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Information and Knowledge Management Systems

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Abstract: ***We discuss main formalisations of information and knowledge available in literature. Knowledge is considered as a meaning of data for an actor who can understand and use it. The actor can be a computer, a robot, a human being or even a virus. We make an assumption that the usage of knowledge depends on material data carrier only as much as the latter allows one to perform operations and restricts knowledge processing through capacity and time. This permits one to consider knowledge abstractly. Knowledge handling requires some tools that are called knowledge systems. These systems have different forms and they can be connected in various ways as it follows from the analysed publications. A metrics of knowledge is discussed that reflects the capability of solving problems.***

Keywords: Basic Information Concepts, Classification of Information Classification by Application, Quality of Information, Implications of Information in Business, Implications

1. Introduction

An **Information System** is a system that gathers data and disseminates information with the sole purpose of providing information to its users. The main object of an information system is to provide information to its users. Information systems vary according to the type of users who use the system. A **Management Information System** is an information system that evaluates, analyzes, and processes an organization's data to produce meaningful and useful information based on which the management can take right decisions to ensure future growth of the organization.

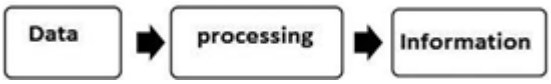
2. Basic Information Concepts

Information Definition
According to at affects the state of a dynamic system that can interpret the information. Conceptually, information is the message (utterance or expression) being conveyed. Therefore, in a general sense, information is "Knowledge communicated or received, concerning a particular fact or circumstance". Information cannot be predicted and resolves uncertainty."

Information vs Data
Data can be described as unprocessed facts and figures. Plain collected data as raw facts cannot help in decision-making. However, data is the raw material that is organized, structured, and interpreted to create useful information systems. Data is defined as 'groups of non-random symbols in the form of text, images, voice representing quantities, action and objects'.

Information is interpreted data; created from organized, structured, and processed data in a particular context.

According to ***Davis and Olson*** −
"Information is a data that has been processed into a form that is meaningful to recipient and is of real or perceived value in the current or the prospective action or decision of recipient."

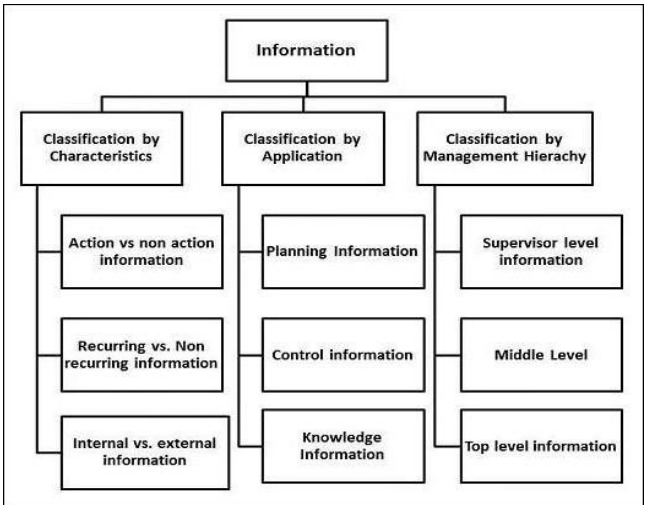


Information, Knowledge and Business Intelligence
- Data − the raw material of information.
- Information − Data organized and presented by someone.
- Knowledge − Information read, heard, or seen, and understood.
- Wisdom − Distilled and integrated knowledge and understanding.

Explains *Information Continuum* as follows –
- Data − A Fact or a piece of information, or a series thereof.
- Information − Knowledge discerned from data.
- Business Intelligence − Information Management pertaining to an organization's policy or decision-making, particularly when tied to strategic or operational objectives.

Information/ Data Collection Techniques
The most popular data collection techniques include −
- Surveys − A questionnaires is prepared to collect the data from the field.
- Secondary data sources or archival data: Data is collected through old records, magazines, company website etc.
- Objective measures or tests − An experimental test is conducted on the subject and the data is collected.
- Interviews − Data is collected by the system analyst by following a rigid procedure and collecting the answers to a set of pre-conceived questions through personal interviews.

Classification of Information
Information can be classified in a number of ways and in this chapter; you will learn two of the most important ways to classify information.



Classification by Characteristic

Based on Anthony's classification of Management, information used in business for decision-making is generally categorized into three types −

- **Strategic Information** − Strategic information is concerned with long term policy decisions that defines the objectives of a business and checks how well these objectives are met. For example, acquiring a new plant, a new product, diversification of business etc, comes under strategic information.
- **Tactical Information** − Tactical information is concerned with the information needed for exercising control over business resources, like budgeting, quality control, service level, inventory level, productivity level etc.
- **Operational Information** − Operational information is concerned with plant/business level information and is used to ensure proper conduction of specific operational tasks as planned/intended. Various operator specific, machine specific and shift specific jobs for quality control checks comes under this category.

Classification y Application

In terms of applications, information can be categorized as :

- **Planning Information** − These are the information needed for establishing standard norms and specifications in an organization. This information is used in strategic, tactical, and operation planning of any activity. Examples of such information are time standards, design standards.
- **Control Information** − This information is needed for establishing control over all business activities through feedback mechanism. This information is used for controlling attainment, nature and utilization of important processes in a system. When such information reflects a deviation from the established standards, the system should induce a decision or an action leading to control.
- **Knowledge Information** − Knowledge is defined as "information about information". Knowledge information is acquired through experience and learning, and collected from archival data and research studies.
- **Organizational Information** − Organizational information deals with an organization's environment, culture in the light of its objectives. Karl Weick's Organizational Information Theory emphasizes that an organization reduces its equivocality or uncertainty by collecting, managing and using these information prudently. This information is used by everybody in the organization; examples of such information are employee and payroll information.
- **Functional/Operational Information** − This is operation specific information. For example, daily schedules in a manufacturing plant that refers to the detailed assignment of jobs to machines or machines to operators. In a service oriented business, it would be the duty roster of various personnel. This information is mostly internal to the organization.
- **Database Information** − Database information construes large quantities of information that has multiple usage and application. Such information is stored, retrieved and managed to create databases. For example, material specification or supplier information is stored for multiple users.

Quality of information

Information is a vital resource for the success of any organization. Future of an organization lies in using and disseminating information wisely. Good quality information placed in right context in right time tells us about opportunities and problems well in advance.

Good quality information − Quality is a value that would vary according to the users and uses of the information.

According to Wang and Strong, following are the dimensions or elements of Information Quality:

- **Intrinsic** − Accuracy, Objectivity, Believability, Reputation
- **Contextual** − Relevancy, Value-Added, Timeliness, Completeness, Amount of information
- **Representational** − Interpretability, Format, Coherence, Compatibility
- **Accessibility** − Accessibility, Access security

Various authors propose various lists of metrics for assessing the quality of information. Let us generate a list of the most essential characteristic features for information quality:

- **Reliability** − It should be verifiable and dependable.
- **Timely** − It must be current and it must reach the users well in time, so that important decisions can be made in time.
- **Relevant** − It should be current and valid information and it should reduce uncertainties.
- **Accurate** − It should be free of errors and mistakes, true, and not deceptive.
- **Sufficient** − It should be adequate in quantity, so that decisions can be made on its basis.
- **Unambiguous** − It should be expressed in clear terms. In other words, in should be comprehensive.
- **Complete** − It should meet all the needs in the current context.
- **Unbiased** − It should be impartial, free from any bias. In other words, it should have integrity.
- **Explicit** − It should not need any further explanation.
- **Comparable** − It should be of uniform collection, analysis, content, and format.
- **Reproducible** − It could be used by documented methods on the same data set to achieve a consistent result.

Information Need & Objective

Information processing beyond doubt is the dominant industry of the present century. Following factors states few common factors that reflect on the needs and objectives of the information processing –

- Increasing impact of information processing for organizational decision making.
- Dependency of services sector including banking, financial organization, health care, entertainment, tourism and travel, education and numerous others on information.
- Changing employment scene world over, shifting base from manual agricultural to machine-based manufacturing and other industry related jobs.
- Information revolution and the overall development scenario.
- Growth of IT industry and its strategic importance.
- Strong growth of information services fuelled by increasing competition and reduced product life cycle.
- Need for sustainable development and quality life.
- Improvement in communication and transportation brought in by use of information processing.
- Use of information processing in reduction of energy consumption, reduction in pollution and a better ecological balance in future.
- Use of information processing in land record managements, legal delivery system, educational institutions, natural resource planning, customer relation management and so on.
- Information is needed to survive in the modern competitive world.
- Information is needed to create strong information systems and keep these systems up to date

Implications of information in business

Information processing has transformed our society in numerous ways. From a business perspective, there has been a huge shift towards increasingly automated business processes and communication. Access to information and capability of information processing has helped in achieving greater efficiency in accounting and other business processes.

A complete business information system, accomplishes the following functionalities:

- Collection and storage of data.
- Transform these data into business information useful for decision making.
- Provide controls to safeguard data.
- Automate and streamline reporting.

The following list summarizes the five main uses of information by businesses and other organizations:

- **Planning** − At the planning stage, information is the most important ingredient in decision making. Information at planning stage includes that of business resources, assets, liabilities, plants and machineries, properties, suppliers, customers, competitors, market and market dynamics, fiscal policy changes of the Government, emerging technologies, etc.
- **Recording** − Business processing these days involves recording information about each transaction or event. This information collected, stored and updated regularly at the operational level.
- **Controlling** − A business need to set up an information filter, so that only filtered data is presented to the middle and top management. This ensures efficiency at the operational level and effectiveness at the tactical and strategic level.
- **Measuring** − A business measures its performance metrics by collecting and analyzing sales data, cost of manufacturing, and profit earned.
- **Decision-making** − MIS is primarily concerned with managerial decision-making, theory of organizational behavior, and underlying human behavior in organizational context. Decision-making information includes the socio-economic impact of competition, globalization, democratization, and the effects of all these factors on an organizational structure.

In short, this multi-dimensional information evolves from the following logical foundations:

- Operations research and management science
- Theory of organizational behavior
- Computer science :
  - Data and file structure
  - Data theory design and implementation
  - Computer networking
  - Expert systems and artificial intelligence
- Information theory

Following factors arising as an outcome of information processing help speed up of business events and achieves greater efficiency:

- Directly and immediate linkage to the system
- Faster communication of an order
- Electronic transfer of funds for faster payment
- Electronically solicited pricing (helps in determining the best price)

Management information systems week need for information systems

Managers make decisions. Decision-making generally takes a four-fold path –

- Understanding the need for decision or the opportunity,
- Preparing alternative course of actions,
- Evaluating all alternative course of actions,
- Deciding the right path for implementation.

Management Information Systems

Is an information system that provides information in the form of standardized reports and displays for the managers. MIS is a broad class of information systems designed to provide information needed for effective decision making.

Data and information created from an accounting information system and the reports generated thereon are used to provide accurate, timely and relevant information needed for effective decision making by managers.

Management information systems provide information to support management decision making, with the following goals –

- Pre-specified and preplanned reporting to managers.
- Interactive and ad-hoc support for decision making.
- Critical information for top management.

Management Information Systems is of vital importance to any organization, because –

- It emphasizes on the management decision making, not only processing of data generated by business operations.
- It emphasizes on the systems framework that should be used for organizing information systems.

3. Knowledge Management

Introduction

Knowledge is a very important concept as it is the process by which data turns into useful information. The process of this transformation between data and valuable information depends on the creation of relationships between sets of data (Stair and Reynolds, 2006). In an information system, Knowledge can be described as: "an awareness and understanding of a set of information and the ways that information can be used to support a specific task or reach a decision. Knowledge management is the conversion of tacit knowledge into explicit knowledge and sharing it within the organization. Knowledge management is the process through which organizations generate value from their intellectual and knowledge-based assets. The knowledge required to increase sales for instance, may include understand who buys the product and what type of marketing those consumers respond to. The result perceived by this process is known as information.

What is knowledge?

- Personalized information
- State of knowing and understanding
- An object to be stored and manipulated
- A process of applying expertise
- A condition of access to information
- Potential to influence action

Sources of knowledge of an organization:

- Intranet
- Data warehouses and knowledge repositories
- Decision support tools
- Groupware for supporting collaboration
- Networks of knowledge workers
- Internal expertise

Definition

Definition of knowledge management system A knowledge management system comprises a range of practices used in an organization to identify, create, represent, distribute, and enable adoption to insight and experience. Such insights and experience comprise knowledge, either embodied in individual or embedded in organizational processes and practices.

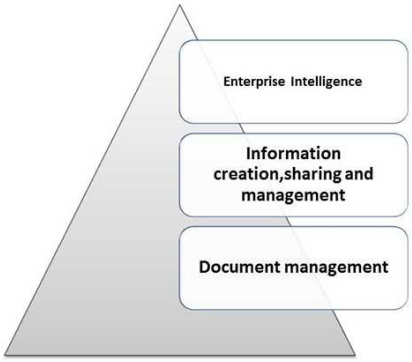
Purpose of knowledge management system improved performance

- Competitive advantage
- Innovation
- Sharing of knowledge
- Integration
- Continuous improvement by −
  - Driving strategy
  - Starting new lines of business
  - Solving problems faster
  - Developing professional skills
  - Recruit and retain talent

Activities in Knowledge Management

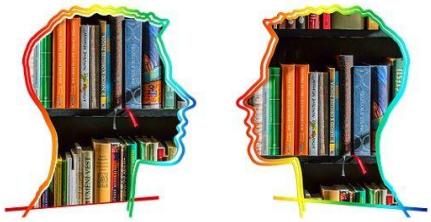
- Start with the business problem and the business value to be delivered first.
- Identify what kind of strategy to pursue to deliver this value and address the knowledge management problem.
- Think about the system required from a people and process point of view.
- Finally, think about what kind of technical infrastructure are required to support the people and processes.
- Implement system and processes with appropriate change management and iterative staged release.

Level of knowledge management



Supply Chain Management

Difference between information and knowledge



Information Vs Knowledge

1) Comparison Chart
2) Definition
3) Key Differences

Comparison Chart

Basis For Comparison	Information	Knowledge
Meaning	When the facts obtained are systematically presented in a given context it is known as information.	Knowledge refers to the relevant and objective information gained through experience.
What is it?	Refined data	Useful information
Combination of	Data and context	Information, experience and intuition
Processing	Improves representation	Increases consciousness
Outcome	Comprehension	Understanding
Transfer	Easily transferable	Requires learning
Reproducibility	Can be reproduced.	Identical reproduction is not possible.
Prediction	Information alone is not sufficient to make predictions	Prediction is possible if one possess required knowledge.

Definition of information

The term 'information' is described as the structured, organised and processed data, presented within context, which makes it relevant and useful to the person who wants it. Data means raw facts and figures concerning people, places, or any other thing, which is expressed in the form of numbers, letters or symbols.

Information is the data which is transformed and classified into an intelligible form, which can be used in the process of decision making. In short, when data turn out to be meaningful after conversion, it is known as information. It is something that informs, in essence, it gives an answer to a particular question.

The main characteristics of information are accuracy, relevance, completeness and availability. It can be communicated in the form of content of a message or through observation and can be obtained from various sources such as newspaper, television, internet, people, books, and so on.

Definition of knowledge

Knowledge means the familiarity and awareness of a person, place, events, ideas, issues, ways of doing things or anything else, which is gathered through learning, perceiving or discovering. It is the state of knowing something with cognizance through the understanding of concepts, study and experience.

In a nutshell, knowledge connotes the confident theoretical or practical understanding of an entity along with the capability of using it for a specific purpose. Combination of information, experience and intuition leads to knowledge which has the potential to draw inferences and develop insights, based on our experience and thus it can assist in decision making and taking actions.

Key differences between information and knowledge

The points given below are important, so far as the difference between information and knowledge is concerned:

1) Information denotes the organised data about someone or something obtained from various sources such as newspaper, internet, television, discussions, etc. Knowledge refers to the awareness or understanding on the subject acquired from education or experience of a person.
2) Information is nothing but the refined form of data, which is helpful to understand the meaning. On the other hand, knowledge is the relevant and objective information that helps in drawing conclusions.
3) Data compiled in the meaningful context provides information. Conversely, when information is combined with experience and intuition, it results in knowledge.
4) Processing improves the representation, thus ensures easy interpretation of the information. As against this, processing results in increased consciousness, thus enhances subject knowledge.
5) Information brings on comprehension of the facts and figures. Unlike, knowledge which leads to the understanding of the subject.
6) The transfer of information is easy through different means, i.e. verbal or non-verbal signals. Conversely, the transfer of knowledge is a bit difficult, because it requires learning on the part of the receiver.
7) Information can be reproduced in low cost. However, exactly similar reproduction of knowledge is not possible because it is based on experiential or individual values, perceptions, etc.
8) Information alone is not sufficient to make generalisation or predictions about someone or something. On the contrary, knowledge has the ability to predict or make inferences.
9) Every information is not necessarily knowledge, but all knowledge is information.

4. Conclusion

As we study IS, we find that the Information System and the effective use of information by all members of the organization are central issues for organizations. Advanced information technologies and intelligent systems-such as groupware and intelligent agents-must be successfully integrated with existing Information Systems. Investigation of business intelligence systems, knowledge management systems, and other methods of assisting the management decision maker can lead to Information Systems that drive the long-term success of an organization. Developing your knowledge of decision making, information processing, and advanced technology will allow you to play an important role in the effective application of advanced technologies in

your own company.

Knowledge management is a set of processes to create, store, transfer, and apply knowledge in the organization. Businesses need knowledge management programs because knowledge has become a central productive and strategic asset in today's information economy and a potential source of competitive advantage. Much of a firm's value depends on its ability to create and manage knowledge. Knowledge management promotes organizational learning by increasing the ability of the organization to learn from its environment and to incorporate knowledge into its business processes. Effective knowledge management systems require organizational and management capital to promote a knowledge culture and programs for knowledge management, including the creation of a chief knowledge officer. There are three major types of knowledge management systems: enterprise wide knowledge management systems, knowledge work systems, and intelligent techniques.

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