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REA619
Property and Facility Management

Lecture 10



Real Estate Management

Lecture 10

REA619

Property and Facility Management

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Dr. Weam Nasan Agha

Recap-Lecture 9

Facility Management Organization

Concept

Comparison Table (FM Organization vs.
Demand Organization)

Perspectives for Classifying the FM
Organization

❖ Organizational Structure and
Management Function

❖ Extent of Embeddedness within
the Demand Organization

❖ Service Delivery Options

❖ Support Processes and Activities

❖ Dynamic Capabilities

Recap-Lecture 9

Procurement in Facility Management

Concept

Key Stages in the FM Procurement Cycle

Facility Maintenance Management

Concept

Maintenance Strategy

Maintenance Policy

Maintenance Methods

Steps of the Maintenance Process

* Contents *

- ❖ Facility Maintenance Management
- ❖ Sustainability in Facility Management
- ❖ Information Management in Facility Management

Facility Maintenance Management

Building Logbook

The building logbook is a fundamental reference document that compiles the essential information required for the efficient operation and maintenance of a facility. It presents the design assumptions and explains the building systems in a manner that can be understood by both specialists and non-specialists.

The logbook is used as a **dynamic document** that is continually **updated**. In some countries, the **logbook** is considered a **mandatory requirement** under relevant legislation.

It is recommended that the **Building Logbook** be incorporated into the **Facility Handbook**, which includes legal, financial, technical, and managerial information.

In the absence of a building logbook, the operational and maintenance data should be directly included in the Facility Handbook.

Facility Maintenance Management

Building Logbook

Section	Purpose	Content
Design Information	Understanding the design basis	• Design assumptions • Performance criteria • Materials and specifications
Engineering Services Information	Operation and maintenance	• Description of systems • Schematics and drawings • Operating specifications
Maintenance Requirements	Ensuring proper maintenance	• Maintenance schedules • Safety procedures • Inspection requirements
Safety Information	Ensuring safety	• Emergency procedures • Alarm systems • Contact points
Performance Data	Continuous improvement	• Energy consumption • Performance indicators • Maintenance history

Facility Maintenance Management

Asset Register

Item	Description
Asset Description	Description of the asset's nature, type, and unique identification number.
Criticality Level	The extent to which the asset affects the continuity of facility operations.
Condition / Deterioration Status	Excellent – Good – Fair – Poor – Unsafe.
Technical Details	Manufacturer, model, year of manufacture, and any essential technical information.
Operational History	Date of installation, purchase, or commissioning.
Location	The physical location of the asset within the facility.
Costs	Initial cost, routine maintenance costs, and depreciation value.
Maintenance Requirements	Type and frequency of required service, along with spare parts needs.
Replacement Cycle (Life Expectancy)	Expected period for asset replacement based on its condition and criticality.
Energy and Consumption	Energy consumption and operational efficiency rating.
Risks	Risks associated with the asset and their impacts on health, safety, environment, or property.

Facility Maintenance Management

Facilities Inspection and Assessment

Inspection Types

Routine Inspection

General Inspection

Detailed Inspection

Safety Inspection

Facility Maintenance Management

Facilities Inspection and Assessment

Type	Purpose / Objective	Frequency	Outputs	Responsible Party
Routine Inspection	Identifying minor issues and tracking immediate user-reported problems.	Weekly / Monthly	Immediate corrective actions	Internal Maintenance Team
General Inspection	Assessing the overall condition of the building and systems, and identifying needs and future plans.	Annually	Maintenance budget	Facility Managers
Detailed Inspection	Conducting a comprehensive assessment of all systems and assets to develop a long-term plan.	Every 3 years	Long-term plan	External Consultants
Safety Inspection	Ensuring compliance with HSSE requirements and safety regulations, and improving safety performance.	Quarterly	Compliance reports and safety improvements	Safety Team

Facility Maintenance Management

Facilities Inspection and Assessment

Inspection Report Structure

Item	Description
Condition Assessment	Classifying the condition of the element (Excellent, Acceptable, Poor).
Priorities	Identifying urgent and non-urgent tasks.
Estimated Costs	Estimating the cost of repairs or replacements.
Scheduling	Specifying the execution timeline for each task.

Facility Maintenance Management

Computerized Maintenance Management Systems (CMMS) Advantages

Asset Tracking

- Maintain records of asset conditions and maintenance history.

Task Scheduling

- Set automated maintenance schedules based on priorities.

Inventory Management

- Track available spare parts and equipment.

Reporting

- Generate performance reports and KPI metrics.

Integration with BMS

- Connect with the Building Management System to monitor energy and security.

Risk Management

- Identify asset-related risks and implement preventive measures.

Continuous Improvement:

- Use performance data to enhance maintenance operations

Facility Maintenance Management

Building Management Systems (BMS)

Building Management Systems (BMS) are among the most important smart tools used to ensure the optimal operation of modern buildings. They provide integrated monitoring and control of energy, ventilation, lighting, and safety systems, while enhancing operational efficiency and reducing maintenance and consumption costs.

Energy Reduction

- Automated control of temperature and lighting based on occupancy and usage patterns.

Performance Monitoring

- Early detection of equipment malfunctions through continuous data analysis

Integration with CMMS

- Seamless data exchange with Computerized Maintenance Management Systems to enhance maintenance efficiency.

Enhanced Occupant Comfort

- Automatic adjustments to temperature, ventilation, and air quality to maintain comfort standards.

Security and Safety

- Integration with fire detection systems and security networks for rapid emergency response

Facility Maintenance Management

Building Management Systems (BMS)

Key Features of Smart Building Management Systems

Function	Technologies Used	Benefits
Indoor Environment Monitoring	• Temperature sensors • Air quality sensors • Humidity meters	• Enhanced occupant comfort • Improved air quality • Better health and safety
Energy Management	• Smart meters • Lighting control systems • Optimized HVAC systems	• Reduced energy consumption • Lower operational costs • Decreased environmental impact
Security System	• Surveillance cameras • Access control systems • Fire alarm devices	• Protection of people and assets • Rapid emergency response • Compliance with regulations
Data Analytics	• Analytical algorithms • Performance reports • Fault prediction tools	• Continuous improvement • Informed decision-making • Failure prevention

Facility Maintenance Management

Building Management Systems (BMS)

Key Challenges of Building Management Systems (BMS)

- ❖ **Initial Cost:** High expenses associated with installation, integration, and operation.
- ❖ **Technical Integration (Interoperability):** Difficulty in integrating multiple systems—such as HVAC, lighting, and security—into a unified platform.
- ❖ **Cybersecurity:** Risks of breaches or unauthorized access if adequate protection measures are not in place.
- ❖ **System Maintenance:** The need for continuous maintenance to ensure reliability and prevent system downtime.
- ❖ **Training:** The necessity to train users and technicians on system operation and data analysis.

Facility Maintenance Management

Maintenance Success Indicators

Maintenance Success Indicators

User Satisfaction:
Measuring the satisfaction levels of facility users

Performance Improvement:
Utilizing specific, measurable performance indicators.

Cost Savings:
Enhancing efficiency and reducing operational expenses.

Compliance:
Ensuring adherence to legal and regulatory requirements.

Sustainability:
Improving environmental and social sustainability.

Sustainability in Facility Management

Sustainability has become a central pillar in **facilities management** today. It goes beyond merely reducing environmental harm to represent a **strategic responsibility** that encompasses environmental, social, and economic dimensions.

Environmental Dimension

provides the ecological
foundation

Sustainability

Social Dimension

ensures responsiveness to
human and community
needs

Economic Dimension

guarantees continuity and
financial efficiency

The **success** of a facilities manager depends on the ability to **integrate** these **three dimensions** into a **unified strategy** in which each dimension reinforces the others

Sustainability in Facility Management

Environmental Sustainability

Environmental sustainability is considered the **cornerstone** of **modern facilities management**. It aims to reduce the negative environmental impact of operational activities and preserve natural resources for future generations. This is achieved through a set of strategic actions, the most prominent of which are:

Improving energy efficiency

Achieving net-zero carbon

Water management

Waste management

Environmental Management Systems (EMS)

Sustainability in Facility Management

Environmental Sustainability

Improving energy efficiency

- Implementing **Building Management Systems (BMS)** and **smart Building Management Systems (SBMS)** to reduce energy consumption.
- **Complying** with energy efficiency regulations.
- Obtaining environmental certifications such as BREEAM or LEED, which serve as benchmarks for assessing a building's environmental performance.

System	Description	Advantages	Disadvantages / Challenges
BREEAM	A British system for assessing the environmental performance of buildings.	Comprehensive, internationally recognized, covers all life-cycle stages.	May be complex to implement in certain regions.
LEED	A U.S. system focusing on sustainable design and construction.	Widely adopted, includes financial incentives.	May require high initial costs to meet requirements.
Green Star	An Australian system focusing on the sustainability performance of buildings.	Well-suited to the Australian context, easy to apply.	Limited adoption outside Australia.
SKA (RICS)	A system by the Royal Institution of Chartered Surveyors focusing on sustainability in practices.	Emphasizes economic and practical aspects.	Relatively new and requires broader adoption.

Sustainability in Facility Management

Environmental Sustainability

Improving energy efficiency

Criterion	Building Management Systems (BMS)	Smart Building Management Systems (SBMS)
Main Purpose	Centralized control of heating, cooling, ventilation, and lighting	Providing an interactive environment that relies on automation and adapts to users and operational conditions
Sensors	Wired sensors (temperature, smoke, humidity)	Wireless, high-precision sensors (motion, air quality, occupancy)
Data	Basic data such as temperature levels and energy consumption	Big data with predictive analytics (occupancy patterns, air quality, user behavior, resource consumption)
Technology Used	Traditional electrical and mechanical control systems	IoT, artificial intelligence, cloud computing, machine learning
Integration	Limited integration between specific systems (e.g., HVAC and lighting only)	Full integration between security, access control, energy systems, elevators, lighting, and occupancy management
Control	Manual or partial control	Automated and predictive control
Flexibility	Changes require physical modifications	High flexibility
Cost	Moderate cost depending on system size	Higher initial cost with significant operational savings and predictive maintenance benefits
Practical Examples	Scheduling-based lighting control, HVAC operation during working hours, monitoring equipment rooms	Facial-recognition access, automatic lighting adjustment based on occupancy, predictive maintenance of elevators/pumps, asset tracking

Sustainability in Facility Management

Environmental Sustainability

Achieving net-zero carbon

- **Designing, constructing, and operating** facilities in ways that minimize carbon dioxide emissions throughout all stages of the facility life cycle.
- This includes **using environmentally friendly materials, applying renewable energy systems** (such as solar panels), and **enhancing building insulation**.

Water management

- **Applying** water-saving measures such as rainwater harvesting,
- **Installing** dual-flush toilets and water-efficient fixtures,
- **Implementing** water safety plans to ensure the quality of the resource.

Sustainability in Facility Management

Environmental Sustainability

Waste management

- **Reducing** waste during the design and construction phase (recycling and reuse).
- **Organizing** processes for sorting, storing, and disposing of waste with a focus on recycling and minimizing waste generation.
- **Applying** environmentally friendly maintenance practices to reduce hazardous waste.

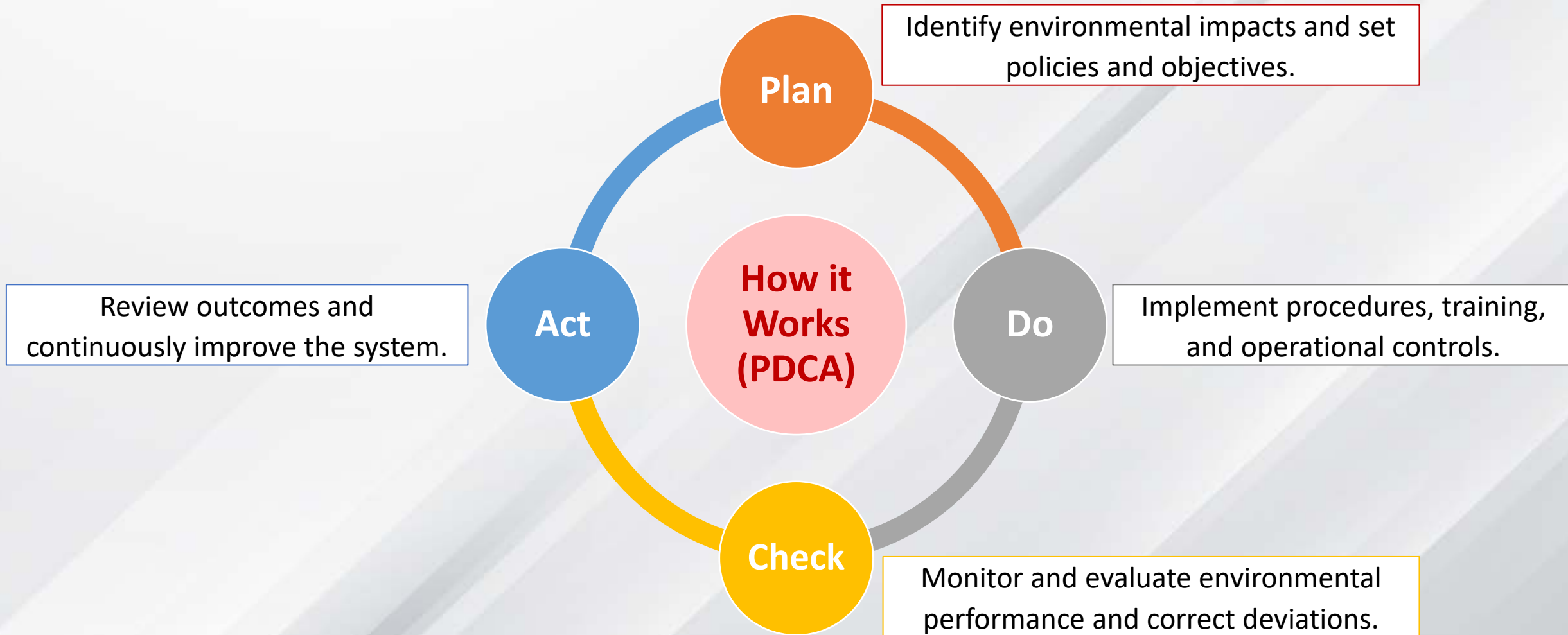
Environmental Management Systems (EMS)

- **The Environmental Management System (EMS)** is a structured managerial framework that enables organizations to systematically and continuously manage their environmental impacts. **ISO 14001** is the most widely recognized international EMS standard.

Sustainability in Facility Management

Environmental Sustainability

Environmental Management Systems (EMS)



Sustainability in Facility Management

Environmental Sustainability

Environmental Management Systems (EMS) Advantages

Leadership-Level Advantages	• Reinforces the organization's commitment to sustainability. • Supports long-term environmental goal-setting. • Integrates sustainability into facility management strategies.
Outcome-Level Advantages	• Reduces consumption of natural resources (energy, water, materials). • Improves indoor environmental quality (air, lighting, thermal comfort). • Creates healthier, more attractive spaces for users. • Contributes to enhancing quality-of-life indicators within the community.
Value-Creation Advantages	• Reduces operational costs. • Minimizes waste and generates financial savings. • Supports flexible work environments and enhances user well-being. • Lowers risks associated with hazardous materials.

Sustainability in Facility Management

Social Sustainability

Social sustainability focuses on enhancing the quality of life for users and the surrounding community. It encompasses a set of responsibilities that facility managers must uphold:

Healthy and Safe Indoor Environment

Community Engagement and Corporate Social Responsibility (CSR)

User Social Sustainability

Accessibility and Inclusiveness

Reducing Negative Transportation Impacts

Sustainability in Facility Management

Social Sustainability

Healthy and Safe Indoor Environment

- Providing a comfortable workspace in terms of lighting, temperature, indoor air quality, and the removal of hazardous elements such as toxic materials or dust. This contributes to improving user health and productivity.

Community Engagement and Corporate Social Responsibility (CSR)

- Facilities should contribute to community development through initiatives such as supporting local community projects, providing public spaces, and hiring local residents. This also includes respecting workers' rights and ensuring fair working conditions.

Sustainability in Facility Management

Social Sustainability

User Social Sustainability:

- Educating users about the importance of sustainable practices—such as turning off unnecessary lights, reducing water consumption, and sorting waste—through awareness campaigns and training programs.

Accessibility and Inclusiveness

- Providing adaptable spaces that meet diverse user needs, including persons with disabilities, by designing accessible pathways and appropriate facilities.

Reducing Negative Transportation Impacts

- Minimizing emissions related to daily commuting by encouraging the use of public transportation, providing cycling facilities, or designing facilities close to transit stations.

Sustainability in Facility Management

Economic Sustainability

Economic sustainability refers to managing facilities in a way that ensures efficient resource use and reduces long-term costs while preserving the value of real estate assets. The key strategies include:

Life-Cycle Costing (LCC)

Balancing Capital and Operational
Expenditures (CAPEX & OPEX)

Enhancing Efficiency and Reducing Waste

Increasing Property Value

Leveraging Financial Incentives

Sustainability in Facility Management

Economic Sustainability

Life-Cycle Costing (LCC)

- Evaluating investment options based on the total costs incurred throughout the facility's lifespan, not just the initial capital cost. For example, investing in renewable energy systems or high-quality insulation may involve higher upfront expenses but results in substantial operational savings over the years.

Balancing Capital and Operational Expenditures (CAPEX & OPEX)

- Selecting solutions that offer an optimal balance between initial investment and ongoing operational expenses, such as using durable materials that minimize future maintenance costs.

Sustainability in Facility Management

Economic Sustainability

Enhancing Efficiency and Reducing Waste

- Utilizing technologies like Building Management Systems (BMS) and smart sensors to reduce energy and water consumption, thereby lowering operational costs sustainably.

Increasing Property Value

- Sustainable facilities with environmental certifications (such as LEED or BREEAM) attract new tenants and provide a competitive advantage, boosting property value and delaying the need for costly renovations.

Leveraging Financial Incentives

- Taking advantage of government incentives such as tax exemptions or grants dedicated to sustainable projects, which reduce financial burdens and improve return on investment.

Sustainability in Facility Management

Sustainability is not an option; it is a fundamental requirement in today's real estate market due to environmental pressures, regulatory demands, and tenant expectations.

Integration is key: sustainability cannot be achieved through isolated actions.

Technology is an essential partner: BMS, sensors, RFID, artificial intelligence, and Building Information Modeling (BIM) are critical tools for improving and monitoring sustainable performance.

Flexibility and adaptability: designing facilities to accommodate technological and functional changes is a defining trait of sustainable and smart buildings.

The facility manager plays a central role: acting as a bridge between sustainability strategies and practical implementation, data collection, performance management, and CSR policy execution.

Sustainable communities are the ultimate goal: extending the focus beyond a single building to the development of fully sustainable neighborhoods that integrate housing, workplaces, services, and renewable energy.

Information Management in Facility Management

Information is the lifeblood of facility management. **Without it**, an organization cannot fully control or reliably account for its assets.

Information management is a fundamental pillar for the success of facility management operations.

The aim of information management is to ensure that accurate, up-to-date, and accessible information is available to the responsible team to **prepare** the facilities handbook, **support** sound decision-making, and **ensure** compliance with legal and regulatory requirements.

Every **asset** in a facility has an associated “**information asset**.”

The quality of information directly affects safety, security, legal compliance, efficiency, and cost reduction.

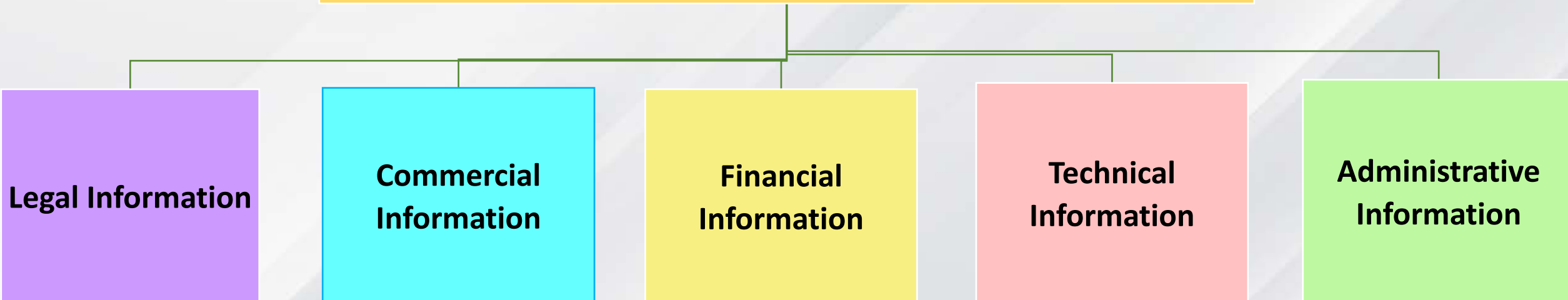
Sound decisions depend on **accurate information**.

Information Management in Facility Management

Data Classification

Type	Characteristics	Examples
Structured Data	Digital, stored in databases	Facility details, users, service providers
Unstructured Data	Non-digital, usually paper-based	Photos, drawings, contracts, documents

Classification of Facility-Related Information



Information Management in Facility Management

Classification of Facility-Related Information

Category	Main Content	Management Objectives	Update Frequency	Importance Level
Legal Information	Lease contracts, work permits, health and safety compliance records, periodic inspection records.	Ensuring legal compliance and providing evidence in cases of legal inquiries.	Upon change	Critical
Commercial Information	Property valuation figures, insurance policies, service level agreements (SLAs), market data.	Supporting negotiations and improving service provider performance.	Annual/ Semi-annual	High
Financial Information	Budgets, expenditure records, cost data, accounting reports.	Cost control and evaluating spending effectiveness.	Monthly/ Quarterly	Very High
Technical Information	As-built drawings, operation and maintenance procedures, facility condition records, environmental assessment reports.	Ensuring safe and efficient facility operations and improving maintenance cycles.	Continuous	Critical
Administrative Information	Organizational charts, emergency procedures, team performance records, actual facility assessment reports.	Supporting daily operations and improving communication between teams.	Quarterly	High

Information Management in Facility Management

Information Management Strategy

The Information Management Strategy is the framework that defines the overall objectives for collecting, analyzing, storing, and updating information, while specifying its access levels.

The four main aspects of The information management strategy

Operations:

Defining processes and integrating facility management into core business operations

Resources:

The human and financial resources needed to capture, process, and exchange information

Technology:

Supporting information and communication technology systems

Policies and Standards:

Internal policies for consistency and standards for interoperability

Information Management in Facility Management

Information Management Procedures

(1) Collection and Entry

Identifying sources →
Collection procedures →
Validation → Secure data
entry

(2) Updating and Maintenance

- Regular update procedures
- Version control
- Preventing unauthorized local copies

(3) Sharing and Communication

- Determining who needs what and when
- Appropriate communication channels
- Ensuring accessibility for all

(4) Archiving and Disposal

- Retention policies
- Secure archiving procedures
- Secure disposal when no longer needed

Information Management in Facility Management

Success Factors in Information Management:

Ensuring that the right employees have access to the required information

Considering information as an asset that can be leveraged

Ensuring the privacy, security, authenticity, and integrity of information

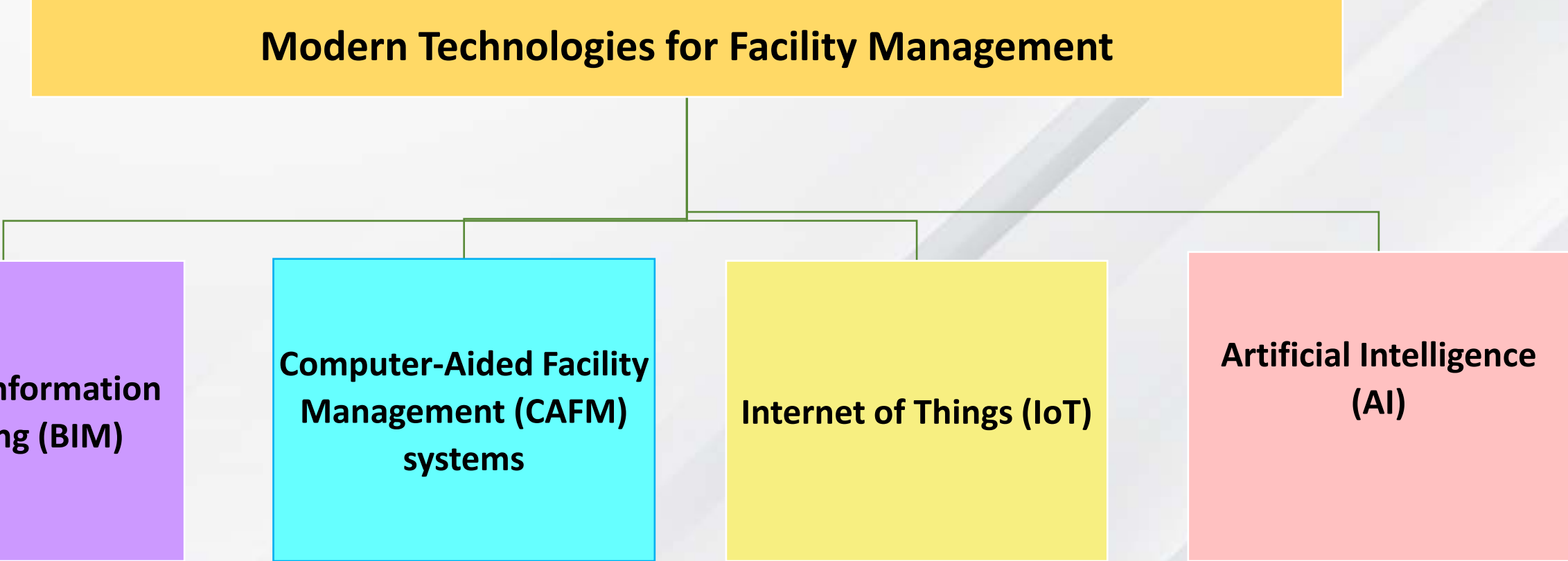
Adding value to the services provided

Reducing exposure to risks

Lowering operational costs

Information Management in Facility Management

Modern Technologies for Facility Management



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graph TD; A[Modern Technologies for Facility Management] --> B[Building Information Modeling (BIM)]; A --> C[Computer-Aided Facility Management (CAFM) systems]; A --> D[Internet of Things (IoT)]; A --> E[Artificial Intelligence (AI)];
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**Building Information
Modeling (BIM)**

**Computer-Aided Facility
Management (CAFM)
systems**

Internet of Things (IoT)

**Artificial Intelligence
(AI)**

Information Management in Facility Management

Building Information Modeling (BIM)

Building Information Modeling (BIM) is an integrated digital environment that contains the engineering and technical data of a facility.

It can be expanded to include time and cost data through 4D–5D models, making it a comprehensive platform for managing the facility’s lifecycle and creating the digital twin.

The main benefits of BIM:

- ✓ Providing a permanent digital model of facilities that can be easily updated.
- ✓ Reducing errors in documentation and information.
- ✓ Supporting sound decision-making in facility management

Information Management in Facility Management

Building Information Modeling (BIM)

Stage	Key Models / Standards	Brief Description	Model or Data Content	Final Objective
Design & Construction Stage	PIM (Project Information Model) + IFC (Industry Foundation Classes)	The project information model used during design, coordination, and construction.	Engineering data, quantities, system details, technical execution information.	Supporting design, coordination, and construction management.
Data Exchange & Handover Stage	EIR (Exchange Information Requirements) + COBie (Construction Operations Building Information Exchange)	Defines the owner's data transfer requirements and information exchange standards between parties.	Operation and maintenance schedules, asset information, equipment data, warranties, specifications.	Transferring project data from the construction team to the owner in an organized, usable format.
Operations & FM Stage	AIM (Asset Information Model)	The asset information model based on data received during the handover stage.	Operation and maintenance data, asset records, equipment lifespans, locations, repair histories.	Managing the facility throughout its lifecycle and improving performance.

Information Management in Facility Management

Building Information Modeling (BIM)

IFC = Exchange of the engineering model + data in a 3D format

A global open standard for exchanging 3D BIM models and their associated data between different software platforms without information loss.

COBie = Exchange of asset and maintenance data in structured spreadsheets

A data format based on tables/files (such as Excel/CSV/XML) for transferring the asset information required for operation and maintenance.

Information Management in Facility Management

Computer-Aided Facility Management (CAFM) systems

Computer-Aided Facility Management (CAFM) systems are digital platforms that help organizations manage all aspects of facility management—including building management, asset management, and operational services—in an organized and efficient manner.

They support everything from space planning to tracking maintenance and expenditures through the use of a centralized database and digital tools.

The main benefits of CAFM:

- ✓ Improving operational efficiency and service quality
- ✓ Reducing maintenance costs
- ✓ Enhancing risk management
- ✓ Facilitating compliance with regulations and standards
- ✓ Saving time and effort compared to manual management through the ability to exchange data with the Building Information Model (BIM)

Information Management in Facility Management

Computer-Aided Facility Management (CAFM) systems

Category	Key Features
Financial Control	Budget monitoring, cost accounting, expenditure tracking.
Asset Management	Asset registry, technical condition monitoring, maintenance tracking.
Daily Operations	Work request logging, task tracking, performance reporting.
Space Planning	Optimizing space utilization, planning layout changes.
Performance Monitoring	Key performance indicators (KPIs), exception reports.

Information Management in Facility Management

CAFM vs.BIM

Element	CAFM	BIM
Nature	An operational software system for facility management	A 3D digital engineering model
Main Objective	Managing operations, maintenance, assets, and spaces	Supporting design, construction, and engineering coordination
Areas of Use	Maintenance – Asset management – Space management – Contracts – Energy	Design – Modeling – Coordination – Clash detection – Documentation
Strength	Enhances daily operations and reduces operational costs	Provides an accurate model that supports engineering decision-making
Weakness	Lacks detailed 3D engineering information	Requires continuous updating and technical expertise
Main Users	Facility managers – Technicians – Contractors – Service providers	Architects – MEP engineers – Contractors
Integration Relationship	Utilizes BIM data for operation and maintenance	Supplies CAFM with the engineering data required for operation
Major Software	Archibus – Planon – FM:Systems – IBM Maximo – Infor EAM – Hippo CMMS – FSI Concept Evolution – Maintenance Connection	Autodesk Revit – Navisworks – ArchiCAD – Bentley AECOsim – Autodesk BIM 360 – Tekla Structures – Trimble Connect – Solibri Model Checker

Information Management in Facility Management

Internet of Things (IoT)

The Internet of Things (IoT) is a system of internet-connected devices that collect real-time data on facility performance. However, it requires careful attention to security integration issues

The main benefits of IOT:

- ✓ Automation: Performing tasks without human intervention
- ✓ Remote Control: Management from anywhere
- ✓ Efficiency: Optimizing resource utilization
- ✓ Cost Reduction through improved energy use

Information Management in Facility Management

Internet of Things (IoT)

Field	Application	Benefit
Energy Management	Smart sensors	Improved consumption
Indoor Environmental Quality	Continuous monitoring	User comfort
Remote Healthcare	Monitoring devices	Support for the elderly and people with disabilities
Predictive Maintenance	Fault detection sensors	Reduced downtime

Information Management in Facility Management

Artificial Intelligence (AI)

AI is used to analyze data and predict future needs, such as determining maintenance schedules before failures occur, and improving the efficiency of facility management operations.

AI Applications in the Facility Lifecycle:

(1) Design Phase

- Identifying missing components
- Warning of unsafe conditions
- Enhancing energy efficiency

(2) Construction Phase:

- Mapping existing facilities
 - Pattern recognition
 - Detailed surveying

(3) Operation Phase:

- Remote monitoring
- Predictive maintenance
- Advanced analytics

Information Management in Facility Management

Artificial Intelligence (AI)

Impact of AI on Facility Services

Service Area	Traditional Solution	AI-Based Solution	Employment Impact
Catering	Human chefs	Robotic chefs + AGVs (Autonomous Guided Vehicles)	↓ High
Cleaning	Cleaning workers	AGVs + robots + drones	↓ Very High
Waste Disposal	Manual workers	Automated AGVs	↓ Medium
Security / Inspection	Security guards	AGVs + thermal camera drones	↓ Medium–High
Maintenance	Technicians	Smart applications + robots + 3D printing	↓ Medium
Reception / Assistance	Staff	Actroids (Human-like robots)+ smart applications	↓ High
Logistics	Transport workers	Actroids + AGVs + autonomous vehicles	↓ High

Information Management in Facility Management

Artificial Intelligence (AI)

Smart Applications

**CMMS
Applications**

**Space &
Workplace
Management
Applications**

**IoT-Based
Facility
Applications**

**Security &
Access
Applications**

**Energy
Management
&
Sustainability
Applications**

**Occupant
Experience
Applications**

**Digital Twin
& BIM-Linked
Applications**

Information Management in Facility Management

Artificial Intelligence (AI)

Main Category	Application	Primary Function	Notes
CMMS Applications	UpKeep	Work orders, asset tracking, preventive maintenance	Efficient field maintenance management
	Fiix Mobile	Failure management, maintenance schedules, analytics	Supports data-driven decision-making
	Hippo CMMS	Receiving maintenance requests and tracking completion	Improves performance and completion tracking
Space & Workplace Management Applications	Eptura	Desk and room booking, occupancy tracking	Organizes the utilization of office spaces
	Archibus Mobile	Space management, maps, usage analysis	Enhances spatial planning and performance analysis
	Planon App	Event scheduling and space allocation management	Supports resource and space management

Information Management in Facility Management

Artificial Intelligence (AI)

Main Category	Application	Primary Function	Notes
IoT-Based Facility Applications	Honeywell Forge	System monitoring, air quality, building performance	Real-time data supporting smart operations
	Schneider Eco Structure	Energy and asset management via IoT	Enhances energy efficiency and building sustainability
	Bosch Building Technologies	Tracking environmental, motion, and security data	Supports intelligent monitoring and control
Security & Access Applications	LenelS2 Mobile	Door and sensitive area control	Building security and smart monitoring
	HID Mobile Access	Using the phone as an access card	Facilitates user access and entry control
	Genetec Security Center App	Management of integrated cameras and security devices	Comprehensive monitoring and device coordination

Information Management in Facility Management

Artificial Intelligence (AI)

Main Category	Application	Primary Function	Notes
Energy Management & Sustainability Applications	Energy CAP Mobile	Energy consumption analysis and operating bills	Reduces costs and improves efficiency
	Lucid Building OS	Energy monitoring linked to sustainability goals	Supports environmental sustainability objectives
	DEXMA Energy App	Pattern detection and waste reduction	Smart energy control and data analytics
Occupant Experience Applications	ServiceNow Facilities App	Receiving and resolving user requests via mobile	Improves user experience and building interaction
	Comfy App	Customizing workspace based on employee preferences	Enhances employee comfort and productivity
Digital Twin & BIM-Linked Applications	Autodesk Tandem	Creating and linking a digital twin with operational data	Integrated building lifecycle management
	Matterport App	3D building models linked to asset management	3D visualization of facilities and assets
	Willow Twin	Performance analytics and building behavior prediction	Supports strategic operational decision-making
	Autodesk Construction Cloud	Using BIM models for asset and maintenance management	Integrating maintenance with the building's digital model

Information Management in Facility Management

The Main Challenges

Main Challenge	Description	Proposed Solutions
Data duplication and inconsistency	The presence of multiple versions of the same data across different systems leads to incorrect decisions and loss of efficiency.	- Using centralized systems (such as CAFM or AIM) to store data - Applying strict policies to control duplicate records - Adopting protocols such as IFC and COBie to ensure data standardization.
Lack of timely and accurate information	Delays in accessing the required data affect asset maintenance and facility management.	- Establish periodic schedules for reviewing and validating data accuracy - Training teams on smart applications and mobile devices for real-time data collection - Adopting dashboard tools for performance monitoring.
Cybersecurity risks	Threats such as hacking, viruses, or data loss impact the safe operation of facilities.	- Implement strict security policies, regularly update systems and software - Use encryption and multi-factor authentication (MFA) - Train employees on cybersecurity best practices.
Employee resistance to change	Low adoption of new technologies may reduce the effectiveness of digital transformation.	- Develop continuous training programs - Involve employees in designing digital processes Use user-friendly applications to increase adoption of smart systems.

Information Management in Facility Management

The Main Challenges

Main Challenge	Description	Proposed Solutions
Platform fragmentation and system incompatibility	Using different applications and systems from multiple vendors creates difficulty in information exchange.	▪ Adopt international standards such as ISO 19650 and IFC ▪ Use a Common Data Environment (CDE) to Integrate different applications ▪ define unified APIs to ensure compatibility.
Difficulty updating legacy systems	Some old systems cannot integrate with modern solutions, hindering digital transformation.	▪ Plan periodic replacement of outdated systems ▪ Use middleware solutions to connect old and new systems ▪ Adopt continuous software updates to align with technological changes.
Inefficient big data management	The accumulation of large data generated by IoT and smart applications makes it difficult to analyze and utilize.	▪ Use advanced data analytics tools (AI Analytics) ▪ Store data in cloud environments (Cloud Computing) ▪ Establish integrated databases to support operational decision-making.
Employee resistance to change	Low adoption of new technologies may reduce the effectiveness of digital transformation.	▪ Develop continuous training programs ▪ Involve employees in designing digital processes ▪ Use user-friendly applications to increase adoption of smart systems.

Lecture Summary: Quick Review

Facility Maintenance Management

Building Logbook

Asset Register

Facilities Inspection and Assessment

**Computerized Maintenance Management
Systems (CMMS) Advantages**

Building Management Systems (BMS)

Maintenance Success Indicators

Sustainability in Facility Management

Concept

Environmental Sustainability

Social Sustainability

Economic Sustainability

Lecture Summary: Quick Review

Information Management in Facility Management

Concept

Data Classification

Classification of Facility-Related Information

Information Management Strategy

Information Management Procedures

Success Factors in Information Management:

Modern Technologies for Facility Management
(BIM, CAFM, IOT,AI)

The Main Challenges



Thank You