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This study aims to elucidate the interrelationship between Information Systems and Big Data. The study elucidates the definition of a computer-based subject, its classification, and its significance in the context of everyday life. Furthermore, the discussion addresses the potential applications of these technologies in a business context, with particular attention to considerations such as data security, real-time data processing, and business intelligence applications.

First Part: Concept of Information Systems

a) <u>Definition of Computer-Based Information Systems</u>

A computer-based information system (CBIS) is a single set of hardware, software, databases, telecommunications, people, and procedures that are configured to collect, manipulate, store, and process data into information. Although not all information systems are computerized, today most are. For this reason, the term "information system" is typically used synonymously with "computer-based information system." The basic components of computer-based information systems are listed below. The first four are called information technology components.

- **Hardware**: consists of devices such as the processor, monitor, keyboard, and printer. Together, these devices accept, process, and display data and information.
- **Software** is a program or collection of programs that enable the hardware to process data.
- **A database** is a collection of related files or tables containing data.
- **A network** is a connecting system (wireline or wireless) that permits different computers to share resources.

("Information systems are integral to business operations" (Rainer, Prince, & Cegielski, 2013, p. 15)).

b) <u>Types of Computer-Based Information Systems:</u>

1. Management Support System
    - Management Information System
    - Decision Support Systems
    - Executive Support System
2. Expert System
3. Transaction Processing Systems
4. Office Automation Systems
5. Accounting Information System

1. MANAGEMENT SUPPORT SYSTEM

- There are three generic kinds of management support systems:
    - Management information systems
    - Decision support systems
    - Executive support systems

a. MANAGEMENT INFORMATION SYSTEM

- Data processing by computers has been extremely effective because of several reasons.
- The main reason being that huge amount of data relating to accounts and other transactions can be processed very quickly.
- MIS are more concerned with management function.
- MIS can be described as an information system that can provide all levels of management with information essential to the running of smooth business.
- A management information system is an information system that generates accurate, timely, and organized information for decision-making.
- The information can be used by managers and other users to make decisions and solve problems.

- This information is used by related management information systems to produce reports of daily sales activities and prepare lists of customers with due account balances.

- **EXAMPLES:**
    - Sales management
    - Inventory control
    - Capital investment analysis

b. DECISION SUPPORT SYSTEM

- A decision support system helps users to analyze the information and make decisions.
- Decision support system may include data from internal sources (TPS, MIS) or external sources.
- Decision makers use Decision Support System to design decision models.
- A decision model is a numerical representation of a realistic situation such as the cash flow model of a business that shows how income adds to cash accounts and how expenses deplete accounts.
- Example : "What-if" analysis of changes in budget.

COMPONENTS OF DECISION SUPPORT SYSTEM

- Inputs
- User knowledge and expertise
- Outputs
- Decision
- **Example:** Analyzing the effects of events such as strikes, rising interest rates.

c. Executive Support System

- An executive information system (EIS), also known as an executive support system (ESS), is a type of management information system that facilitates and supports senior executive information and decision-making needs.
- It provides easy access to internal and external information relevant to organizational goals.
- These systems were mainframe computer-based programs.
- The purpose was to package a company's data and to provide sales performance or market research statistics for decision-makers, such as marketing directors, chief executive officers, who were not necessarily well acquainted with computers.

2. EXPERT SYSTEM

- An expert system is an information system that captures and stores the knowledge of human experts and then imitates human reasoning and decision making.
- Expert system consists of two main components:
    - **Knowledge Base:** It is a database that contains facts provided by a human expert and rules used by the expert system to make decisions.
    - **Inference Engine:** It is a software program that applies the rules to data stored in the knowledge base to reach decisions.
    - **Example:** Status of sales by product

3. TRANSACTION PROCESSING SYSTEM (TPS)

- A transaction is an exchange between two parties that is recorded and stored in a computer system.
- A transaction processing system is an information system that provides a way to collect, process, store, display, modify, or cancel transactions.
- Data collected by TPS is stored in a database.

Example:

- The process of buying and selling a product.
- The process of withdrawing cash from an ATM.

4. OFFICE AUTOMATION SYSTEM (OAS)

- Office Automation Systems are among the newest and most rapidly expanding computer-based information systems.

- They are being developed with the hope and expectation that they will increase the efficiency and productivity of office workers, typists, secretaries, administrative assistants, staff professionals, managers, and others.
- Examples: Introducing new products, starting a company-wide cost control program, Microsoft® Office.

5. ACCOUNTING INFORMATION SYSTEMS (AIS)

- The collection, storage, and processing of financial and accounting data that is used by decision-makers.
- An accounting information system is generally a computer-based method for tracking accounting activity in conjunction with information technology resources.
- The resulting statistical reports can be used internally by management or externally by other interested parties, including investors, creditors, and tax authorities.

c) <u>Importance of Information Systems on Daily Life and Business</u>

1. IT Affects Our Daily of Life

- IT has significant implications for our quality of life. The workplace can be expanded from the traditional 9-to-5 job at a central location to 24 hours a day at any location. IT can provide employees with flexibility that can significantly improve the quality of leisure time, even if it doesn't increase the total amount of leisure time. From the opposite perspective, however, IT also can place employees on "constant call," which means they are never truly away from the office, even when they are on vacation. In fact, surveys reveal that the majority of respondents take their laptops and smartphones on their vacations, and 100 percent took their cell phones. Going further, the majority of respondents did some work while vacationing, and almost all of them checked their e-mail regularly.

("Information systems are integral to business operations" (Rainer, Prince, & Cegielski, 2013, p. 23)).

2. IT Affects Our Business

Role of Information Systems in Business

1. Support of business processes and operations.
2. Support of decision making by employees and managers.
3. Support of strategies for competitive advantage.

1. **Support for Business Processes and Operations**

Information systems are fundamental to the seamless execution of daily business operations. They automate and manage a wide array of business processes, including but not limited to inventory management, customer relations, and payroll. By simplifying and streamlining these activities, IS significantly reduce operational costs and enhance both efficiency and productivity across the board. The automation of routine tasks frees up human resources, allowing them to focus on more strategic activities that add value to the business.

2. **Support for Business Decision Making**

In today's data-driven landscape, the ability to make well-informed decisions swiftly is crucial for business success. Information systems provide a robust framework for the collection, processing, and analysis of data, converting raw data into actionable insights. These insights empower managers and business leaders to make informed decisions, accurately forecast future trends, and devise effective strategies. The analytical capabilities of IS, therefore, are invaluable in navigating the complexities of the market and maintaining a competitive edge.

3. Support for Strategic Competitive Advantages

The competitive advantage of a business often hinges on its agility, responsiveness, and innovation. Information systems are key enablers in this regard, offering tools to identify new market opportunities, enhance customer service, and foster the creation of innovative products or services. Moreover, IS facilitates the optimization of supply chains, ensuring that businesses can respond swiftly to changes in market dynamics. Through the strategic use of IS, businesses can position themselves ahead of competitors, adapting quickly to new challenges and seizing opportunities as they arise.

In essence, information systems are indispensable assets for businesses, integral to optimizing operations, guiding decision-making, and securing a competitive stance in the marketplace. Their role in enhancing operational efficiency, providing data-driven insights, and enabling strategic initiatives underscores the vital contribution of IS to business success in the digital age.

- Customer satisfaction: The result of optimizing and aligning business processes to fulfill customers' needs, wants, and desires
- Cost reduction: The result of optimizing operations and supplier processes
- Cycle and fulfillment time reduction: The result of optimizing the manufacturing and logistics processes.
- Quality: The result of optimizing the design, development, and production processes.
- Differentiation: The result of optimizing the marketing and innovation processes.
- Productivity: The result of optimizing each individual's work processes.

Second part: Big Data

a) Definition of Big Data

We are accumulating data and information at an increasingly rapid pace from such diverse sources as company documents, e-mails, Web pages, credit card swipes, phone messages, stock trades, memos, address books, and radiology scans. New sources of data and information include blogs, podcasts, videocasts (think of YouTube), digital video surveillance, and RFID tags and other wireless sensors In fact, organizations are capturing data about almost all events—including events that, in the past, fi rms never used to think of as data at all, such as a person's location, the vibrations and temperature of an engine, or the stress at numerous points on a bridge—and then analyzing those data.

Organizations and individuals must process an unimaginably vast amount of data that is growing ever more rapidly. According to IDC (a technology research fi rm), the world gener ates exabytes of data each year (an exabyte is one trillion terabytes). Furthermore, the amount of data produced worldwide is increasing by 50 percent each year. We refer to the superabundance of data available today as Big Data. (We capitalize Big Data to distinguish the term from large amounts of traditional data.) We are awash in data that we have to make sense of and manage. To deal with the growth and the diverse nature of digital data, organizations must employ sophisticated techniques for data management.

b. Characteristics of Big Data

Big Data has three distinct characteristics: volume, velocity, and variety. These characteristics distinguish Big Data from traditional data. However, two additional Vs have emerged over the past few years: value and veracity.

5 V's of Big Data

- **Volume**
- **Velocity**
- **Variety**
- **Veracity**
- **Value**

1. **Volume**: We have noted the incredible volume of Big Data in this chapter. Although the sheer volume of Big Data presents data management problems, this volume also makes Big Data incredibly valuable. Irrespective of their source, structure, format, and frequency, data are always valuable. If certain types of data appear to have no value today, it is because we have not yet been able to analyze them effectively.
   For example, several years ago when Google began harnessing satellite imagery, capturing street views, and then sharing these geographical data for free, few people understood its value. Today, we recognize that such data is incredibly useful (e.g., consider the myriad of uses for Google Maps). Consider machine-generated data, which are generated in much larger quantities than nontraditional data. For instance, sensors in a single jet engine can generate 10 terabytes of data in 30 minutes. With more than 25,000 airline flights per day, the daily volume of data from just this single source is incredible. Smart electrical meters, sensors in heavy industrial equipment, and telemetry from automobiles increase the volume of Big Data.

2. **Velocity**: The rate at which data fl ow into an organization is rapidly increasing. Velocity is critical because it increases the speed of the feedback loop between a company and its Data and Knowledge Management customers.
   For example, the Internet and mobile technology enable online retailers to compile histories not only on final sales, but on their customers' every click and interaction. Companies that can quickly utilize that information, for example, by recommending additional purchases—gain competitive advantage.

3. **Variety**: Traditional data formats tend to be structured, relatively well described, and they change slowly. Traditional data include financial market data, point-of-sale transactions, and much more. In contrast, Big Data formats change rapidly. They include satellite imagery, broadcast audio streams, digital music fi les, Web page content, scans of government documents, and comments posted on social networks

("Information systems are integral to business operations" (Rainer, Prince, & Cegielski, 2013, p. 142)).

4. **Veracity**: is the extent to which data can be considered truthful and the degree to which it can be relied upon. The concept of veracity in data is closely related to other functional concepts, such as data quality and data integrity. Ultimately, these concepts are interrelated and collectively contribute to the development of a data repository that provides high-quality, accurate, and reliable data to inform insights and decisions.

5. **Value**: The concept of value is of paramount importance in business. In business, data possesses an inherent value. However, it is of no use until such value is identified. The aggregation of vast quantities of data enables the discovery of insights that can benefit an organization. Such value may be internal, manifesting as optimized operational processes, or external, as customer profile suggestions designed to enhance engagement.

c. What is Big Data Analytics?

Big data analytics describe the process of uncovering trends, patterns, and correlations in large amounts of raw data to help make data-informed decisions. These processes use familiar statistical analysis techniques—like clustering and regression—and apply them to more extensive datasets with the help of newer tools. Big data has been a buzz word since the early 2000s, when software and hardware capabilities made it possible for organizations to handle large amounts of unstructured data. Since then, new technologies—from Amazon to smartphones—have contributed even more to the substantial amounts of data available to organizations. With the explosion of data, early innovation projects like Hadoop, Spark, and NoSQL databases were created for the storage and processing of big data. This field continues to evolve as data engineers look for ways to integrate the vast amounts of complex information created by sensors, networks, transactions, smart devices, web usage, and more. Even now, big data analytics methods are being used with emerging technologies, like machine learning, to discover and scale more complex insights.

d. What are Big Data Analytics Methods?

- Diagnostic analytics
- Descriptive analytics
- Prescriptive analytics
- Predictive analytics

1. **Diagnostic analytics:**
   represents one of the more advanced forms of big data analytics, offering a means of investigating data and content. Through this approach, insights gained can be employed to address the question of causal factors. By analyzing data, one can gain a deeper comprehension of the reasons underlying specific behaviors and events within an organizational context, encompassing the company itself, its customers, employees, products, and other pertinent factors.

   Diagnostic analytics benefits, the advantages of diagnostic analytics include a more comprehensive understanding of the data and a variety of methods for identifying solutions to organizational queries. This type of analytics enables businesses to gain insight into their customers by utilizing tools for searching, filtering, and comparing the data produced by individuals.

2. **Descriptive analytics:**
   Descriptive analytics represents one of the most prevalent forms of analytics employed by companies to remain apprised of prevailing trends and the operational performance of their organizations. It represents one of the initial stages of data analysis, entailing the execution of elementary mathematical operations and the generation of statements pertaining to samples and measurements. Once trends and insights have been identified through descriptive analytics, other forms of analytics can be employed to ascertain the underlying causes of these trends.

   Descriptive analytics benefits, Descriptive analytics offers a plethora of benefits. One of the most significant advantages of descriptive analytics is its capacity to assist organizations in interpreting the vast quantities of raw data they amass,

enabling them to prioritize the most pertinent areas. The advent of descriptive analytics has had a profound impact on the way in which companies conduct their business. In the contemporary era, this type of analytics was employed to enhance comprehension of the present business context in comparison to the past. It represents a pivotal stage in the process of data analytics, and without it, it would be impossible to anticipate any future trends or make data-driven decisions.

3. **Prescriptive analytics:**
   Prescriptive analytics employs the findings of descriptive and predictive analysis to identify optimal solutions for enhancing business practices through the utilization of diverse simulation techniques. It employs the insights derived from data to propose the optimal subsequent course of action for the company.

   Google is one of numerous companies that employ this type of analytics. The company employed this approach in the design of its autonomous vehicles. The cars in question analyze data in real time and make decisions based on prescriptive analytics.

   Prescriptive analytics benefits, the utilization of prescriptive analytics can facilitate enhancements to a multitude of organizational processes, including those pertaining to campaigns, strategies, production, and customer service. By employing statistical and modelling techniques, this form of analytics enables manufacturers to gain deeper insights into market dynamics and anticipate future market trends. Furthermore, it enables manufacturers to establish a clear hierarchy of priorities and identify strategies that can lead to increased financial gains.

4. **Predictive analytics:**
   This form of data analytics is predicated on the ability to make predictions about future outcomes based on insights derived from data. In order to achieve optimal results, the methodology employs a multitude of sophisticated predictive tools and models, including machine learning and statistical modelling.
   Predictive analytics is currently one of the most prevalent forms of analytics in use. It is projected that the market size and shares will reach $10.95 billion by 2022, representing a 21% growth rate over the preceding six-year period.

   Predictive analytics benefits, The principal advantage of predictive analytics is the generation of dependable and more precise projections regarding future outcomes. By employing predictive analytics, organizations can identify opportunities to reduce costs and enhance profitability, optimize logistics operations, and ensure the availability of requisite inventory.

e. How and Where Big Data Analytics Used?

- The application of big data analytics is not limited to a single industry. Rather, it can be employed in a variety of contexts, including customer relationship management (CRM) and fraud detection.
- The application of big data analytics can assist businesses in a number of ways, including the analysis of customer behavior, the improvement of operational efficiency, and the detection of fraud.
- Moreover, big data analytics can equip companies with pertinent search capabilities and machine learning algorithms, thereby facilitating the formulation of well-informed decisions.
- In all sectors, big data analytics can be beneficial to businesses by enabling the identification of use cases that are specific to each industry and the utilization of the most appropriate analytical tools. Consequently, organizations can maintain a competitive advantage and make decisions that facilitate success.
- Another significant domain within the field of big data analytics is machine learning. Machine learning algorithms are trained on extensive datasets with the objective of identifying patterns and making predictions. The recognition of text

and images represents one of the most fascinating applications of machine learning. By analyzing log data and browsing behavior, companies can identify relevant content and personalize customer experiences.

Result:

There is a robust relationship between big data and Information Systems. The term 'Big data' is used to describe data sets that are large, diverse in nature and subject to rapid change. Information systems, on the other hand, are defined as systems through which this data is collected, stored, processed and analyzed. The fields of big data and information systems exhibit a complementarity that is mutually beneficial. Big data refers to large and intricate data structures, whereas information systems are designed to process this data in an efficient manner, providing tools and infrastructure that facilitate its meaningful interpretation.

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