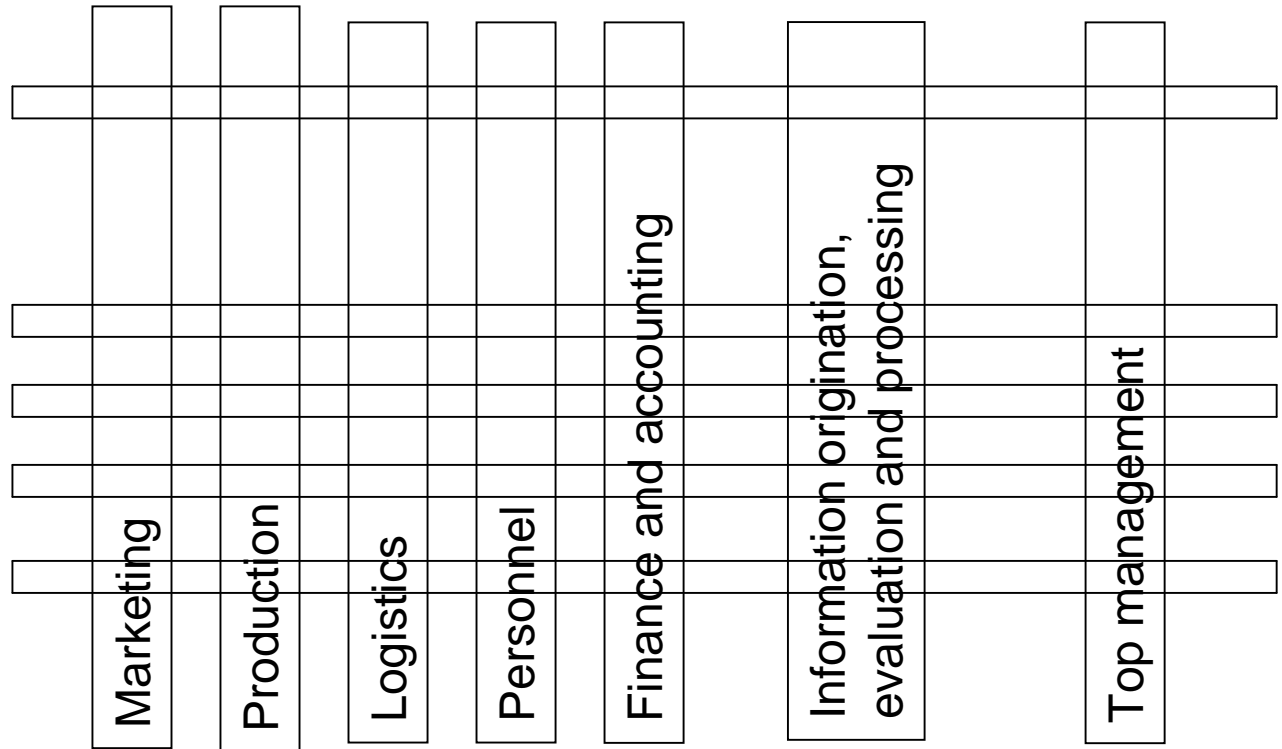
Dynamic Decision Making Processes
(6th level Information control – From Long term goal to Flexible Information Decision)

Strategic planning (5th & 4th level controls)

Management control (2nd & 3rd level controls)

Operation control (1st level control)

Transaction processing



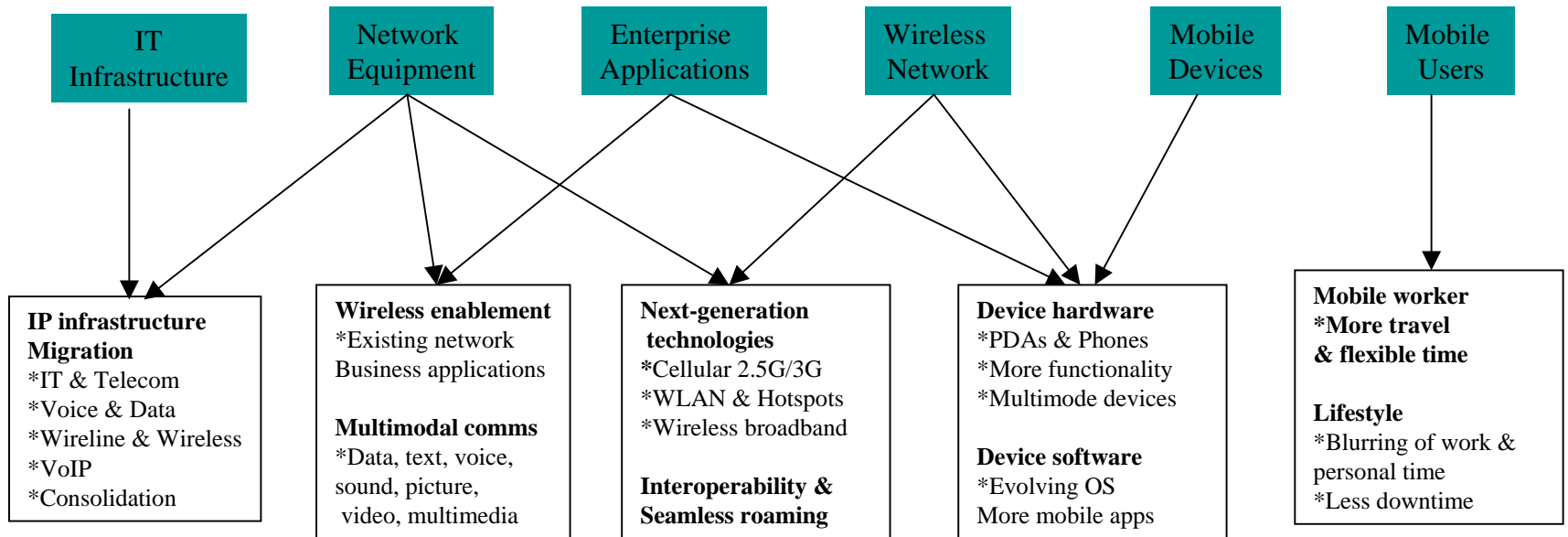
Activities Subsystems

- Note that activities subsystems correspond to the levels of the pyramid structure illustrated by way of typical uses that defines MIS.

MIS AS SEEN BY THE USER

- User
 - 1. Clerical personnel
 - 2. First-level Managers
 - 3. Staff specialists
 - 4. Management
- Uses
 - 1. Handle transactions, process input data and answer inquiries.
 - 2. Obtain operations data. Assistance with planning, scheduling, identifying out-of-control situations, and making decisions.
 - 3. Information for analysis. Assistance with analysis, planning, and reporting.
 - 4. Regular reports. Ad hoc analyses. Ad hoc reports. Assistance in identifying problems and opportunities. Assistance in decision- making analysis.

MIS AS SEEN BY THE USER



Security considerations
 Strategy formulation
 Requirement design
 Information Integrity (I*I) Control
 Cost benefit Analysis
Information Economics (of Information Evaluation)

Business Information Planning for Competitive Advantage

Growth of ICT

- Tools for recording on cave walls, cliffs, stone, wood,
- Paper, Invention of writing,
- Printing Technology, Typewriters,
- Telephone and Television,
- Computers,
- Fax and Recorders,
- Modem, e-mail, Computers on-line,

Growth of ICT

- LAN, WAN,
- World Wide Web,
- Digital communication, Bandwidth, Broadband
- High Speed Digital Networks
- Wi-Fi:
 - Better battery technologies, less power-hungry devices and improved use of radio frequency (RF) are making everything electric talk with everything else electric, using wireless communication.

Growth of ICT

- Ultimately, all long-distance traffic will be fiber and all short distance traffic will be RF.
- Internet telephony
- Wireless Web or Mobile Internet
- Impact of ICTs on information processing
 - Information explosion
 - Information Infrastructure
 - Information availability at any time, any place

What can ICT do?

- One is witnessing a second industrial revolution,
 - through ICT: the new information processing technology of communications and computers.
- "Convergence" of electronics, computing and telecommunications supported by moment by moment computer-aided optimization of processes and decision-making is now yielding enterprise-wide system integration opportunities.