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KOLEJ KOMUNITI MALAYSIA

INTRODUCTION TO TECHNOLOGY IN FACILITY MANAGEMENT

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INTRODUCTION TO TECHNOLOGY IN FACILITY MANAGEMENT

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PREFACE

This book is an introduction to technology in facility management for students and newcomers interested in expanding their knowledge in the facility management industry. Technology has become a need for everyone in daily life, including facility management organisations.

Numerous software and multi-technology applications are becoming more prevalent in recent activities. Even yet, while some technologies are appropriate for facility management activities, not all are. This book will introduce the technologies necessary to sustain the facility management industry's significant growth to ensure that the facilities management sector is elevated to the same level as other industries. This book is also appropriate for facility management beginners and anyone with interest in technology.

A primary objective of this book is to explain the fundamental principles and concerns underlying the facility management sector and suggest methods in which technology might be applied to facility management activities. Additionally, the book discusses the technologies utilised in the facilities management industry and the history and use of facilities management in other sectors.

OVERVIEW

The opening chapter presents an overview of facility management technology. The opening chapter presents an overview of facility management technology. The second chapter examines Computer Aided Facility Management (CAFM), followed by a discussion of Building Information Modelling in Chapter 3. (BIM). Chapter 4 examines how Building Automation and Control Systems (BAS/BMS) have evolved, demonstrating each of these techniques via practical examples. The Geographic Information System (GIS) is the subject of Chapter 5. (GIS). Radio Frequency Identification (RFID) is discussed in Chapter 6, and Information and Communication Technology are discussed in Chapter 7. Finally, the bibliography at the book's conclusion.

About the author

Ts NOR HAZLIN BINTI MD GHARIP is a lecturer at Sultan Salahuddin Abdul Aziz Shah Polytechnic (PSA) in Shah Alam, Selangor. She graduated from Universiti Teknologi Mara with a Master of Science in Integrated Construction Project Management and a Bachelor of Quantity Surveying. From 1999 to 2000, she worked as a quantity surveyor for the Kementerian Pendidikan Malaysia. With 21 years of teaching and learning experience in the Civil Engineering Department. Currently a lecturer in facilities management studies. She was recognised as MCTS (The Microsoft Certified Technology Specialist) since 2016. Procurement anmanagement, project management, financial management, technology, and innovation in the facility management industry are all areas of interest.

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NIK ZETY AKHTAR ABDUL AZIZ is a lecturer in the Department of Civil Engineering, Politeknik Sultan Salahuddin Abdul Aziz Shah. Previously, she served at Politeknik Sultan Azlan Shah , Perak from 2009 to 2011 and Politeknik Kota Kinabalu, Sabah from 2011 to 2020. She was also a Contract Executive with the main contractor company from 2005 to 2009. She graduated from Universiti Teknologi Mara (UiTM) in Master of Science Facilities Management (2008) and University of Malaya (UM) in Bachelor of Building Surveying (2005). Currently a lecturer in facilities management studies, with 12 years of teaching and learning experience in the Civil Engineering department.

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CHAPTER 1

INTRODUCTION TO TECHNOLOGY IN FACILITY MANAGEMENT

INTRODUCTION

WHAT IS TECHNOLOGY ?

Technology is usually associated with a particular piece of equipment, but that equipment can be either incredibly simple or dazzlingly complex. It can be anything from the invention of the wheel to the creation of computers and MP3 players.

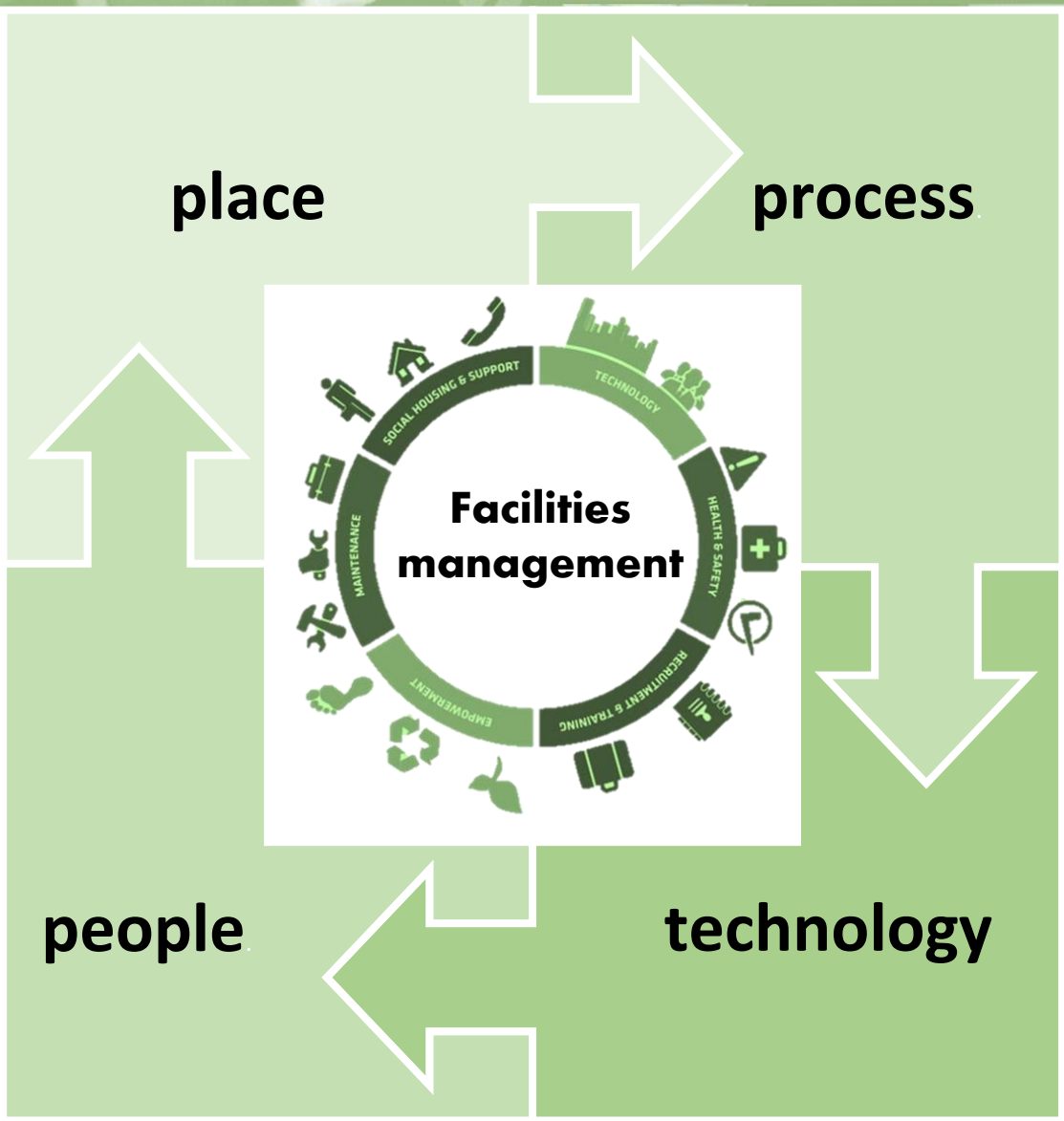
TECHNOLOGY FOR FACILITIES MANAGEMENT.

Facility Management Providers have two key technology objectives:

1. To protect and enhance asset value, including lowering management and administrative costs; and

2. To keep the facility compliant with regulations and to protect the people who work there.

WHAT IS FACILITY MANAGEMENT ?



- Facility management (FM) is a profession that encompasses multiple disciplines to ensure functionality, comfort, safety and efficiency of the built environment by integrating people, place, process and technology.(IFMA 2020)

WHAT IS TECHNOLOGY IN MANAGEMENT ?

Technology management is defined as the integrated planning, design, optimization, operation and control of technological products, processes and services. A better definition would be the management of the use of technology for human advantage.

TECHNOLOGY OPPORTUNITIES FOR FACILITY MANAGEMENT

More efficient and effective processes (more productive)	Allow more time to focus on strategic/ value-adding activities(less hands on)	Greater predictive/preventative capabilities (less reactive)
More accurate and timely reporting / monitoring	Reduce expenditure and improve compliance	Improved provision of customer services
Improved understanding of customer needs	more customer focused	More informed, robust and quicker decision-making

TECHNOLOGY CHALLENGES FOR FACILITY MANAGEMENT

Lacks the skills and knowledge about new technologies

Lack of money and resources to invest in new technologies

Legacy IT systems and business processes

The increasing pace of technological change (uncertainty

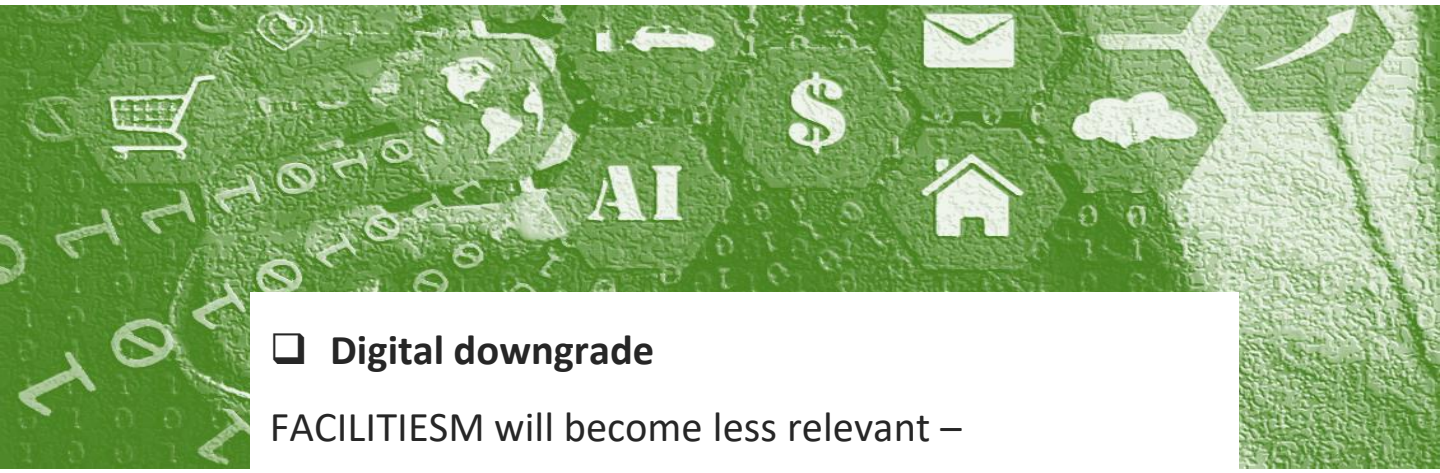
Ensuring that emerging digital technologies remain secure

Ethical issues associated with new technologies

Clients who are risk averse/don't want to invest in technology

Resistance to change in the FM profession

THE FUTURE OF TECHNOLOGY ON FACILITY MANAGEMENT



- **Digital downgrade**

FACILITIESM will become less relevant –

it will become de-skilled and marginalised

- **Digital upgrade**

FM will be broadly the same as it is now -

but with more technology

- **Digital reinvention**

FM will be more about data science and analytics - and involve fewer people

- **Digital displacement**

FM as we know it won't exist in the future - it will be disrupted by new technology

QUIZ 1

How technology impact facilities management activities?

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What are the challenges of facilities management during technology adoption?

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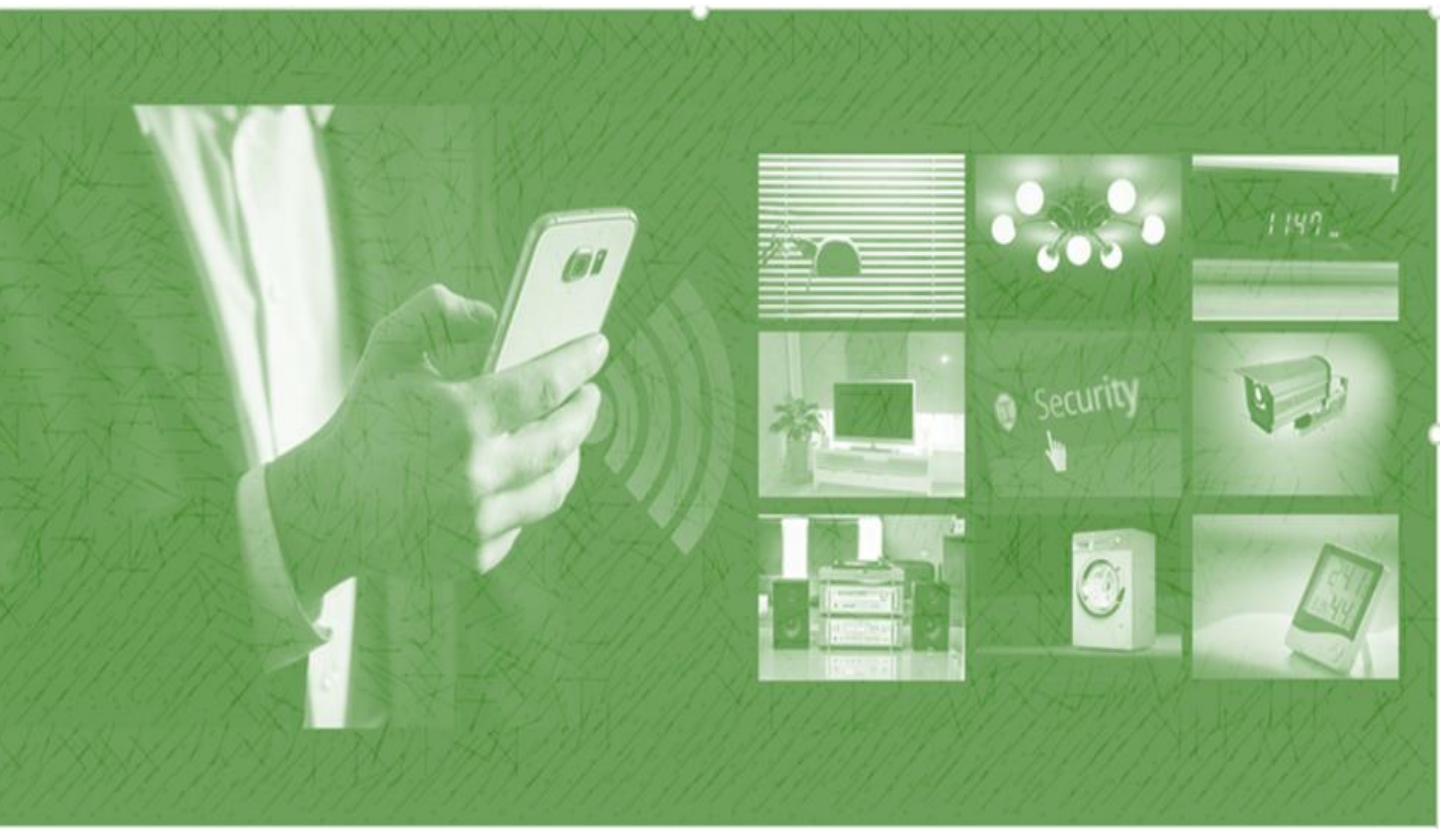
CHAPTER 2

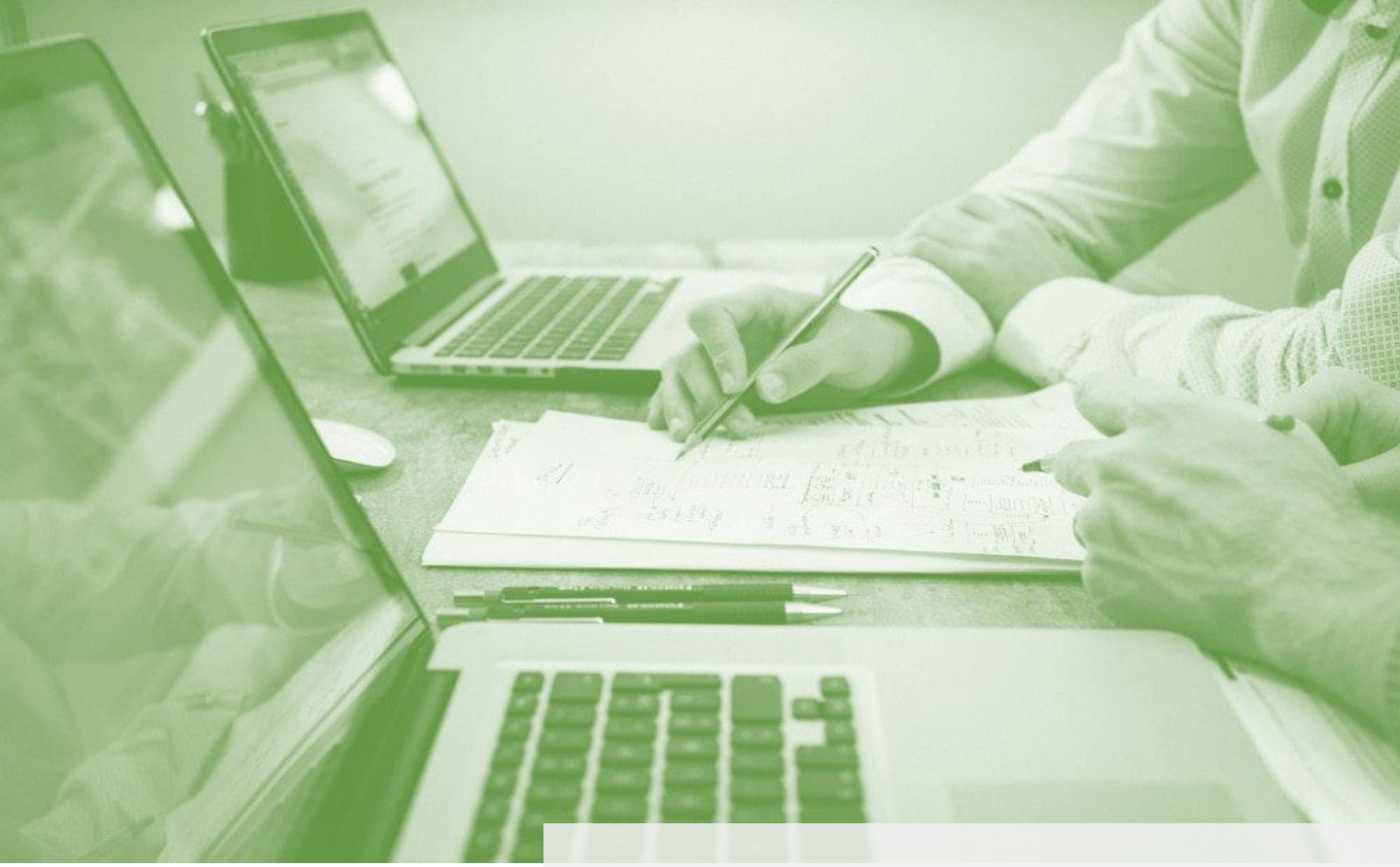
COMPUTER AIDED FACILITY MANAGEMENT (CAFM)



COMPUTER AIDED FACILITY MANAGEMENT

"Facilities management (FM) is a type of resource management that combines competence in people, property, and process management to offer critical services in support of an organisation." (Nik-Mat et. al, 2011).

The professional Facilities Management required an appropriate support through a Computer Aided Facility Management (CAFM) system.



DEFINITION BY IFMA

It is defined by the International Facility Management Association (IFMA) as the process of coordinating physical workplace and facilities with an organization's people and activities.

CAFM SOFTWARE

Facility Manager can plan, execute, and monitor all activities in a building or facility using CAFM software.

Preventative maintenance, space, asset management, operational facility services, help desk service, room reservations, and other customer services are among the activities that a Facility Manager can organize by using CAFM Software.

DID YOU KNOW?

CAFM TECHNOLOGY

CAFM Technology integrates concepts from business administration, behavioural science, architecture, and engineering to strengthen the organization's performance.

CAFM systems are decision-support tools that provide KPIs on processes that can impact an organization's performance. These software will help decision makers evaluate performance and risk, as well as manage and improve their businesses (Ernesto & Alessio, 2019).

THE NEED OF CAFM

The efficient operation of facilities is tightly connected to the efficient storage, provision and processing of data.

Out of the need to accomplish this task, CAFM has been developed

(Jochen et. Al, 2006).

In the 1980,

The demands for FM automation significantly exceeded the technology available.

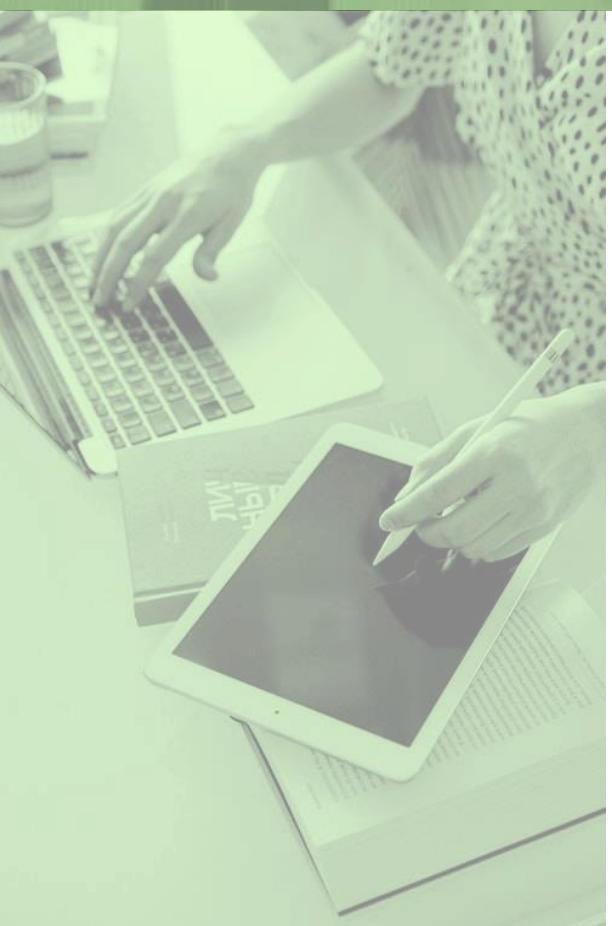
Then CAFM systems were created, which integrated a number of different programmes into a single platform and, most crucially, integrated CAD and data.

Today,

Technology is growing at a higher speed than an organization's ability to adapt its work processes and organisational structure to take advantage of new tools, and this trend will continue in the future.

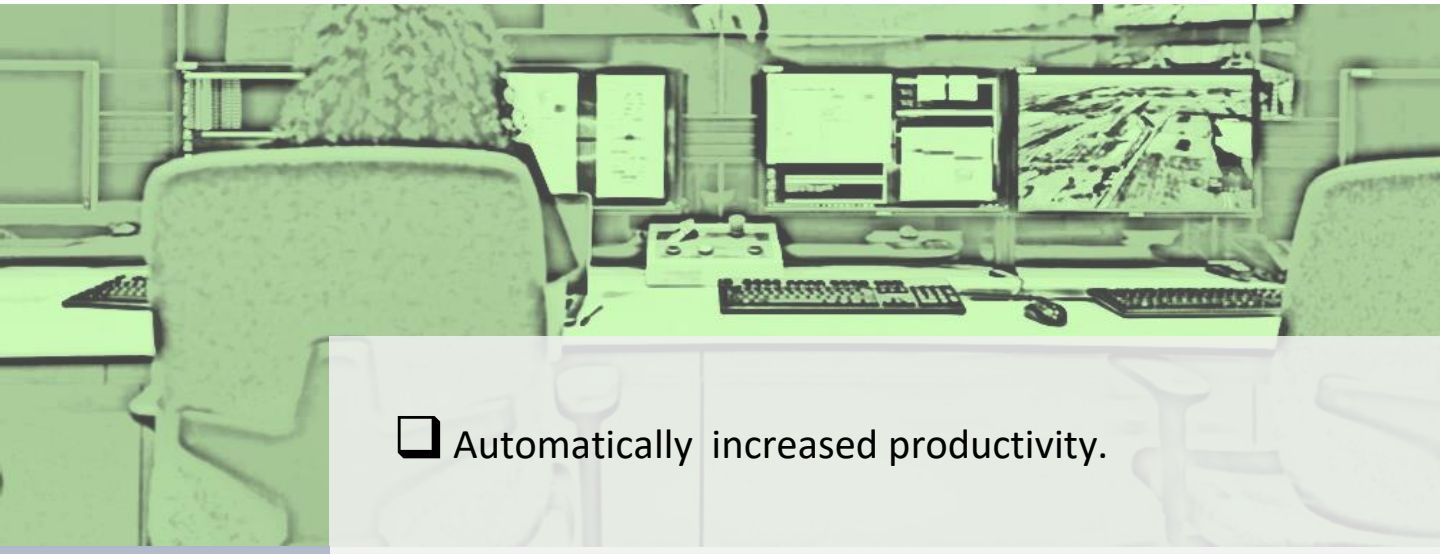
CAFM APPLICATIONS

CAFM can be used to manage practically any type of facility, such as offices, hospitals, airports, factories, commercial building, universities, and more.



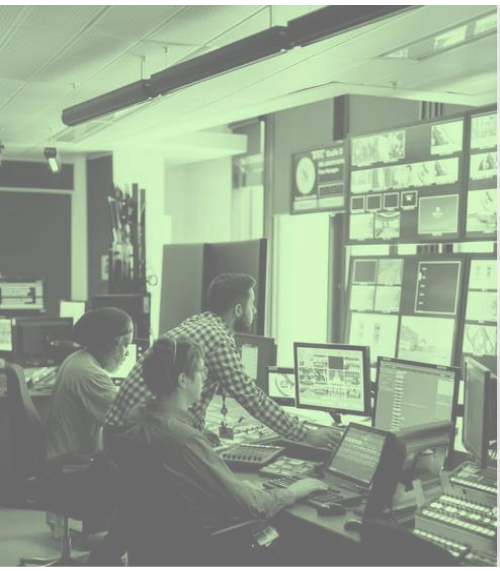
When CAFM merged with others where more advanced technologies applied, it can have a significant impact on an organization's bottom line while also supporting top-line growth.

BENEFITS OF CAFM



- Automatically increased productivity.
- Administrator dashboard provides remote management features.
- Maintenance workflows that are more efficient, including faster repairs and fewer downtime.
- Artificial Intelligence-powered predictive maintenance extends equipment lifecycles.
- To assist decision-making, real-time data and advanced analytics are used.

WHAT DOES CAFM DO?

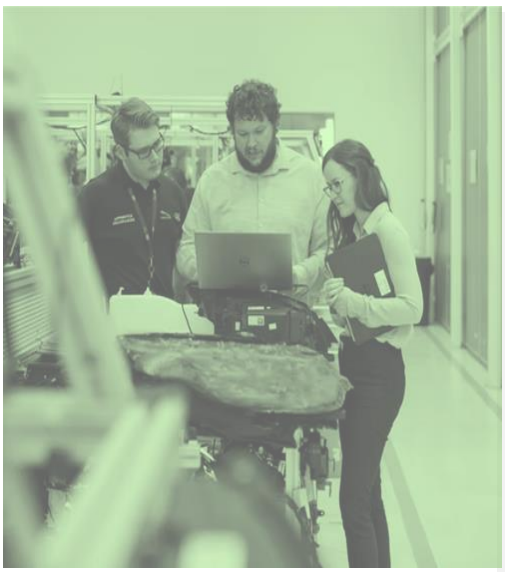


AUTOMATE ADMINISTRATIVE TASK

CAFM technology enable managers to computerize evaluations, organize and evaluate invoice as well as track work orders. By automating the planning and implementation task at a site, CAFM systems can save time and money.

MONITOR ASSET

CAFM can track all equipment and inventory. By tracking real time assets, CAFM software enables managers to see trends, the energy is being used, and optimize spend by automating tasks and scheduling repairs as needed.



CREATE DATA REPORTS

By monitor all information in one platform, managers can run trends, download expense reports, and provide leadership with timely data to support in strategic planning and operational decision-making.

CAFM gather data from every part of the organization and analyze challenges in actual time. CAFM software solutions allow managers to track spend, examine key performance indicators, and make systematic decisions based on data.

WHAT DOES CAFM DO?

MANAGE OPERATION ANYWHERE

CAFM software lets facility managers keep tabs on their facilities and properties even when they are not physically there.

QUIZ 2

How CAFM software help organization to save money and cost?

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What benefits for organization when they implement CAFM software?

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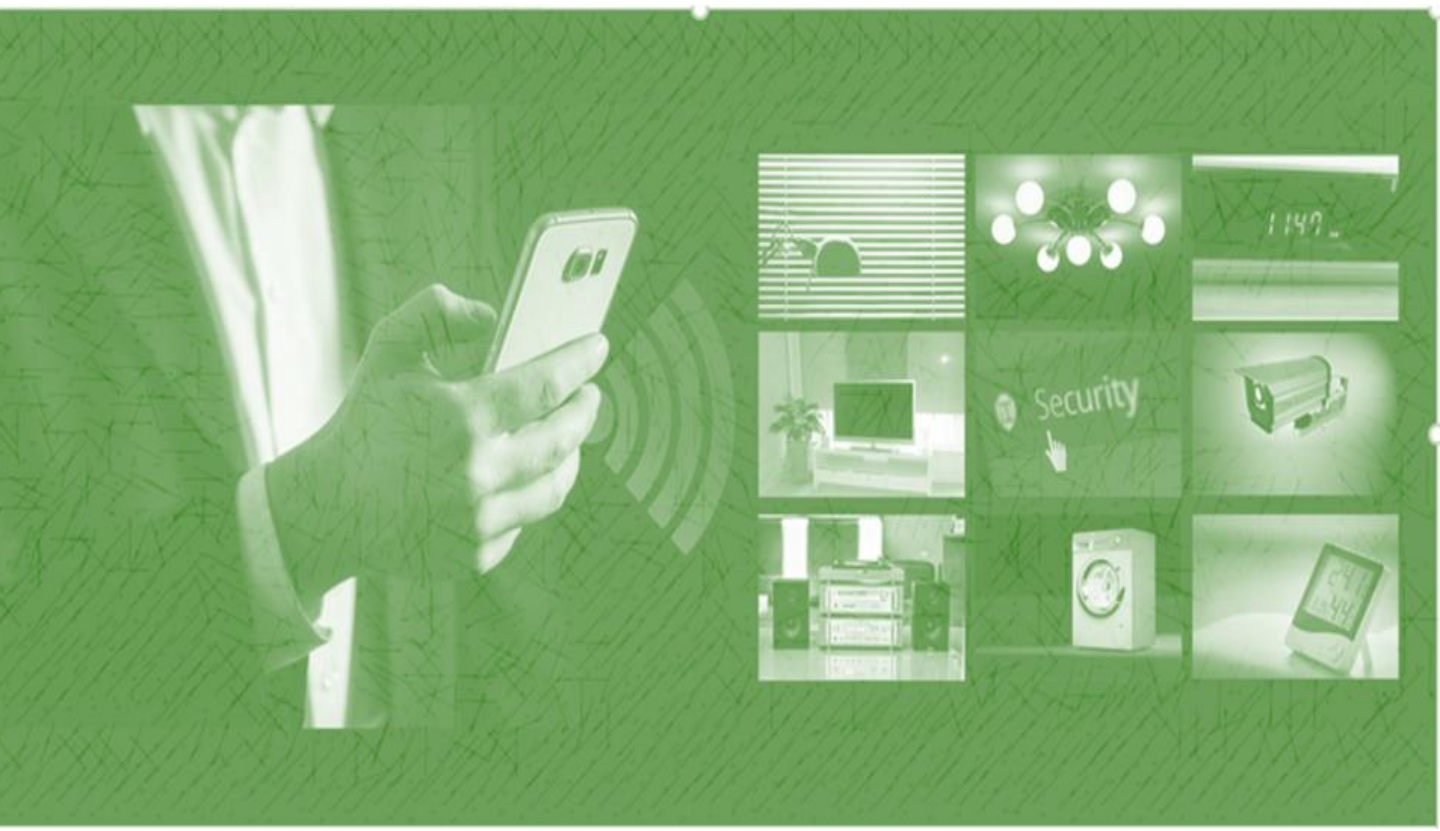
CHAPTER 3

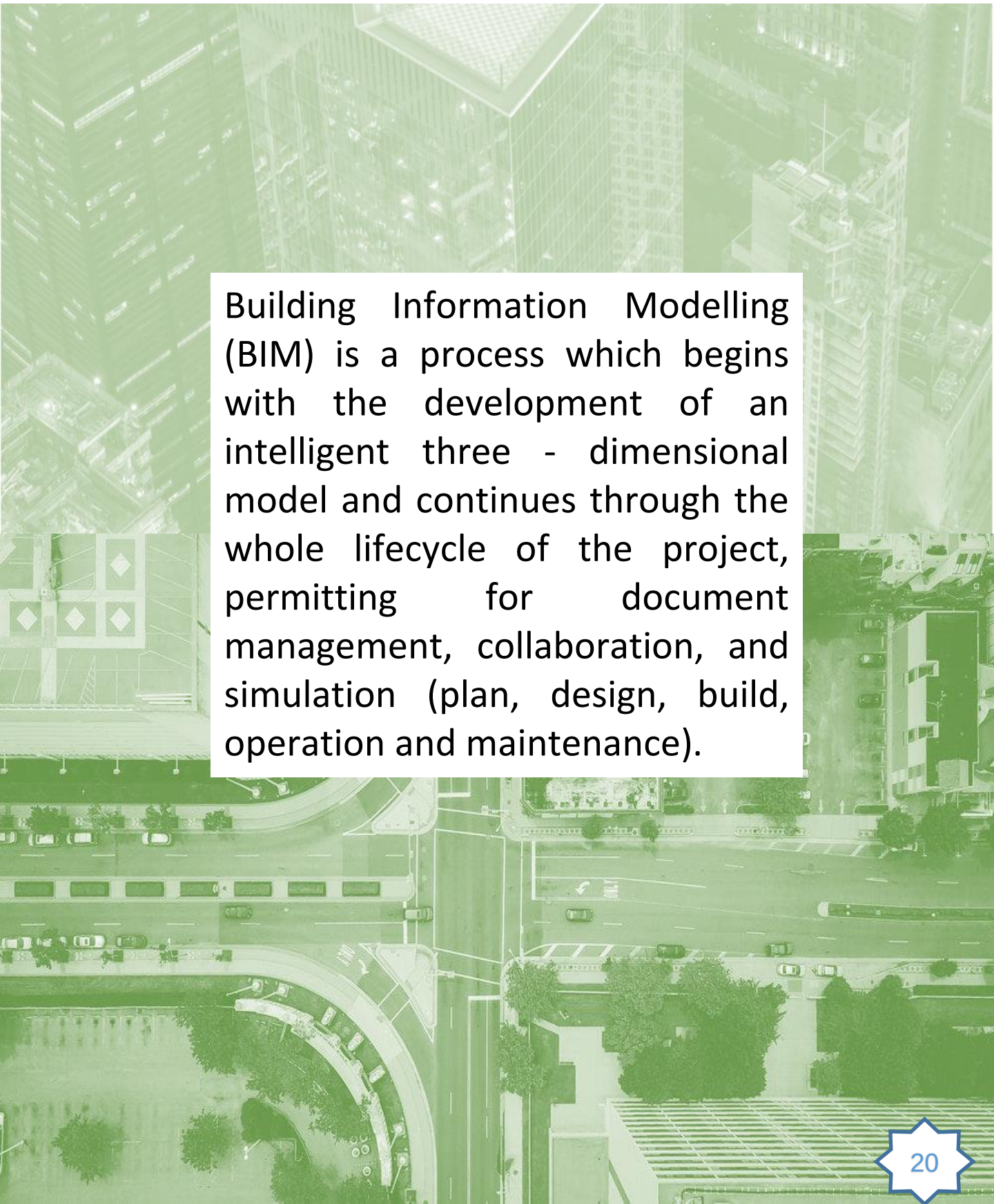
BUILDING INFORMATION MODELLING (BIM)



BIM (building information modelling) is a software technique that is quickly gaining traction in the architectural, engineering, and construction (AEC) business. It also functions as a database, allowing users to track data properties for the various components that make up the building model. The three-dimensional geometry, items, and properties of a physical facility are described using building information models.

BUILDING INFORMATION MODELLING (BIM)

BUILDING INFORMATION MODELLING (BIM)



Building Information Modelling (BIM) is a process which begins with the development of an intelligent three - dimensional model and continues through the whole lifecycle of the project, permitting for document management, collaboration, and simulation (plan, design, build, operation and maintenance).

WHAT IS BIM ?

BIM is the process of leveraging a database infrastructure to integrate built facilities with exact information provided by stakeholders. (Arayici et al., 2012).

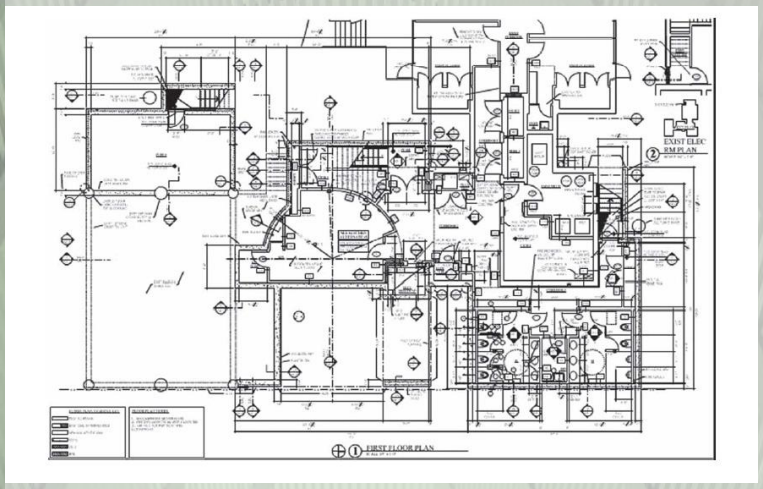
It comprises creating a digital parametric model of a structure that accurately portrays its physical and functional properties and acts as a platform for a shared knowledge pool to make rational choices throughout the project's life cycle. (Eastman et al., 2008)

BIM is used for :

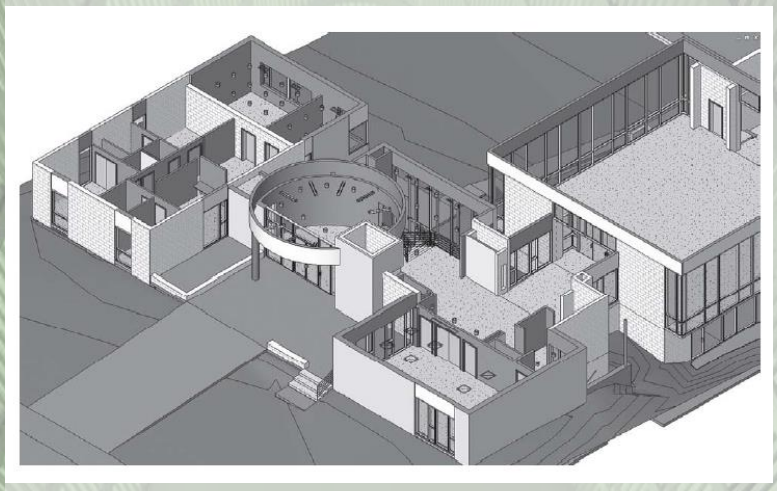
Source : https://www.lodplanner.com/what-is-bim/

ADVANTAGES OF BIM

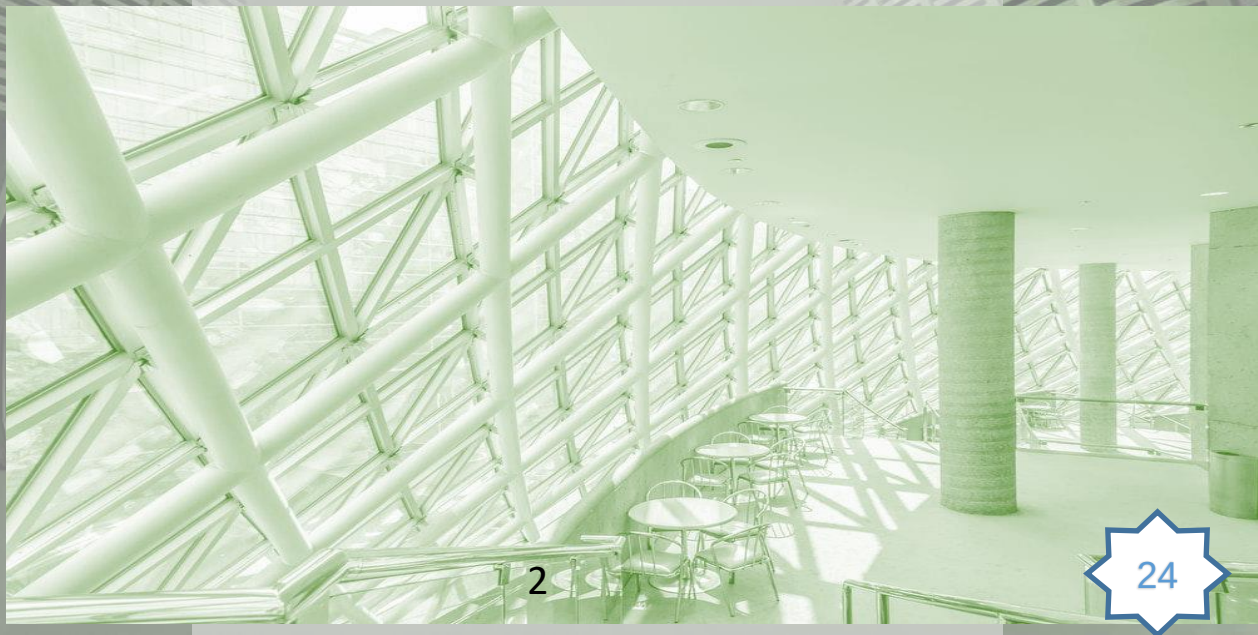
- **Making quick decisions-** BIM enables for an early assessment of a building's performance, allowing for more timely and cost-effective decisions and improvements.
- **Increased precision-** Improved communication and understanding amongst the various groups engaged in construction projects. Throughout the design and construction process, it reduces errors and changes. BIM enables the model's representation to be consistent and coordinated across all views and drawing outputs.
- **Rapid quantification** - Produces estimations and workflows more efficiently and quickly than traditional processes by automatically generating quantities and reporting on data.
- **Analytical capability** - BIM does complicated analysis, such as clash detection, scheduling and sequencing (also known as 4D modelling), energy analysis, decision clarification, issue resolution, and process delay reduction.
- **Project delivery strengthened.** At completion of the project, BIM allows the development of a more holistic, structured, accurate, and full body of data.

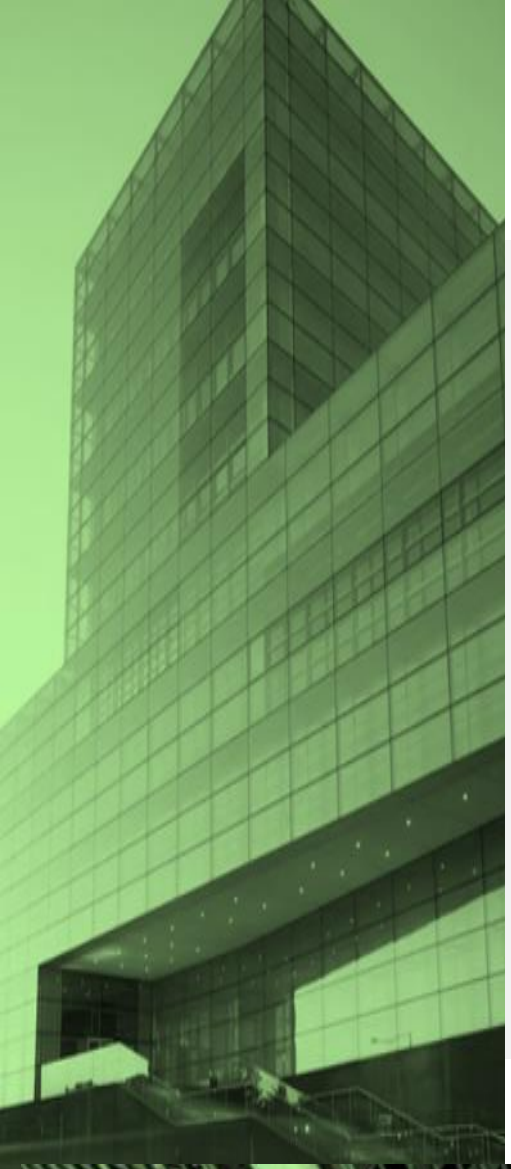


It's hard to decipher traditional CAD documentation..



A 3D BIM improves the way a building is described, resulting in increased process efficiency.





When BIM and FM are combined, the outcome is 6D modelling, which is effective in augmenting manual information handover processes and, in general, results in more efficient and well-managed facilities after completion. (Parn et al., 2017)

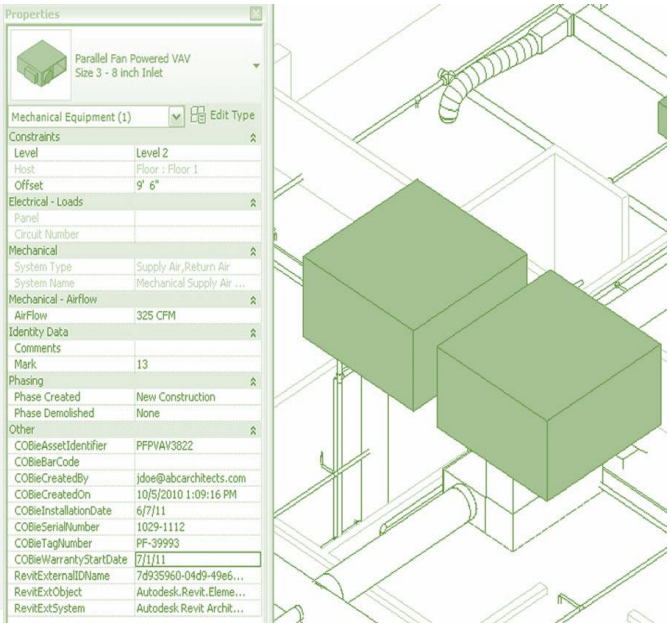
BIM FOR FACILITY MANAGEMENT

For effective process development, utilize BIM templates

-By offering smart BIM models, organisations with well-developed project standards can support project teams achieve significant efficiencies in project conception and execution.

Project delivery that is more constant

After project completion, project BIMs can be defined and developed to include organisational data to satisfy facilities management data demands.



Management of space

3D spaces and objects, as well as properties for these components, are included in BIM. It may handle unique space management and measuring requirements.

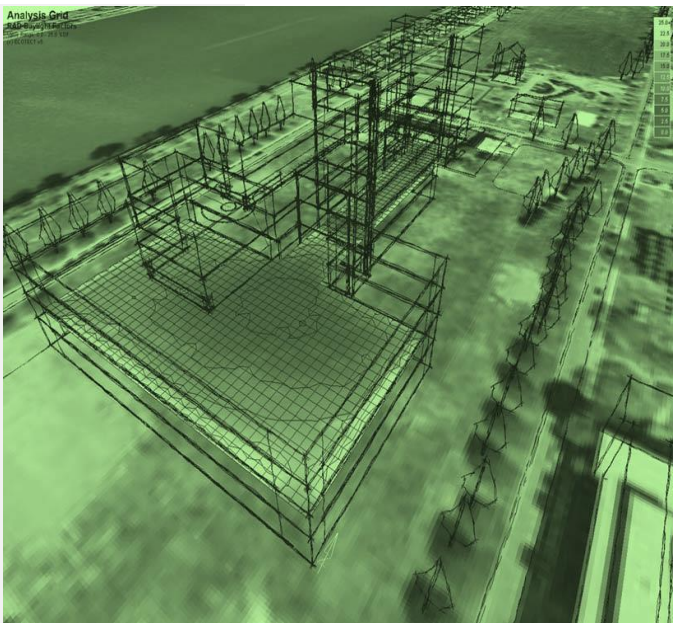
BIM FOR FACILITY MANAGEMENT

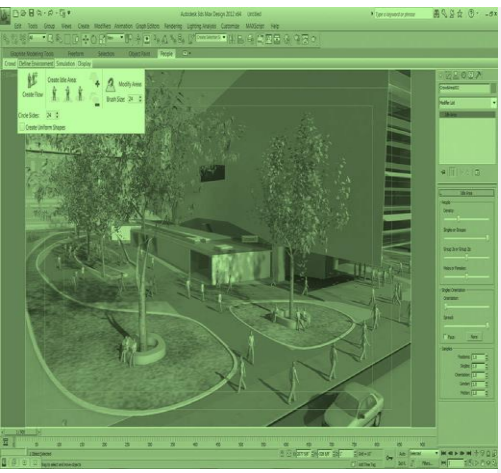
Visualization

The significant visualisation capabilities of BIM, as well as its expanded capabilities to represent prospective changes over time (4D BIM), can effectively explain essential building challenges, particularly in terms of scheduling and sequencing.

Management of energy and the environment

Organizations are under increasing pressure to improve their facilities' energy efficiency and sustainability. From conceptual energy to detailed engineering, BIM is well positioned to accommodate a variety of analytics.

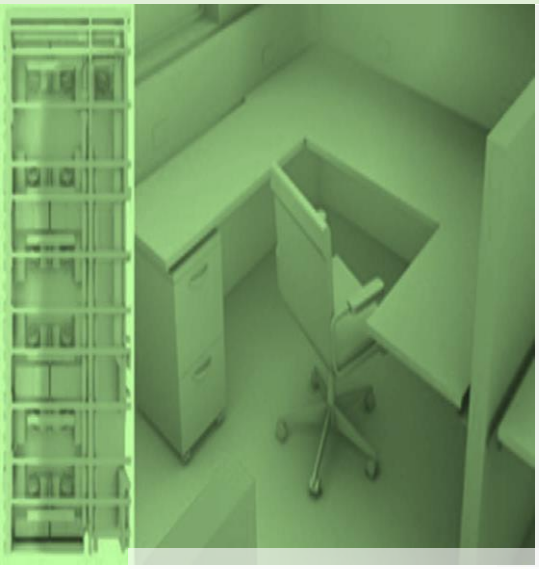




Security management

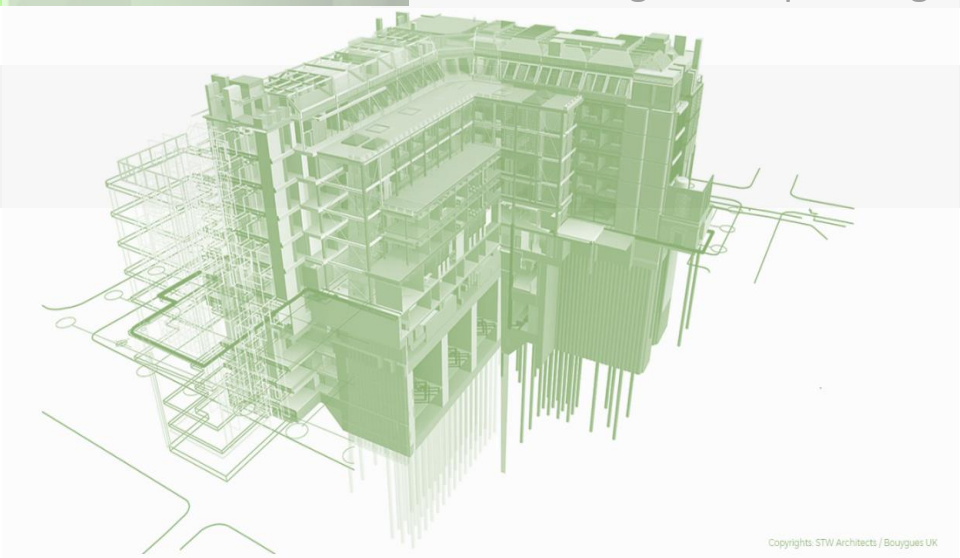
The ability to add 3D human agents expands the scope of BIM's capability for analysing how the dynamic flow of people within a facility will vary in response to an event and the physical environment's layout.

BIM FOR FACILITY MANAGEMENT



Display of real-time data

The significant visualisation capabilities of BIM, as well as its expanded capabilities to represent prospective changes over time (4D BIM), can effectively explain essential building challenges, particularly in terms of scheduling and sequencing.



BIM is the technique of leveraging a database system to integrate built facilities with exact information provided by stakeholders. (Arayici et al., 2012).

It involves creating a digital parametric model that accurately represents a structure's physical and functional properties and acts as a platform for a shared knowledge pool to make intelligent decisions throughout the project's life cycle. (Eastman et al., 2008)

QUIZ 3

How can BIM improve Facilities Management in an organization?

CHAPTER 4

BUILDING AUTOMATION AND MANAGEMENT SYSTEM (BAS/BMS)

BUILDING AUTOMATION SYSTEMS

Building automation is the automatic centralized control of a building's HVAC (heating, ventilation, and air conditioning), electrical, lighting, shading, Access Control, Security Systems, and other interrelated systems through a Building Management System (BMS) or Building Automation System (BAS).

https://en.wikipedia.org/wiki/Building_automation

HISTORY OF BUILDING AUTOMATION SYSTEMS (BAS)

- The history of building automation and control systems begins in the early 1970s. It coincided with the first great energy crisis in North America and the recognition that well-established electrical and electronic control systems could be improved with emerging digital technology also known as energy management and control systems (EMCSs). most common method for heating, ventilating, and air-conditioning (HVAC) control was pneumatic, which was mismatched with early computer-based control systems.
- The 1980s piloted a significant change in the method of monitoring and controlling mechanical and electrical systems within buildings. It marked the beginning of the direct digital control (DDC) revolution that replaced pneumatic control methods with the programmability and precision of digital control EMCSs were becoming building automation systems (BASs).
- By the end of the 1980s, there were major advances in the ability to integrate multiple systems into a central workstation, along with the refinement of color graphic terminals to display representations of floor plans and system schematics.

BENEFITS OF BIM

❑ Aspects of ease

The most obvious benefit of a BAS for tenant comfort is temperature regulation. For example, a BAS can help avoid cold and hot mornings by automating HVAC systems to turn on before people arrive and off after they leave. It also control the amount of fresh air or natural light entering a building.

❑ Financial Gains

An adequately installed BAS generally pays for itself in reduced utility bills. According to one estimate, simply monitoring occupancy and letting the BAS adjust HVAC use results in 10-30% savings. In addition, reduced peak load and other energy savings help lower utility costs.

❑ Environmental Gains

While environmental benefits rarely directly benefit building owners, they can increase a property's appeal. In addition, many owners have a personal interest in keeping an energy-efficient building portfolio.

COMPONENT OF BUILDING AUTOMATION SYSTEMS

❑ SENSORS

• Keep track of the humidity, temperature, lighting levels, how many people are in the rooms, and other parameters

• After gathering this information, sensors transmit them to the controllers

❑ OUTPUT DEVICES

• Follow the new instructions or requirement from controllers.

❑ CONTROLLERS

• Brain of the building's automation system.

• They collect all of the information from sensors.

❑ COMMUNICATION PROTOCOLS

• Specific language to connect each individual component.

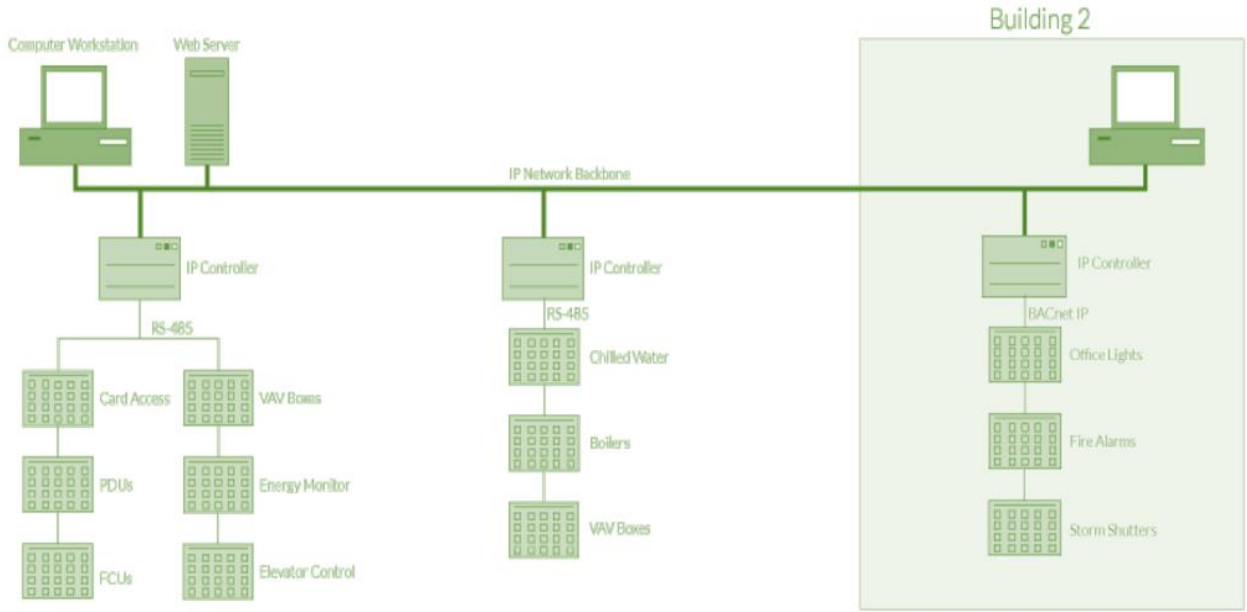
• Such as BACnet and Modus.

❑ TERMINAL INTERFACE

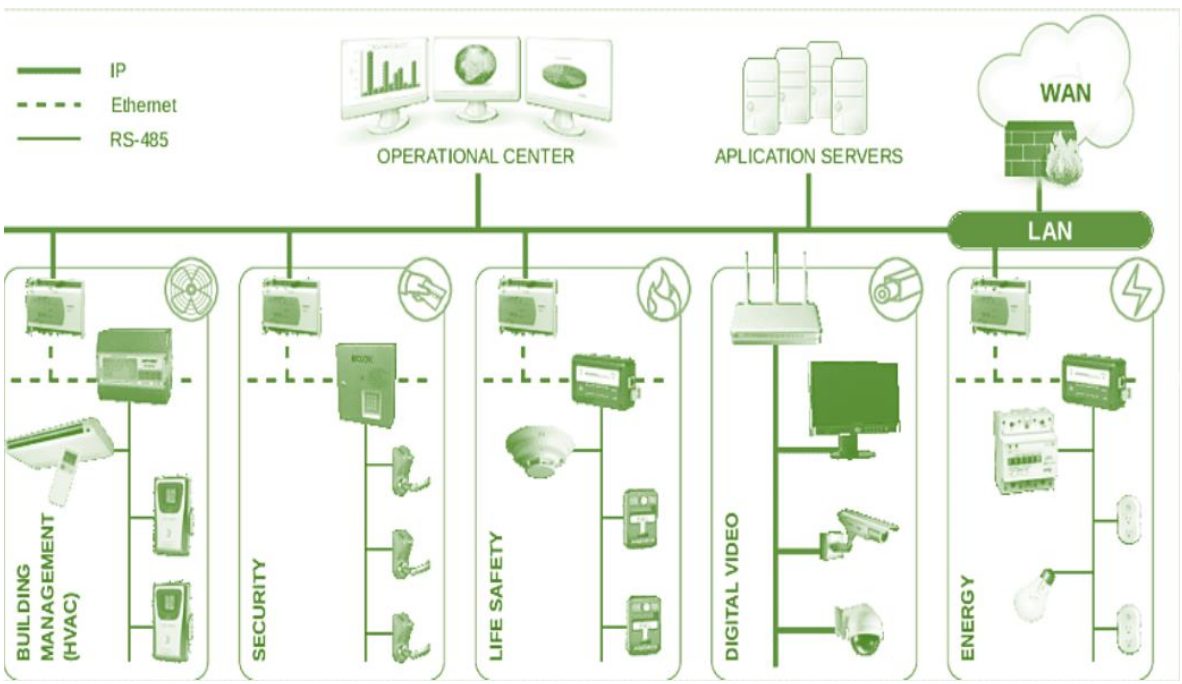
• Facilities operator can access it.

• Helps users to understand the information transferred between each component

EXAMPLE OF OF BUILDING AUTOMATION SYSTEMS



EXAMPLE OF BUILDING MANAGEMENT SYSTEMS



BUILDING MANAGEMENT SYSTEM (BMS)

- A computer-based system for managing and monitoring equipment in buildings.
- A building management system (BMS) keeps track of, supervises, manages, and reports on intelligent building technology systems.
- These systems are access control, video surveillance, fire alarms, HVAC control, programmable lighting, and electric power management.
- Building Management Systems (BMS) are most typically used for large projects with sophisticated mechanical, HVAC, and electrical systems are where Building Management Systems (BMS) are most typically used. Systems linked to a BMS typically represent 40% of a building's energy usage; if the lighting is included, this number approaches 70%.
- BMS systems are a critical component to managing energy demand.

STRUCTURES OF BUILDING MANAGEMENT SYSTEM (BMS)

❑ SYSTEM SECURITY

• To prevent unauthorized use

• Password protection

• Operator specific access and log summary

❑ ALARM MANAGEMENT

• Present in the sequence of importance and time of potentially dangerous situation

• Guide the operator to take appropriate action through audible and visual indications

❑ DATA LOGGING/TRENDING

• Automatic gathering and storage of data from the field equipment for later analysis

❑ TIME SCHEDULING

• Save energy cost and efficient operations

BUILDING MANAGEMENT SYSTEM (BMS) VS BUILDING AUTOMATION SYSTEM (BAS)

- There is no distinction between BMS and BMS, to put it simply. On the contrary, in the industry, the two terms are frequently interchanged. Building Automation Systems have been marketed as a more advanced version of Building Management Systems for some time. Everyone began to refer to their BMS as a BAS after that.

- BAS was viewed by software vendors as an evolution of BMS systems, with more advanced automated controls and innovative analytics. On the other hand, building owners and operators consider BAS to be a subset of BMS, with an emphasis on automating HVAC and lighting controls.

- **Building Control Systems (BCS) and Energy Management Systems (EMS/EMCS) are two other terms used interchangeably with BMS.**

QUIZ 4

What are the factors influencing Building Automation System application in the facilities management industry?

CHAPTER 5

GEOGRAPHIC INFORMATION SYSTEM (GIS)

In any building, facility management is crucial. Managing spaces, building services systems, and assets demands a consistency task for storing, querying, and updating spatial and information database.

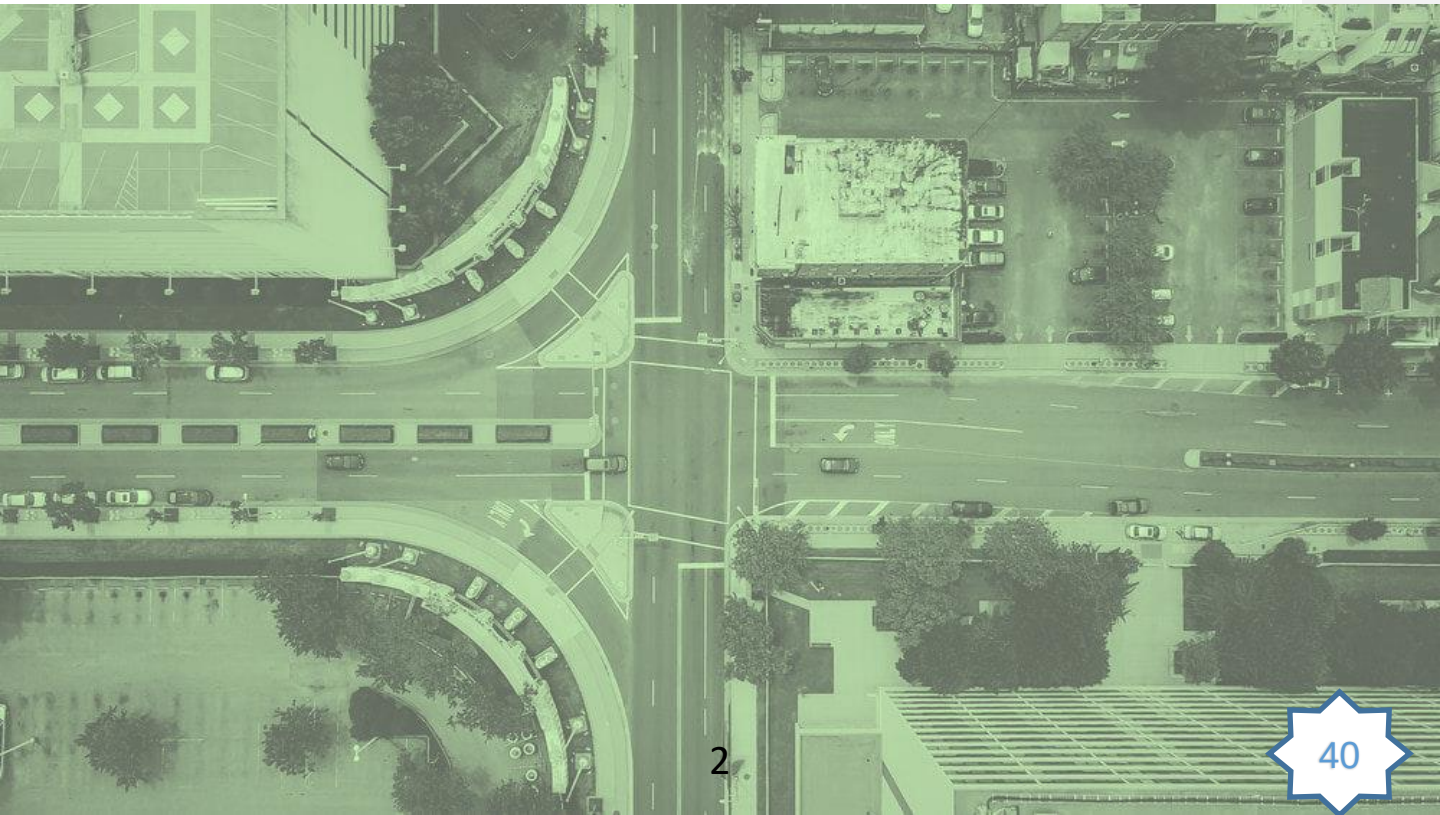
A Geographic Information System (GIS) is a computer system for capturing, storing, manipulating, analysing, managing, presenting, and disseminating spatial or geographic data (Cantwell and Milem, 2010).

GEOGRAPHIC INFORMATION SYSTEM (GIS)

GIS TECHNOLOGY

WITH GIS TECHNOLOGY,
people can the positions of various objects to see how they relate to one another.

For example, this software can detect pollutants, such as factories, as well as pollution-sensitive locations, such as wetlands and rivers by using GIS.
GIS would also help to determine where water sources are most critical.

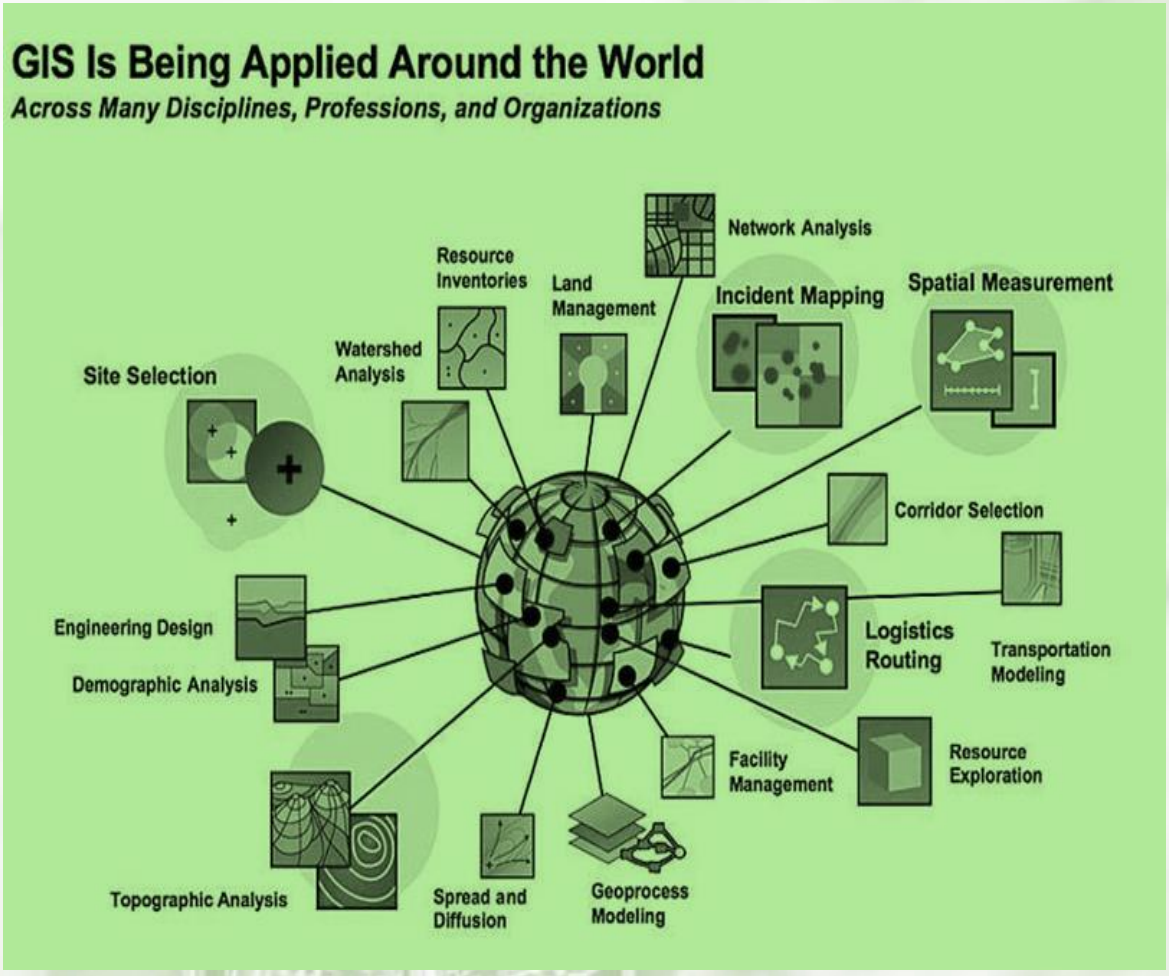


WHY USE GIS?

GIS can be used to enhance and integrate existing facilities management (FM) systems. Maintaining and managing all of an organization's facilities and assets in GIS ensures that everyone knows their location and status.

Data can be updated more quickly, work orders can be issued more quickly, and space can be better utilised.

GIS APPLICATION



Sources: Applied GIS around the world across disciplines, professions and organizations (ESRI, 2007)

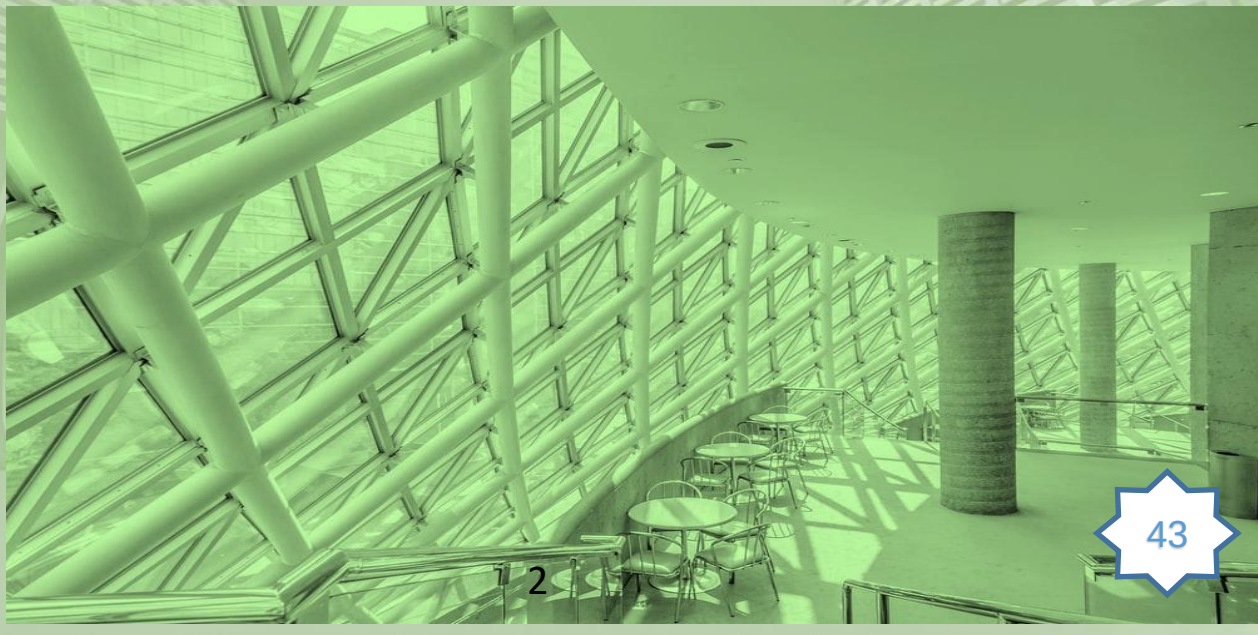
HISTORY

In the 1954,

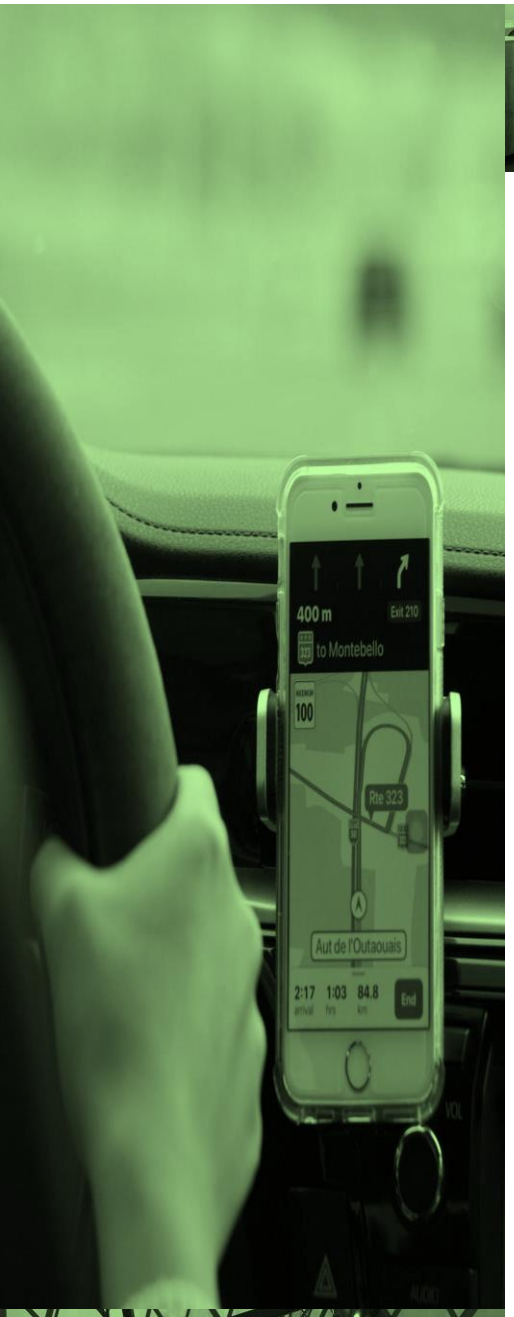
There was just a small amount of progress in GIS. There was no computer mapping and all mapping was done on paper. Maps were being used in vehicle navigation, building planning, and locating areas of interest by the 1950s.

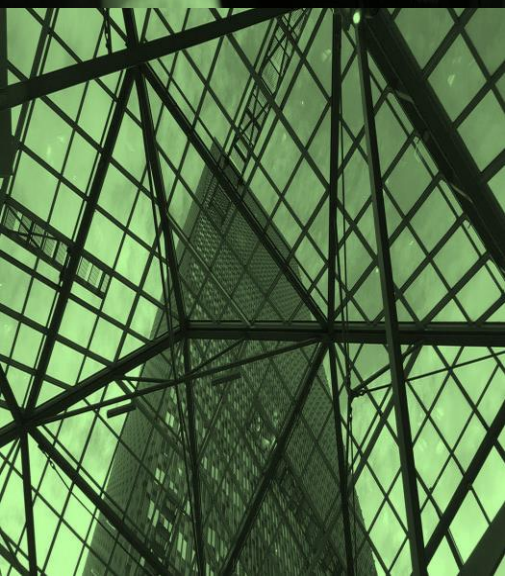
Today,

GIS is used by practically in every company in the world, to produce maps that communicate, perform analysis, share information, and solve complicated problems. The way the world operates is changing as a result of this.



GIS APPLICATION





GIS can be used to combine data from other systems and applications, as well as serve as the system of record for facility data.

GIS is used to combine and manage data on-site and inside buildings, for example:

- ✔ Maps and Floor Plans
- ✔ Capital Planning
- ✔ Real Property Inventory
- ✔ Space Inventory
- ✔ Asset Inventory
- ✔ Energy Use
- ✔ Equipment Locations
- ✔ Hazardous Materials Locations
- ✔ Fire and Life Safety
- ✔ Emergency Preparedness Information
- ✔ Operation and Maintenance (O&M) Costs

WHAT ARE THE USE CASES FOR GIS?

Assets Management and Maintenance	Telecom and Network Services	Accident Analysis	. Urban Planning
Planners can better distribute resources if they have a better understanding of the population at risk.	Organizations can incorporate geographic data into their complex network design, optimization, planning, and maintenance activities.	GIS data may be used to determine accident areas, and data intelligence can be used to optimise road networks. This intelligence helps in the improvement of road safety and traffic management.	GIS data is used to study urban growth and expansion trends. When used effectively, it can identify new development sites by taking into account a variety of criteria that are important for successful development.

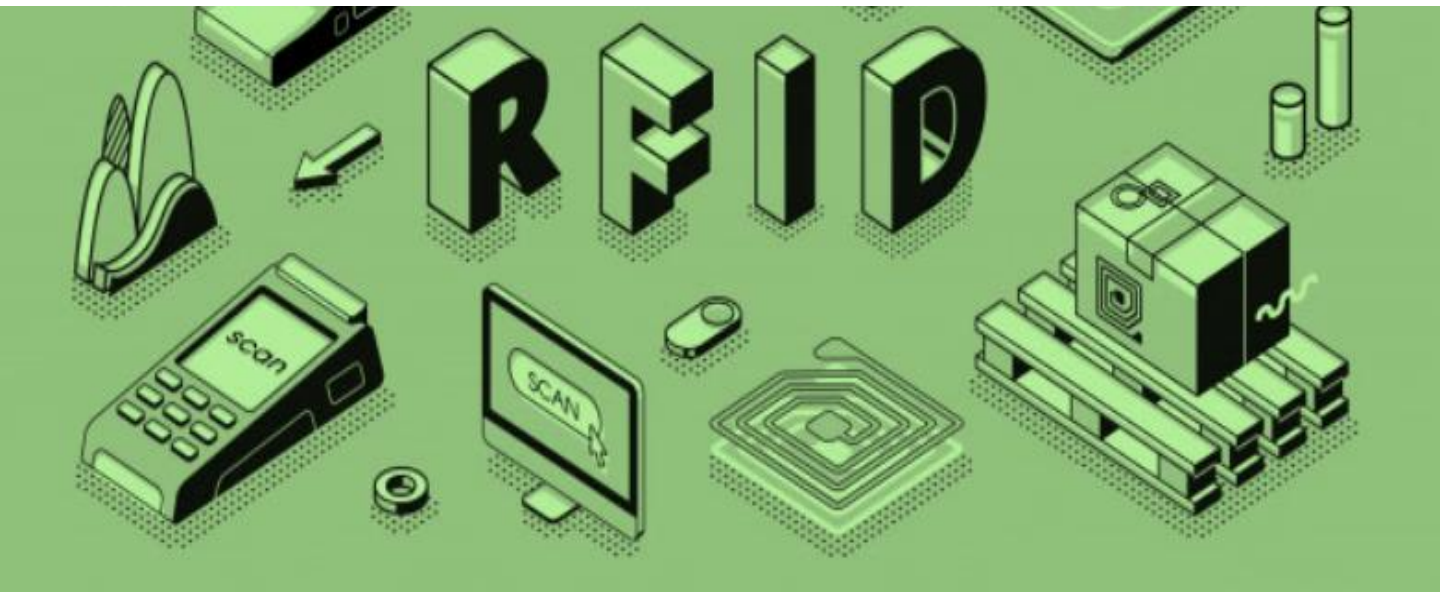
QUIZ 5

How can GIS improve Facilities Management in an organization?

CHAPTER 6

RADIO FREQUENCY IDENTIFICATION (RFID)

RADIO FREQUENCY IDENTIFICATION



The use of radio waves to read and collect information recorded on a tag connected to an object is known as radio-frequency identification (RFID).

To be tracked, a tag can be read from up to several feet away and does not need to be in direct line of sight of the reader.

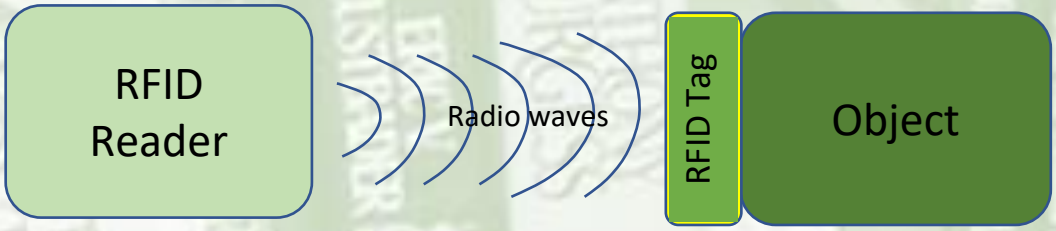
RFID systems are made up of software, network, and database components that allow data to flow from tags to the organization's data infrastructure, where it is processed and stored.

HISTORY

RFID's origins can be traced back to World War II. Radar, which was invented in 1935 by Scottish physicist Sir Robert Alexander Watson-Watt, was used to warn of approaching aircraft at the time. Was it our pilots returning home, or was it a hostile attack?

British researchers led by Watson-Watt devised a novel method based on a brilliant concept. They installed transmitters aboard all British planes, and when they received signals from ground radar systems, they began broadcasting a signal back identifying the jet as friendly. (Crepaldi & Pimenta, 2017)

The basic premise of RFID operation is as follows: a signal is given to a transponder, which wakes up and either reflects or transmits a signal (active system).The IFF (Identification Friend or Foe) system used has the same principle in order to identify the allied planes. (Fennani et al., 2011)



Radio frequency identification (RFID) is a technique that uses radio frequency (or radio waves) to identify people. This technology is used to recognise objects or track them automatically.

Anything could be the object. The object could be booked at a library, any item purchased from a shopping centre, warehouse goods, or even your car. So not only can it be used to track objects, but it can also be used to track animals.

In this RFID technology, the RFID tag is used to get attached to the object we want to track. This RFID reader is continuously sending radio waves. Whenever this object is in the range of the reader, then this RFID tag is used to transmit its feedback signal to the reader. Then, it is very similar to the technology which is used in a barcode.

RFID is a novel technology that works in the same way as a barcode but without the need for a line of sight. RFID tags, unlike barcodes, do not require line of sight and can be active, interacting with readers. (Barjis & Fosso Wamba, 2010)

Despite the fact that RFID and barcoding belong to the same technology family, they differ in a number of ways.

COMPONENTS OF RFID

❑ RFID READER

An RFID reader is the brain of any RFID system and is crucial for it to work. Readers, also referred as interrogators, are devices that communicate with RFID tags by transmitting or receiving radio waves.

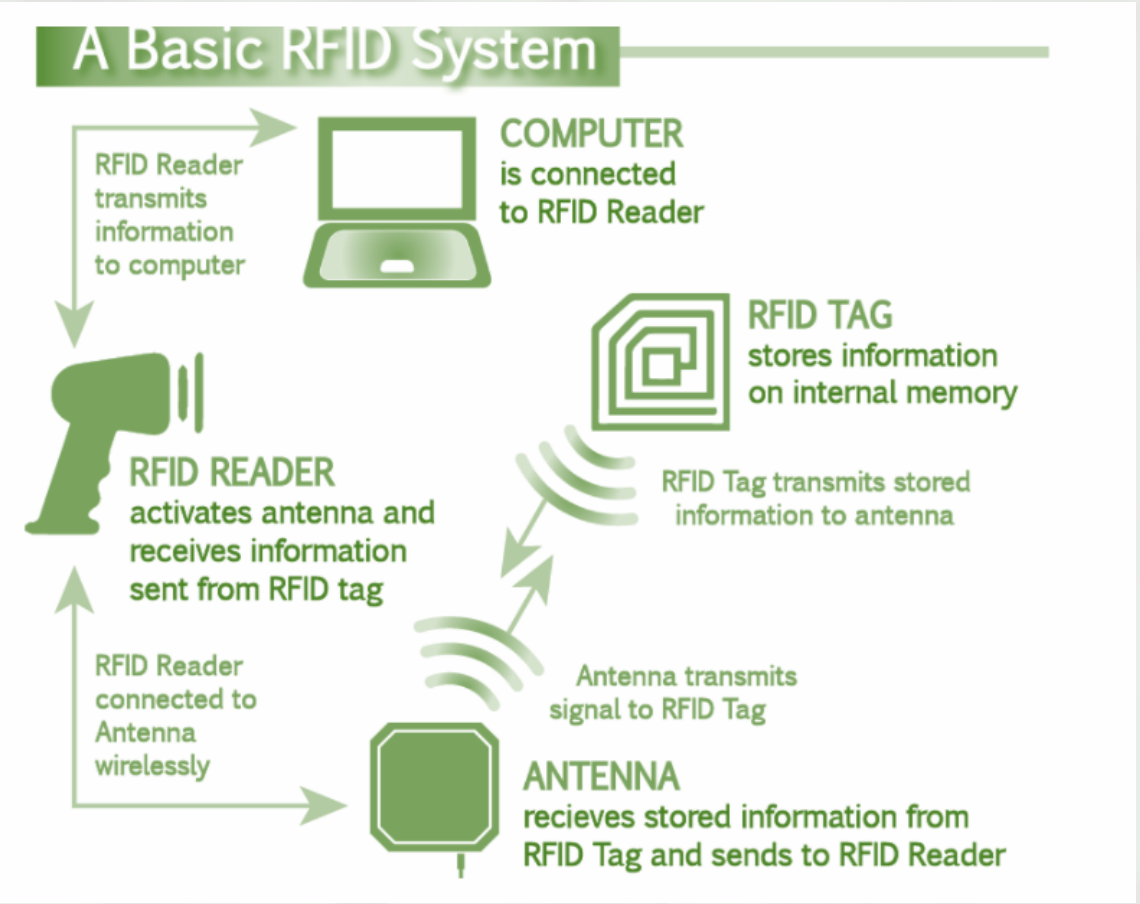
❑ RFID TAG / TRANSPONDER

The data carrier, usually known as the transponder or simply the Tag, is at the heart of an RFID system. The consumer can programme the EPC (Electronic Product Code) storage area on the transponder.

❑ RFID TAG ANTENNA

A coil with one or more windings and a corresponding network make up an RFID antenna. It accepts RF signals from the transponder and radiates the electromagnetic waves created by the reader.

BASIC RFID SYSTEM



Source : http://smartt-tags.com/#what-is-rfid?

RFID CATEGORIES

❑ Active Tag

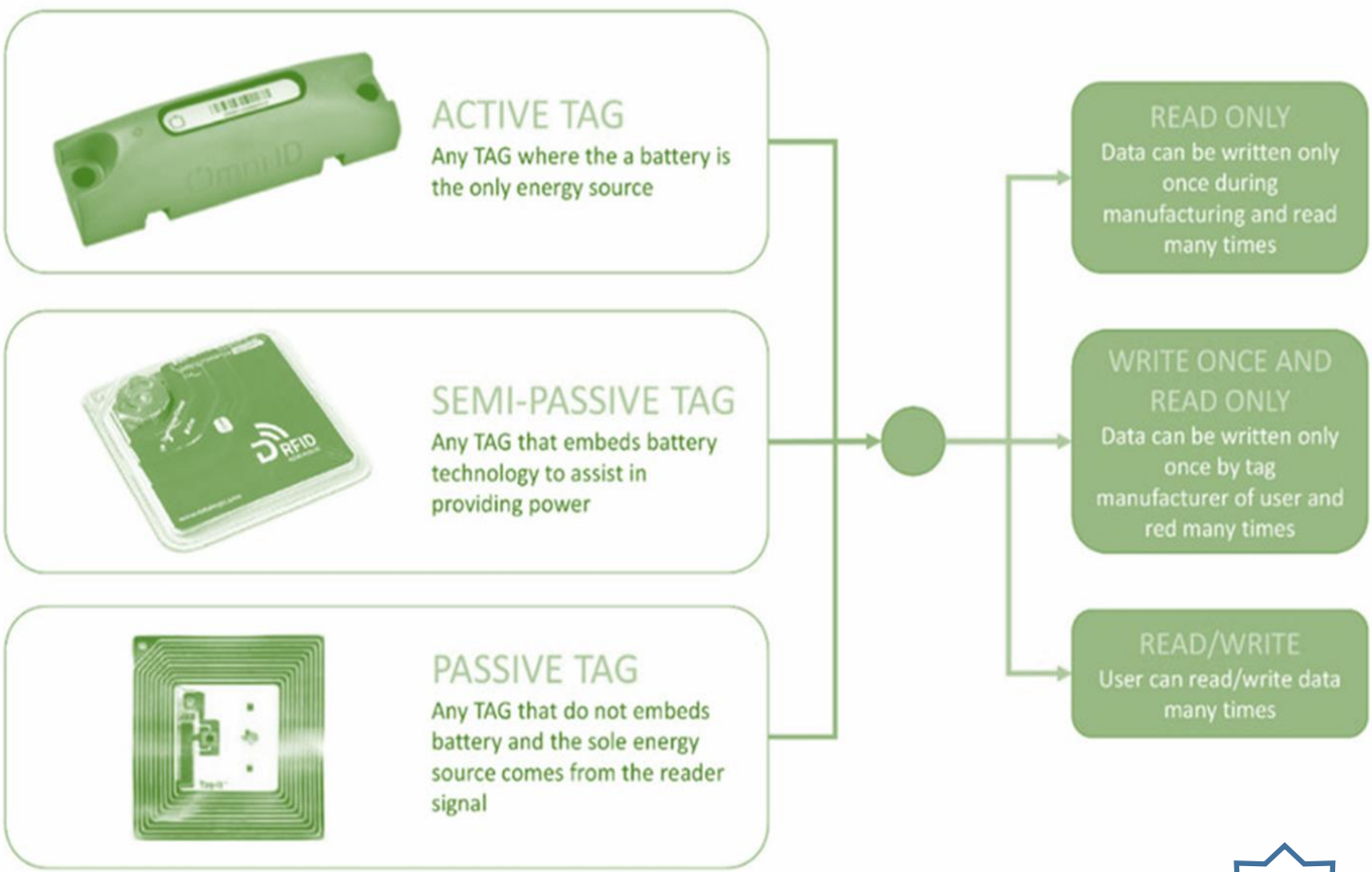
An active RFID tag has its own source of power, which is usually a battery.

❑ Passive Tag

Reading antenna, whose electromagnetic wave causes a current in the RFID tag's antenna, provides power to a passive RFID tag.

❑ Semi Passive Tag

Semi-passive RFID tags have a battery that powers the electronics while the RFID reader powers the connection.



Source : Diagram from Condemi et al. (2019)

RFID TAGS COMPARISON

Passive Tags	Active Tags
✓ Operate without the need of a battery	✓ An internal battery powers the device.
✓ Cost effective or Less Expensive	✓ More expensive
✓ Life is limitless (because of no battery)	✓ Finite lifetime (because of battery)
✓ Less weight (because of no battery)	✓ Greater weight (because of battery)
✓ Subject to noise	✓ Better noise immunity
✓ Use the reader's electromagnetic field to create power.	✓ Internal power is used to send the signal to the reader.
✓ More powerful readers are required.	✓ It's possible that it'll work with a weaker reader.
✓ Data transmission rates are lower.	✓ Higher data transmission rate
✓ There are fewer tags that can be read at the same time.	✓ More tags can be read at the same time.
✓ Greater sensitivity towards orientation	✓ Less orientation sensitivity

(Wyld, 2006)

RFID AND BARCODE COMPARISON

RFID	BARCODE
➢ It's possible to read it even if you don't have a clear line of sight	➢ To be read, you must have a clear line of sight.
➢ Multiple tags can be read at the same time.	➢ Can only be read individually
➢ Adaptable to severe or filthy surroundings	➢ If the book is broken or dirty, it cannot be read.
➢ Hold the capability to recognise a certain thi	➢ Can only identify the type of item
➢ New information can be overwritten	➢ Cannot be updated
➢ Can be tracked automatically, eliminating human mistake.	➢ Require manual tracking, making them prone to human mistake.

(R.T. White et al., 2007)

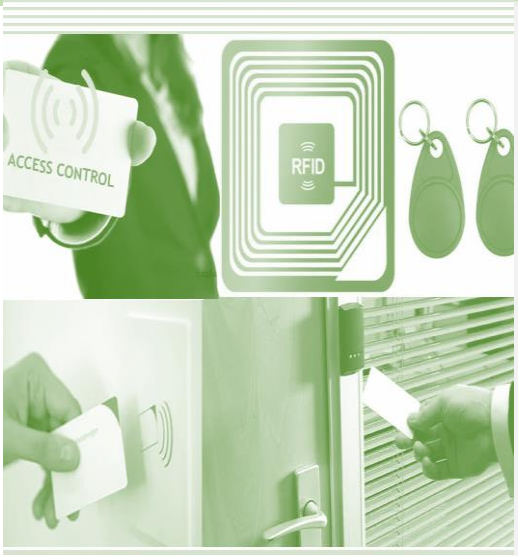
BENEFITS OF RFID

There are many benefits of RFID. Here are some of the benefits.

- Multiple tags can be read at the same time..
- The durability is excellent. It is much better protected and can be mounted internally, allowing it to be read in extremely severe settings.
- Once installed the system will be completely automated.
- The level of security is relatively high. Data can be encrypted, password secured, or include a "kill" option that permanently deletes data.
- With the use of RFID and automation, information sharing may be improved, such as transferring electronic money.
- During production, RFID could be utilised to ensure quality control.

(Mehrjerdi, 2011)

RFID APPLICATIONS



ACCESS CONTROL

Certain regions necessitate a certain level of protection and accessibility. RFID access control tags restrict entry to just those who have been pre-approved, from doors to parking lots.

LIBRARY MANAGEMENT

The library management system consists of RFID-tagged books, an RFID reader, a computer network, and software. In this library system, library staff are in charge of lending, returning, sorting, and tagging books with RFID tags. The RFID reader, which identifies and locates the book, can be used to locate RFID library books marked with RFID tags.

HEALTHCARE

RFID technology is being used in hospitals in a variety of ways, from tracking medical instruments to tracking people – patients, visitors, and personnel.

RFID APPLICATIONS

AGRICULTURE

Farmers may detect the health state of agricultural products by placing RFID tags on their packages, making it easier for processing companies to add information to the tag at the same time, such as enterprise codes, processing dates, batch processing, and package weight.

RETAIL

RFID in retail refers to the use of tags on merchandise that send signals to a reader. RFID in retail streamlines the manual and time-consuming inventory management process.

AIRLINE

RFID in airline involves operational activities area in baggage handling or baggage tags, cargo handling, passenger ticketing and security process.

QUIZ 6

How RFID technology help organization to save money and cost?

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What benefits for organization when they use RFID technology?

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CHAPTER 7

TECHNOLOGY AND THE WORKPLACE

DEFINITION OF WORKPLACE

- Workplace recognises the joint responsibility of facilities management, IT, and human resources to achieve optimal performance between people, technology, and workspace, anywhere that work happens, including hospitals, hotels, tourist attractions, and many other types of facilities.
- Workplaces represent a large proportion of any operation's costs, so when organisations bring people together, there must be a value to doing that. There is, and it comes about through making connections and creating a mutual purpose and direction.
- A workplace is a location where someone works for their employer, a place of employment. Such a place can range from a home office to a large office building or factory.

ADVANTAGE OF CHANGE WORKPLACE

❑ Opportunities

Opening the opportunities earning big project

New products that can be featured services and the most important opportunity is when there is a huge probability of knowledge that can be gained. From employees to management and whether it is a successful change or a not so successful one, it will bring about a better understanding of the business and market.

❑ Progress

This way work is done easier and faster, reducing the time and resources to get a higher rate of productivity and thus increases efficiency.

In other words, the company and the industry are progressing and the results will always look promising. Systems and processes develop because of the change and the employees are more innovative and creative leading to progress.

❑ Creativity

Embracing those changes that are necessary and one that fights the current problems that the company has can be a cause of growth. Whether the problem is with productivity, efficiency, faulty processes or just to update the obsolete technologies there is definite growth in the future.

DISADVANTAGES OF CHANGE WORKPLACE

❑ Morale

There will be a lot of pressure in getting a successful result from the change. Hence there will be a lot of resistance because of the added weight. Employees who did not explain why the changes are being done and how this is important for the company will lose their trust and bring about low morale.

❑ Inefficiency

During the first few months of implementing the changes, there will be a lot of mistakes taking place. It caused a downfall in the productivity chart during these months where the time spent mostly on adapting to the new changes, inefficiency is an inevitable outcome.

❑ Expenses

Any change will come at a cost. Whether it is the expense of buying the new technology or training the new tool for the employees, the change will come at a price that the company should handle beforehand.

Then it is essential that the management plans and strategizes the change before actually implementing them.

DEVELOPING TECHNOLOGIES

Technology has become firmly embedded in our personal lives and transformed the typical workplace. People are constantly on the lookout for cutting-edge technology, whether it's the latest smartphone or the most advanced automobile model. If we are constantly updating our personal technology, why shouldn't we be updating our professional technology as well? Technology is critical to the smooth and efficient operation of an organisation

REASON TO KEEP TECHNOLOGY UP TO DATE AT WORKPLACE

❑ Staying Innovative

An innovative workplace is on the cutting edge of technology, design and business practices. With a little creativity, you can come up with better ways to design products, connect with customers, market your business, and develop promotions.

❑ Computational Accuracy

Minor discrepancies in an organization can bring about large amounts of uncertainty. Modern spreadsheets like Excel, with their hundreds of computational formulas, help ensure accuracy.

❑ Industry Efficient

Whatever product or service you provide, you need to compete. Your competitors use technology, so you need to as well. The latest technology allows you to stay competitive and provide the best quality service or products possible.

❑ Maintain Organization

Technology helps in keeping the business organized. Systems like Project Management Software helps in building, allocating, reviewing, and assessing a task. Employers and managers can easily supervise workplace activities that help in keeping everything on track

REASON TO KEEP TECHNOLOGY UP TO DATE AT WORKPLACE

❑ Communicate Better, Collaborate More

Technology has given us a level of communication never seen before. We can connect with any one of our employees, leaders, and co-workers anytime, anywhere. The influx of new technology in the workplace has affected how employees communicate, collaborate, and work more efficiently.

❑ Security and Safety

The security of company information can be severely compromised without implementing proper channels of technology and software. Therefore, a company should implement innovative technology as a haven against such breaches of security.

❑ Increase Productivity

It's essential to study and utilize different hardware and software solutions that can improve employee productivity. Businesses nowadays rely on many tools to overcome the challenges of executing strategy every day. In addition, it enables managers to track progress more easily during every phase of goal completion and offer immediate reinforcement or coaching to keep performance and deadlines on track.

QUIZ 7

Technology plays an important role in workplace sustainability. The way we work is constantly changing and technology plays a pivotal role in that revolution especially in this COVID 19 challenging time.

Interpret THREE (3) situations where COVID 19 change a workplace tradition

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NOTES

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