

Module 1

Information Technology (IT)

Information Technology (IT) refers to any computer-based tool that people use to work with information and to support the information and information-processing needs of an organization.

Information technology (IT) consists of all the hardware and software that a firm needs to use in order to achieve its business objectives. This includes:

- Computer machines
- storage devices
- handheld mobile devices
- the Windows or Linux operating systems,
- the Microsoft Office desktop productivity suite, and
- the many thousands of computer programs that can be found in a typical large firm.

Information System (IS)

An **information system** can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products.

Information system consists of Information technology, management and organizations. These are the three important parts that contribute to information system as technology helps us to use new tools to build the system, management defines what are the rules and protocols and pedagogies that we need to follow and organization is for what we are developing that information system. So technology and management combined together will build an information system for organizations.

An **Information System (IS)** collects, processes, stores, analyzes, and disseminates information as per the technology used and applying the rules of management for a specific purpose ie. organization.

Computer Based Information Systems

Computer-based information system (CBIS) is an information system that uses computer technology to perform some or all of its intended tasks. The term “information system” is typically used synonymously with “computer-based information system.” The basic components of computer-based information systems are listed below. Figure illustrates how the various components interact to form a CBIS.

- **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.
- **Procedures** are the instructions for combining the above components to process information and generate the desired output.
- *People* are those individuals who use the hardware and software, interface with it, or utilize its output.

Types of Computer-Based Information Systems

- **Transaction Processing Systems (TPS):**
 - (TPS) is used primarily for record keeping which is required in any organization to conduct the business.
 - It supports the monitoring, collection, storage, and processing of data from the organization’s basic business transactions, each of which generates data.
 - Examples of TPS are sales order entry, payroll, and shipping records etc. TPS is used for periodic report generation in a scheduled manner. TPS is also used for producing reports on demand as well as exception reports.
 - The TPS collects data continuously, typically in *real time*—that is, as soon as the data are generated—and it provides the input data for the corporate databases.

- TPSs are considered critical to the success of any enterprise because they support core operations.
- Significantly, nearly all ERP systems are also TPSs, but not all TPSs are ERP systems. In fact, modern ERP systems incorporate many functions that previously were handled by the organization's functional area information systems.
- **Decision Support System (DSS):**
 - (DSS) serves the management of an organization.
 - A decision support system has sophisticated data analysis tools, which support and assist all aspects of problem-specific decision-making.
 - DSS may use data from external sources such as current stock prices to enhance decision-making.
 - DSS is used when the problem is complex, and the information needed to make the best decision is difficult to obtain and use.
 - DSS is developed with the help of decision-makers in an organization.
 - DSS helps in the appropriate decision-making process and does not make any decision.
- **Executive Information System (EIS):**
 - Senior managers of an organization use the EIS. Therefore, it must be easy to use so that executives can use it without any assistance.
 - EIS can do trend analysis, exception reporting and have drill-down capabilities.
 - The results are usually presented in a graphical form tailored to the executive's information needs.
 - EIS has on-line analysis tools and they access a broad range of internal and external data.
- **Management Information Systems (MIS):**
 - (MIS) provides the management routine summary of basic operations of the organization.
 - The essential services are recorded by the TPS of the organization and MIS consolidates the data on sales, production etc.

- MIS provides routine information to managers and decision makers.
- The primary objective behind installing an MIS in the organization is to increase operational efficiency. MIS may support marketing, production, finance, etc.
- **Workflow System:**
 - A workflow system is a rule-based management system that directs, coordinates and monitors the execution of an interrelated set of tasks arranged to form a business process.
- **Enterprise Resource Planning (ERP):**
 - (ERP) system is business process management software that allows an organization to use a system of integrated programs capable of managing a company's vital business operations for an entire multi-site, global organization.
 - ERP systems are designed to correct a lack of communication among the functional area ISs.
- **Expert Systems:**
 - The expert systems can make suggestions and act like an expert in a field of an organization.
 - An expert system has an extensive knowledge base. Expert Systems attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain.
 - They have become valuable in many application areas, primarily but not exclusively areas involving decision making.
 - For example, navigation systems use rules to select routes, but we do not typically think of these systems as expert systems.
 - Significantly, expert systems can operate as standalone systems or be embedded in other applications.

Impact of IT on organizations

1. IT Reduces the Number of Middle Managers

- IT makes managers more productive, and it increases the number of employees who can report to a single manager. Thus, IT ultimately decreases the number of managers and experts.
- So we can say conclude that in coming years organizations will have fewer managerial levels and fewer staff and line managers.
- If this trend materializes, promotional opportunities will decrease, making promotions much more competitive.

2. IT Changes the Manager's Job

- One of the most important tasks of managers is making decisions.
- A major consequence of IT has been to change the manner in which managers make their decisions. In this way, IT ultimately has changed managers' jobs.
- IT often provides managers with near-real-time information, meaning that managers have less time to make decisions, making their jobs even more stressful.
- Due to advances in IT, you will increasingly supervise employees and teams who are geographically dispersed. Employees can work from anywhere at any time, and teams can consist of employees who are literally dispersed throughout the world. (Lockdown)
- Information technologies such as telepresence systems can help you manage these employees even though you do not often see them face-to-face. For these employees, electronic or "remote" supervision will become the norm. Remote supervision places greater emphasis on completed work and less emphasis on personal contacts and office politics.
- You will have to reassure your employees that they are valued members of the organization, thereby diminishing any feelings they might have of being isolated and "out of the loop."

3. Will IT Eliminate Jobs?

- One major concern of every employee, part-time or full-time, is job security.

- Relentless cost cutting measures in modern organizations often lead to large-scale layoffs. Organizations are responding to today's highly competitive environment by doing more with less. (Lockdown financial crisis)
- Regardless of your position, then, you consistently will have to add value to your organization and to make certain that your superiors are aware of this value.
- Many companies have responded to difficult economic times, increased global competition, demands for customization, and increased consumer sophistication by increasing their investments in IT. In fact, as computers continue to advance in terms of intelligence and capabilities, the competitive advantage of replacing people with machines is increasing rapidly. This process frequently leads to layoffs.
- At the same time, however, IT creates entirely new categories of jobs, such as electronic medical record keeping and nanotechnology.

4. IT Impacts Employees at Work

- Many people have experienced a loss of identity because of computerization. They feel like "just another number" because computers reduce or eliminate the human element present in non-computerized systems.
- The Internet threatens to exert an even more isolating influence than have computers and television. Encouraging people to work and shop from their living rooms could produce some unfortunate psychological effects, such as depression and loneliness. (since interaction with people is reduced)

IT Impacts Employees' Health and Safety

Although computers and information systems are generally regarded as agents of "progress," they can adversely affect individuals' health and safety. Two issues associated with IT are:

- Job stress –
 - An increase in an employee's workload and/or responsibilities can trigger *job stress*.
 - Although computerization has benefited organizations by increasing productivity, it also has created an ever-expanding workload for some employees. Some workers feel overwhelmed and have become increasingly anxious about their job

performance. (Some people are under constant pressure performing better than peers).

- These feelings of stress and anxiety can actually diminish rather than improve workers' productivity while jeopardizing their physical and mental health. Management can help alleviate these problems by providing training, redistributing the workload among workers, and hiring more workers.
- Long-term use of the keyboard -
 - The long-term use of keyboards can lead to *repetitive strain injuries* such as backaches and muscle tension in the wrists and fingers.
 - *Carpal tunnel syndrome* is a particularly painful form of repetitive strain injury that affects the wrists and hands.
 - Designers are aware of the potential problems associated with the prolonged use of computers. To address these problems, they continually attempt to design a better computing environment.
 - The science of designing machines and work settings that minimize injury and illness is called **ergonomics**. The goal of ergonomics is to create an environment that is safe, well lit, and comfortable.
 - Examples of ergonomically designed products are antiglare screens that alleviate problems of fatigued or damaged eyesight and chairs that contour the human body to decrease backaches.

IT Provides Opportunities for People with Disabilities

- Computers can create new employment opportunities for people with disabilities by integrating speech-recognition and vision-recognition capabilities.
 - For example, individuals who cannot type can use a voice-operated keyboard, and individuals who cannot travel can work from home.
- Adaptive equipment for computers enables people with disabilities to perform tasks they normally would not be able to do.
 - For example, the Web and graphical user interfaces (GUIs; e.g., Windows) can be difficult for people with impaired vision to use. To address this problem,

manufacturers have added audible screen tips and voice interfaces, which essentially restore the functionality of computers to the way it was before GUIs become standard.

- Other devices help improve the quality of life in more mundane, but useful, ways for people with disabilities.
 - Examples are a two-way writing telephone, a robotic page turner, a hair brusher, and a hospital-bedside video trip to the zoo or the museum. Several organizations specialize in IT designed for people with disabilities

Importance of IS to Society

- **IT Affects Our Quality 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.
- 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.
- The majority of respondents did some work while vacationing, and almost all of them checked their e-mail regularly.
- It probably will be a long time before we see robots making decisions by themselves, handling unfamiliar situations, and interacting with people.
- Nevertheless, robots are extremely helpful in various environments, particularly those that are repetitive, harsh, or dangerous to humans.

- **Improvements in Healthcare**

- IT has brought about major improvements in healthcare delivery.

- Medical personnel use IT to make better and faster diagnoses and to monitor critically ill patients more accurately.
- IT also has streamlined the process of researching and developing new drugs.
- Expert systems now help doctors diagnose diseases, and machine vision is enhancing the work of radiologists. Surgeons use virtual reality to plan complex surgeries. They also employ surgical robots to perform long-distance surgery. Finally, doctors discuss complex medical cases via videoconferencing.
- New computer simulations recreate the sense of touch, allowing doctors-in-training to perform virtual procedures without risking harm to an actual patient.
- Not all uses of information technology to improve health are expensive and sophisticated.
- Among the thousands of other healthcare applications, administrative systems are critically important. These systems perform functions ranging from detecting insurance fraud, to creating nursing schedules, to financial and marketing management.
- The Internet contains vast amounts of useful medical information and can help develop systems which can diagnose a disease based on the symptoms. However, the research team cautions against self-diagnosis. They maintain that people should use diagnostic information gained from Google and medical Web sites such as WebMD (www.webmd.com) only to ask questions of their physicians.

Competitive Advantages and IS

A *competitive strategy* is a statement that identifies a business's approach to compete, its goals, and the plans and policies that will be required to carry out those goals. A strategy, in general, can apply to a desired outcome, such as gaining market share.

A competitive strategy focuses on achieving a desired outcome when competitors want to prevent you from reaching your goal. Therefore, when you create a competitive strategy, you must plan your own moves, but you must also anticipate and counter your competitors' moves.

Through its competitive strategy, an organization seeks a competitive advantage in an industry. That is, it seeks to outperform its competitors in a critical measure such as cost, quality, and time-to-market. Competitive advantage helps a company function profitably with a market and generate larger-than-average profits.

Competitive advantage is increasingly important in today's business environment. In general, the *core business* of companies has remained the same. That is, information technologies simply offer tools that can enhance an organization's success through its traditional sources of competitive advantage, such as low cost, excellent customer service, and superior supply chain management.

Strategic information systems (SISs) provide a competitive advantage by helping an organization implement its strategic goals and improve its performance and productivity. Any information system that helps an organization either achieve a competitive advantage or reduce a competitive disadvantage, qualifies as a strategic information system.

Porter's Competitive Forces Model

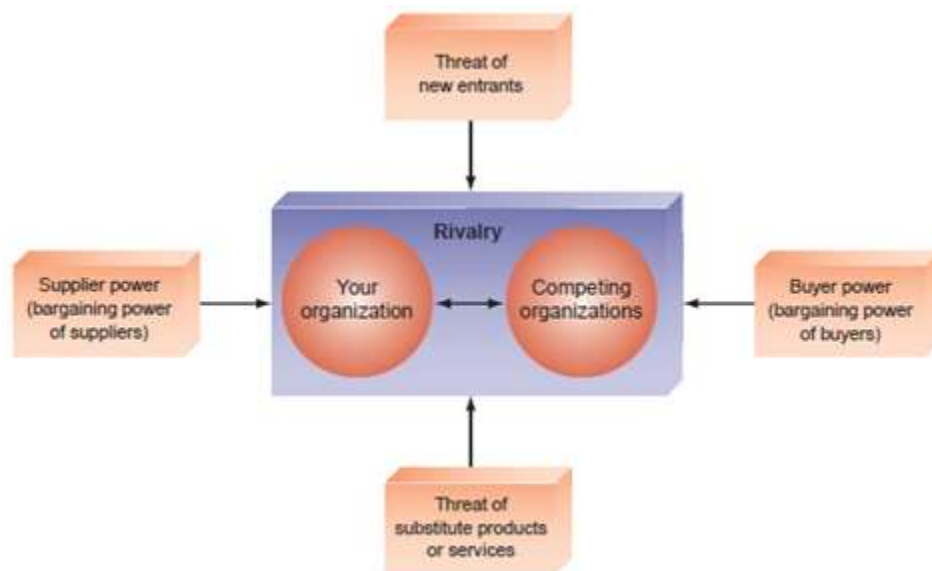


Figure 4: Porter's Competitive Forces model

- The best-known framework for analyzing competitiveness is Michael Porter's **competitive forces model** (Porter, 1985). Companies use Porter's model to develop strategies to increase their competitive edge.
- Porter's model demonstrates how IT can make a company more competitive.

- Porter's model identifies five major forces that can endanger or enhance a company's position in a given industry. Figure 4 highlights these forces.
- Every competitive organization, no matter how large or small, or what business it is in, is driven by these forces.
- Porter (2001) concludes that the *overall* impact of the Web is to increase competition, which generally diminishes a firm's profitability.

Porter's five forces and the ways that the Web influences them are as follows:

1. ***The threat of entry of new competitors***

- The threat that new competitors will enter your market is high when entry is easy and low when there are significant barriers to entry.
- An **entry barrier** is a product or service feature that customers have learned to expect from organizations in a certain industry. A competing organization must offer this feature in order to survive in the marketplace.
- There are many types of entry barriers. Consider, for example, legal requirements such as admission to the bar to practice law or a license to serve liquor, where only a certain number of licenses are available.
- Suppose you want to open a gasoline station. In order to compete in that industry, you would have to offer pay-at-the-pump service to your customers. Pay-at-the-pump is an IT based barrier to entering this market because you must offer it for free. The first gas station that offered this service gained first-move advantage and established barriers to entry. This advantage did not last, however, because competitors quickly offered the same service and thus overcame the entry barrier.
- For most firms, the Web *increases* the threat that new competitors will enter the market because it sharply reduces traditional barriers to entry, such as the need for a sales force or a physical storefront. Today, competitors frequently need only to set up a Web site.
- This threat of increased competition is particularly acute in industries that perform an *intermediation role*, which is a link between buyers and sellers (e.g., stock brokers and travel

agents), as well as in industries where the primary product or service is digital (e.g., the music industry).

- In addition, the geographical reach of the Web enables distant competitors to compete more directly with an existing firm. In some cases the Web increases barriers to entry. This scenario occurs primarily when customers have come to expect a nontrivial capability from their suppliers. For example, the first company to offer Web-based package tracking gained a competitive advantage from that service. Competitors were forced to follow.

2. *The bargaining power of suppliers.*

- Supplier power is high when buyers have few choices from whom to buy and low when buyers have many choices. Therefore, organizations would rather have more potential suppliers so they will be in a stronger position to negotiate price, quality, and delivery terms.
- The Internet's impact on suppliers is mixed. On the one hand, it enables buyers to find alternative suppliers and to compare prices more easily, thereby reducing the supplier's bargaining power. On the other hand, as companies use the Internet to integrate their supply chains, participating suppliers prosper by locking in customers.

3. *The bargaining power of customers (buyers).*

- Buyer power is high when buyers have many choices from whom to buy and low when buyers have few choices.
- For example, in the past, there were few locations where students could purchase textbooks (typically, one or two campus bookstores). In this situation, students had low buyer power. Today, the Web provides students with access to a multitude of potential suppliers as well as detailed information about textbooks. As a result, student buyer power has increased dramatically.
- In contrast, *loyalty programs* reduce buyer power. As their name suggests, loyalty programs reward customers based on the amount of business they conduct with a particular organization (e.g., airlines, hotels, and rental car companies). Information technology enables companies to track the activities and accounts of millions of

customers, thereby reducing buyer power. That is, customers who receive “perks” from loyalty programs are less likely to do business with competitors.

4. *The threat of substitute products or services.*

- If there are many alternatives to an organization’s products or services, then the threat of substitutes is high. If there are few alternatives, then the threat is low. Today, new technologies create substitute products very rapidly.
- For example, customers today can purchase wireless telephones instead of land-line telephones, Internet music services instead of traditional CDs, and ethanol instead of gasoline in cars.
- Information-based industries experience the greatest threat from substitutes. Any industry in which digitized information can replace material goods (e.g., music, books, and software) must view the Internet as a threat because the Internet can convey this information efficiently and at low cost and high quality.
- Even when there are many substitutes for their products, however, companies can create a competitive advantage by increasing switching costs. *Switching costs* are the costs, in money and time, imposed by a decision to buy elsewhere. For example, contracts with smartphone providers typically include a substantial penalty for switching to another provider until the term of the contract expires (quite often, two years). This switching cost is monetary. As another example, when you buy products from Amazon, the company develops a profile of your shopping habits and recommends products targeted to your preferences. If you switch to another online vendor, that company will need time to develop a profile of your wants and needs. In this case, the switching cost involves time rather than money.

5. *The rivalry among existing firms in the industry.*

- The threat from rivalry is high when there is intense competition among many firms in an industry. The threat is low when the competition is among fewer firms and is not as intense.

- In the past, proprietary information systems—systems that belong exclusively to a single organization—have provided strategic advantage to firms in highly competitive industries.
- Today, however, the visibility of Internet applications on the Web makes proprietary systems more difficult to keep secret. In simple terms, when I see my competitor's new system online, I will rapidly match its features to remain competitive. The result is fewer differences among competitors, which leads to more intense competition in an industry.
- To understand this concept, consider the highly competitive grocery industry, where Walmart, Kroger, Safeway, and other companies compete essentially on price. Some of these companies have IT-enabled loyalty programs in which customers receive discounts and the store gains valuable business intelligence on customers' buying preferences. Stores use this business intelligence in their marketing and promotional campaigns.
- Grocery stores are also experimenting with wireless technologies such as *radio-frequency identification* to speed up the checkout process, track customers through the store, and notify customers of discounts as they pass by certain products.
- Grocery companies also use IT to tightly integrate their supply chains for maximum efficiency and thus reduce prices for shoppers.
- Competition also is being affected by the extremely low variable cost of digital products. That is, once a digital product has been developed, the cost of producing additional "units" approaches zero. Consider the music industry as an example. When artists record music, their songs are captured in digital format. Physical products, such as CDs or DVDs of the songs for sale in music stores, involve costs. The costs of a physical distribution channel are much higher than those involved in delivering the songs digitally over the Internet.
- In fact, in the future companies might give away some products for free. For example, some analysts predict that commissions for online stock trading will approach zero because investors can search the Internet for information to make their own decisions regarding buying and selling stocks. At that point, consumers will no longer need brokers to give them information that they can obtain themselves, virtually for free.

Strategies for Competitive Advantage

- Organizations continually try to develop strategies to counter the five competitive forces identified by Porter.
- An organization's choice of strategy involves trade-offs. For example, a firm that concentrates only on cost leadership might not have the resources available for research and development, leaving the firm unable to innovate. As another example, a company that invests in customer happiness (customer-orientation strategy) will experience increased costs.
- Companies must select a strategy and then stay with it, because a confused strategy cannot succeed. This selection, in turn, decides how a company will utilize its information systems.
- A new information system that can improve customer service but will increase costs slightly will be welcomed at a high-end retailer such as Nordstrom's, but not at a discount store like Walmart.
- The following list presents the most commonly used strategies (Figure 5 provides an overview of these strategies).



Figure 5: Strategies for Competitive Advantage

1. *Cost leadership strategy.*

- Produce products and/or services at the lowest cost in the industry. An example is Walmart's automatic inventory replenishment system, which enables Walmart to reduce inventory storage requirements. As a result, Walmart stores use floor space only to sell products, and not to store them, thereby reducing inventory costs.

2. *Differentiation strategy.*

- Offer different products, services, or product features than your competitors. Southwest Airlines, for example, has differentiated itself as a low-cost, shorthaul, express airline. This has proved to be a winning strategy for competing in the highly competitive airline industry. Also, Dell has differentiated itself in the personal computer market through its mass-customization strategy.

3. *Innovation strategy.*

Introduce new products and services, add new features to existing products and services, or develop new ways to produce them. A classic example is the introduction of automated teller machines (ATMs) by Citibank. The convenience and cost cutting features of this innovation gave Citibank a huge advantage over its competitors. Like many innovative products, the ATM changed the nature of competition in the banking industry. Today, an ATM is a competitive *necessity* for any bank.

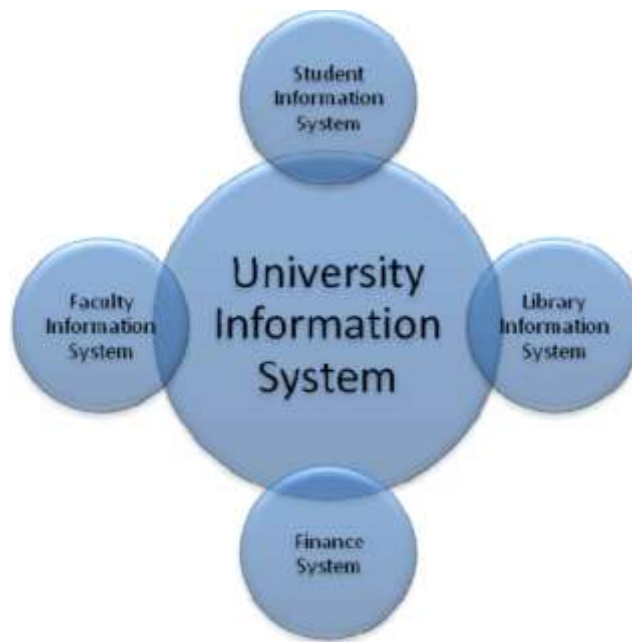
4. *Operational effectiveness strategy.*

- Improve the manner in which a firm executes its internal business processes so that it performs these activities more effectively than its rivals.
- Such improvements increase quality, productivity, and employee and customer satisfaction while decreasing time to market.

5. *Customer-orientation strategy.*

- Concentrate on making customers happy.
- Web-based systems are particularly effective in this area because they can create a personalized, one-to-one relationship with each customer.

Example - University Management Information System



- Managing universities activities requires University Management Information System (UMIS).
- UMIS refers broadly to a computer-based system 'collection of hardware, software, people, data, and information' that provides managers with the tools for organizing, evaluating and efficiently running their departments
- Examples of UMIS components include Student Information System (SIS), Library Information System, Faculty Information System, and Finance System
- In the following section, I present each component in brief details, listing the reasons why it can't be considered part of an "E-Learning" system.

Student Information System (SIS)

- SIS is the information system responsible for managing students' data within the faculty and/or university.
- SIS typical student record includes ID, SSN (Social Security Number), Name, Age, Gender, Address (Street, City, Country), Email, Username, Password, DOB (Date Of Birth), Faculty, Year, Department.

- SIS by itself is not an E-Learning system because personal data that SIS provides and manages differs in nature than data required for education
- Learner should be able to get a student profile that includes data like
 - Detailed records of what learners have already learned (at the level of learning object, rather than a module or program).
 - Profile of learning preferences.
 - Development portfolio of transferable skills.

Library Information System

- Library Information System is responsible for managing and automating libraries within universities.
- Automated Libraries are libraries that contain material in digitized form
- Automated Library Information System database record reflects the managerial tasks performed by librarians in order to effectively manage libraries.
- A typical Library Information System record will include Book ISBN, Name, Author(s), Keyword(s), and data like Section, List of all the books, List of books available, List of borrowed books, who is borrowing, when they should return, etc.
- Learner should be able to access fully available digital libraries as part of the learning process.

Faculty Information System

- Faculty Information System is responsible for managing and automating managerial activities related to Instructors, Employees, Courses, and intersection between them.
- A typical faculty information system database record includes Faculty data; ID, Name, Departments, Courses data; Course ID, Name, Description, Instructors data; ID, SSN (Social Security Number), Name, Age, Gender, Address (Street, City, Country), Email, Username, Password, DOB (Date Of Birth), Faculty, Year, Department; and Employees data; same as instructor's data with customized data about job
- Faculty information system capabilities are to generate courses report(s), for example, that includes course managerial issues.

Finance System

- Finance system is responsible for managing financial issues related to any organization, UMIS Role UMIS achieved success over the years and proved efficiency and effectiveness within educational institutions.