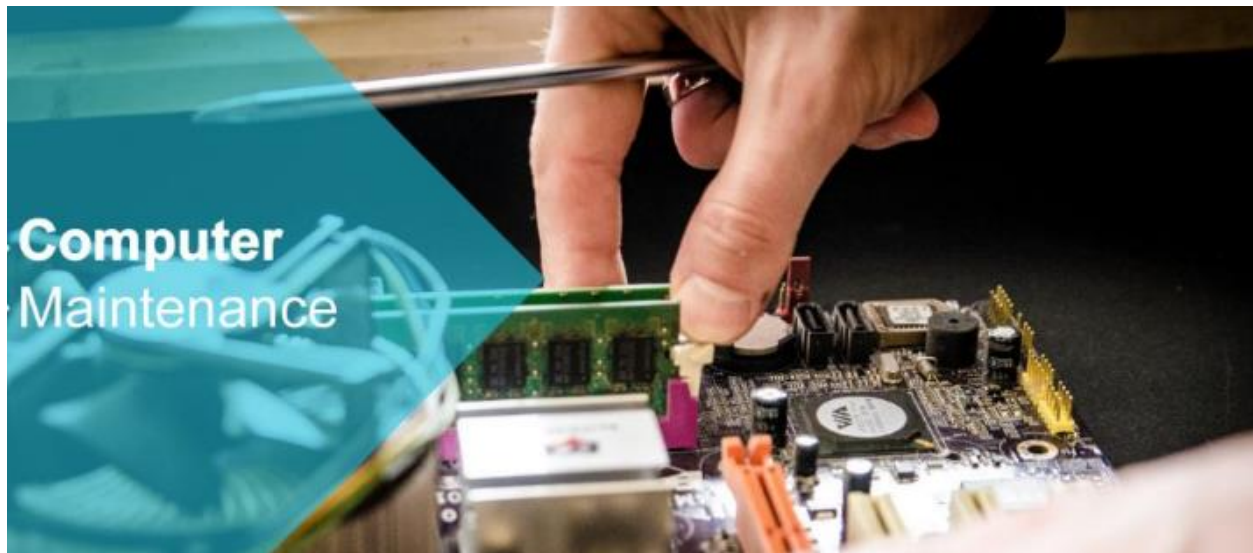


# Hardware and Network Servicing

## Level-IV

Based on March 2023, Curriculum Version- II



**Module Title: - Determine Maintenance Strategy**

**Module code: - EIS HNS4 M06 1123**

**Nominal duration: 30 Hour**

**Prepared by: Ministry of Labor and Skill**

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## Acronym

FMEA	Failure Mode and Effects Analysis
CMMS	Computerized Maintenance Management Systems
SLA	A service-level agreement
KPI	Key Performance Indicators
MTBF	Mean time between failures
MTIR	Mean time to repair
TPM	Total Productive Maintenance
RTF	Run-to-Failure
COO	Chief Operations Officer

## Introduction to the Module

This module provide you to obtain knowledges that required to determine and operationalize maintenance strategies and supporting processes to achieve continuity of IT operations and business functions in general.

### This module covers the units:

- Identify and analyze maintenance needs
- Service level agreements
- Formulate maintenance strategy
- Client and supplier processes and standards

### Learning Objective of the Module:

- Identify risks to business continuity
- Document warranty status
- Identify risks and problems
- Prepare service-level agreement
- Identify and Examine maintenance options and strategy
- Create reporting procedures for service requests
- Set-up help desk or other support function

### Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the specific objectives of this Learning Guide.
2. Read the information that this module contain.
3. Complete the Self-check.
4. Submit your accomplished Self-check.
5. Do the Operations which in the module.
6. Do the LAP test in page (if you are ready) and show your output to your teacher.

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## Unit One: Identify and analyze maintenance needs

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Risks to business continuity
- Systems architecture and configuration documentation for currency
- Equipment and/or software audit
- Warranty status of components and/or software
- Critical components and/or software document recommendation
- Documentation of risks and problems
- Create maintenance solutions meet to business needs

This unit will also support you to accomplish the learning outcomes stated in the cover page.

Specifically, upon completion of this module, you will be able to:

- Identify risks to business continuity due to system malfunction.
- Review systems architecture and configuration documentation.
- Conduct equipment and/or software audit
- Determine and document warranty status of components and/or software
- Identify critical components and/or software and document recommendations.
- Document risks and problems.
- Develop recommended maintenance solutions to meet business needs.

## 1. Identify and analyze maintenance needs

Determining a maintenance strategy involves selecting an approach to ensure that equipment, facilities, and systems remain in good working condition. The choice of maintenance strategy depends on factors such as the type of assets, their criticality, the available resources, and organizational goals. Here are some common maintenance strategies:

Identifying and analyzing maintenance needs is a crucial step in developing an effective maintenance strategy. Here are key steps to identify and analyze maintenance needs:

### 1. Asset Inventory:

- **Identification:** Create a comprehensive inventory of all assets, including equipment, facilities, and systems.
- **Documentation:** Document key information for each asset, such as age, manufacturer, specifications, and maintenance history.

### 2. Criticality Assessment:

- **Prioritization:** Assess the criticality of each asset to the organization's operations.
- **Risk Analysis:** Evaluate the potential impact of asset failure on safety, production, and overall business objectives.

### 3. Condition Monitoring:

- **Implement Monitoring Systems:** Use sensors, meters, and other tools to monitor the condition of critical assets in real-time.
- **Data Collection:** Collect data on performance parameters, such as temperature, vibration, and pressure, to identify trends and anomalies.

### 4. Failure Mode and Effects Analysis (FMEA):

- **Identify Failure Modes:** Determine potential failure modes for each asset.
- **Assess Consequences:** Evaluate the effects and consequences of each failure mode.
- **Risk Prioritization:** Prioritize failure modes based on their likelihood and severity.

### 5. Maintenance History Analysis:

- **Review Records:** Analyze historical maintenance records to identify recurring issues and patterns.
- **Failure Patterns:** Look for trends in equipment failures and identify common root causes.



## 6. Resource Assessment:

- **Labor and Skill Requirements:** Assess the availability of skilled personnel required for different maintenance tasks.
- **Tools and Equipment:** Ensure that the necessary tools and equipment are available for maintenance activities.

## 7. Life Cycle Cost Analysis:

- **Evaluate Costs:** Consider the total cost of ownership over the lifespan of each asset.
- **Compare Strategies:** Compare the costs associated with different maintenance strategies, including preventive, predictive, and corrective maintenance.

## 8. Operational and Environmental Factors:

- **Operating Conditions:** Consider the environmental and operational conditions in which assets operate.
- **External Factors:** Take into account external factors such as weather, location, and other environmental considerations.

## 9. Stakeholder Input:

- **Collaboration:** Seek input from operators, maintenance personnel, and other stakeholders who have hands-on experience with the equipment.
- **Feedback:** Gather feedback on current maintenance practices and identify areas for improvement.

Thoroughly conducting these analyses, organizations can gain a comprehensive understanding of their maintenance needs and tailor their strategies to address specific challenges and opportunities. Regularly reviewing and updating this analysis ensures that the maintenance strategy remains aligned with the evolving needs of the organization.

### 1.1.Risks to Business Continuity

The maintenance strategy adopted by an organization can significantly impact its business continuity. The effectiveness of maintenance activities directly influences the reliability and availability of critical assets, which, in turn, affects overall operations. Here are some risks to business continuity based on maintenance strategy:

#### 1. Reactive Maintenance:

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- **Risk:** Reliance on reactive maintenance may lead to unplanned downtime and disruptions if equipment fails unexpectedly.
- **Impact:** Production delays, increased repair costs, potential damage to other interconnected systems.

## 2. Preventive Maintenance:

- **Risk:** Strict reliance on scheduled preventive maintenance without considering actual equipment condition may result in unnecessary downtime and costs.
- **Impact:** Unplanned downtime during scheduled maintenance, potential over-maintenance leading to increased costs.

## 3. Predictive Maintenance:

- **Risk:** Relying solely on predictive maintenance without a backup plan may result in missed predictions or false alarms.
- **Impact:** Unplanned failures if the predictive system fails to accurately predict issues, potential under-maintenance if false positives are common.

## 4. Proactive Maintenance (RCM):

- **Risk:** Inadequate analysis of failure modes and consequences in RCM may lead to incorrect prioritization of maintenance tasks.
- **Impact:** Unplanned failures of critical assets, potential escalation of issues due to misjudged criticality.

## 5. Condition-Based Maintenance:

- **Risk:** Inaccurate or insufficient monitoring may lead to missed signs of equipment deterioration.
- **Impact:** Unplanned downtime, potential for critical failures if condition-based triggers are not reliable.

## 6. Total Productive Maintenance (TPM):

- **Risk:** Overemphasis on equipment efficiency may lead to neglect of other critical maintenance needs.
- **Impact:** Unaddressed issues that may lead to failures, reduced overall equipment effectiveness.

## 7. Resource Constraints:

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- **Risk:** Inadequate resources allocated to maintenance, regardless of strategy, may result in delayed or insufficient maintenance activities.
- **Impact:** Increased risk of equipment failures, higher costs associated with emergency repairs.

## 1.2. Reviewing systems architecture and configuration documentation

Reviewing systems architecture and configuration documentation is a critical step in developing and maintaining an effective maintenance strategy. This process ensures that the maintenance strategy aligns with the characteristics and requirements of the systems in place. Here's how you can approach the review:

### 1. Understand Systems Architecture:

- **Objective:** Gain a comprehensive understanding of the overall systems architecture, including hardware, software, network components, and their interdependencies.
- **Considerations:** Identify critical components, redundancies, and any specific requirements or limitations.

### 2. Assess Configuration Documentation:

- **Objective:** Evaluate the documentation that outlines the configuration settings and parameters of the systems.
- **Considerations:** Ensure that configuration details are accurate, up-to-date, and aligned with industry best practices and security standards.

### 3. Identify Critical Components:

- **Objective:** Identify components crucial to system functionality and business operations.
- **Considerations:** Assess the impact of failures or performance degradation in critical components on overall system performance and business continuity.

### 4. Review Maintenance History:

- **Objective:** Analyze historical maintenance records to understand past issues and resolutions.
- **Considerations:** Look for patterns or recurring issues that may indicate the need for adjustments to the maintenance strategy or changes in system configuration.

### 5. Check Compliance with Standards:

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- **Objective:** Ensure that the systems and configurations comply with relevant industry standards, regulatory requirements, and security protocols.
- **Considerations:** Identify any gaps in compliance and address them to minimize risks.

#### 6. Evaluate System Performance Monitoring:

- **Objective:** Review the systems' performance monitoring capabilities.
- **Considerations:** Ensure that monitoring tools are in place to track key performance indicators, identify anomalies, and provide early warnings of potential issues.

#### 7. Assess Scalability and Flexibility:

- **Objective:** Evaluate how well the systems can scale to accommodate growth or changes in demand.
- **Considerations:** Ensure that the maintenance strategy accounts for scalability requirements and can adapt to changes in system configuration.

#### 8. Check Backup and Recovery Configurations:

- **Objective:** Review backup and recovery configurations to ensure they align with business continuity objectives.
- **Considerations:** Verify the frequency of backups, the integrity of data restoration processes, and the recovery time objectives.

#### 9. Evaluate Security Configurations:

- **Objective:** Assess the security configurations of the systems.
- **Considerations:** Verify that security measures are in place and aligned with the organization's security policies. Consider any potential vulnerabilities that may impact the maintenance strategy.

#### 10. Review Documentation Accessibility:

- **Objective:** Confirm that documentation is easily accessible to maintenance personnel.
- **Considerations:** Ensure that relevant teams can quickly retrieve necessary information for troubleshooting, maintenance planning, and system modifications.

By conducting a thorough review of systems architecture and configuration documentation, organizations can better tailor their maintenance strategies to the specific needs and characteristics of their systems. Regular updates and continuous monitoring ensure that the maintenance strategy remains effective in the face of evolving technologies and operational requirements.

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### 1.3. Conducting equipment and software audit

Conducting an equipment and software audit is a crucial step in developing and refining a maintenance strategy. This audit provides a comprehensive understanding of the organization's assets, their condition, and the software systems supporting them. Here's a guide on how to conduct an effective equipment and software audit for maintenance strategy:

#### Equipment Audit:

##### 1. Create an Asset Inventory:

- **Objective:** Identify and document all physical assets, including machinery, equipment, and infrastructure.
- **Considerations:** Include details such as make, model, installation date, and location.

##### 2. Assess Asset Criticality:

- **Objective:** Prioritize assets based on their criticality to business operations.
- **Considerations:** Consider the impact of each asset's failure on safety, production, and overall business objectives.

##### 3. Review Maintenance Records:

- **Objective:** Analyze historical maintenance records for each asset.
- **Considerations:** Look for patterns of failures, maintenance needs, and the effectiveness of past maintenance activities.

##### 4. Evaluate Condition Monitoring Systems:

- **Objective:** Assess the effectiveness of any existing condition monitoring systems.
- **Considerations:** Ensure that monitoring systems are providing accurate data on asset health and performance.

##### 5. Check for Redundancy and Spare Parts:

- **Objective:** Identify redundant assets and the availability of spare parts.
- **Considerations:** Ensure that critical components have sufficient spares to minimize downtime in case of failures.

##### 6. Assess Maintenance Accessibility:

- **Objective:** Evaluate how easily maintenance personnel can access and service each asset.

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- **Considerations:** Consider factors such as location, safety considerations, and ease of disassembly for maintenance.

#### 7. Examine Technology Integration:

- **Objective:** Assess how well equipment integrates with other systems and technologies.
- **Considerations:** Ensure compatibility with monitoring systems, data analytics tools, and other technologies that support maintenance.

### Software Audit:

#### 1. Identify Maintenance Management Software:

- **Objective:** Document the software systems used for maintenance management.
- **Considerations:** Include computerized maintenance management systems (CMMS) and any other software relevant to maintenance processes.

#### 2. Review Software Configurations:

- **Objective:** Assess the configurations of maintenance software.
- **Considerations:** Ensure that software settings align with maintenance strategies, including preventive schedules, work order management, and reporting.

#### 3. Evaluate Data Accuracy and Integrity:

- **Objective:** Verify the accuracy and integrity of data within maintenance software.
- **Considerations:** Regularly update equipment information, maintenance schedules, and other relevant data.

#### 4. Check Integration with Other Systems:

- **Objective:** Assess how well maintenance software integrates with other organizational systems.
- **Considerations:** Ensure seamless data flow between maintenance software, inventory systems, and other relevant platforms.

#### 5. Assess User Training and Competence:

- **Objective:** Review the training provided to users of maintenance software.
- **Considerations:** Ensure that maintenance personnel are adequately trained to use the software effectively.

#### 6. Examine Reporting and Analysis Capabilities:

- **Objective:** Evaluate the reporting and analysis features of maintenance software.

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- **Considerations:** Ensure that the software provides meaningful insights into maintenance performance and asset health.

#### 7. Check for Software Updates and Support:

- **Objective:** Verify that maintenance software is up to date with the latest releases.
- **Considerations:** Ensure ongoing support and updates to address bugs, security vulnerabilities, and to introduce new features.

#### 8. Assess Security Measures:

- **Objective:** Review the security features of maintenance software.
- **Considerations:** Ensure that access controls, data encryption, and other security measures are in place to protect sensitive maintenance information.

### Overall Integration:

#### 1. Evaluate Alignment with Business Objectives:

- **Objective:** Ensure that the equipment and software support broader business goals.
- **Considerations:** Confirm that maintenance strategies align with organizational objectives and contribute to overall operational efficiency.

#### 2. Identify Improvement Opportunities:

- **Objective:** Look for areas where the maintenance strategy, equipment, and software can be improved.
- **Considerations:** Seek feedback from maintenance personnel, analyze audit findings, and identify opportunities for optimization.

#### 3. Establish Documentation and Communication Protocols:

- **Objective:** Develop protocols for documenting changes and communicating updates to maintenance strategies, equipment, and software.
- **Considerations:** Ensure that all relevant stakeholders have access to the latest information.

#### 4. Create a Maintenance Roadmap:

- **Objective:** Develop a roadmap for ongoing maintenance improvements.
- **Considerations:** Prioritize actions based on criticality, cost-effectiveness, and alignment with business objectives.

By conducting a thorough equipment and software audit, organizations can gain valuable insights into their maintenance landscape. This information serves as a foundation for developing and optimizing maintenance strategies, enhancing overall business continuity, and ensuring the reliability and longevity of critical assets. Regular reviews and updates are essential to adapt to changing conditions and technologies.

### **1.4.Documenting warranty status**

Documenting the warranty status of equipment and components within a maintenance strategy is a crucial aspect of asset management. This documentation helps in tracking the warranty coverage, planning maintenance activities, and optimizing costs. Here's a guide on how to document the warranty status within your maintenance strategy:

#### **1. Create an Asset Registry:**

- Develop a comprehensive list of all assets and equipment that are part of the maintenance strategy.
- Include details such as asset ID, description, manufacturer, model, and installation date.

#### **2. Record Warranty Information:**

- Document the warranty information for each asset.
- Include details such as warranty start and end dates, coverage terms, and conditions.

#### **3. Categorize Assets Based on Warranty Status:**

- Categorize assets based on their warranty status.
- Classify assets as under warranty, out of warranty, or approaching the end of warranty.

#### **4. Utilize a Maintenance Management System:**

- Implement a Computerized Maintenance Management System (CMMS) to centralize asset information.
- Use the CMMS to store and manage warranty details for easy access.

#### **5. Include Warranty Information in Asset Profiles:**

- Enhance asset profiles with a dedicated section for warranty information.
- This should be easily accessible to maintenance personnel and other relevant stakeholders.

#### **6. Set Up Alerts for Warranty Expirations:**



- Implement an alert system within your CMMS to notify maintenance teams when an asset's warranty is approaching expiration.
- This ensures timely action, such as scheduling preventive maintenance or exploring warranty extension options.

#### **7. Document Warranty Claim Procedures:**

- Provide clear documentation on the procedures for initiating warranty claims.
- Include contact information for manufacturers or suppliers and any required documentation.

#### **8. Update Records Regularly:**

- Establish a process for regularly updating warranty information.
- This includes updating records when warranties are extended, expired, or when assets are replaced.

#### **9. Integrate Warranty Information with Maintenance Planning:**

- Factor in warranty status when planning maintenance activities.
- Prioritize warranty-covered repairs and replacements to optimize cost-effectiveness.

#### **10. Document Warranty Extensions and Renewals:**

- Keep track of any warranty extensions or renewals.
- Document the terms and conditions of extended warranties.

#### **11. Ensure Accessibility to Relevant Personnel:**

- Ensure that maintenance personnel, procurement teams, and decision-makers have access to warranty information.
- Facilitate communication between maintenance and procurement for timely decision-making.

#### **12. Implement Training on Warranty Management:**

- Train relevant personnel on the importance of tracking and managing warranty information.
- Ensure that staff understands the implications of warranty status on maintenance planning and budgeting.

Documenting the warranty status of equipment within your maintenance strategy, you enhance your ability to make informed decisions, optimize maintenance practices, and maximize the

value of warranty coverage for your assets. Regular updates and thorough record-keeping are essential to ensuring the ongoing effectiveness of your maintenance strategy.

## 1.5. Identifying critical components and software

Identifying critical components and software for a maintenance strategy is essential for prioritizing resources, optimizing maintenance efforts, and ensuring the reliability of key assets. Here's a systematic approach to identify critical components and software within your maintenance strategy:

### Identifying Critical Components:

#### 1. Asset Inventory:

- Create a comprehensive inventory of all physical assets, including machinery, equipment, and infrastructure.
- Include details such as make, model, and critical specifications.

#### 2. Criticality Assessment:

- Prioritize assets based on their criticality to business operations.
- Consider the impact of each asset's failure on safety, production, and overall business objectives.

#### 3. Historical Maintenance Records:

- Analyze historical maintenance records to identify components that have a history of frequent failures or issues.
- Prioritize components that have a significant impact on downtime.

#### 4. Condition Monitoring:

- Implement condition monitoring systems to continuously assess the health of critical components.
- Use real-time data to identify potential issues before they escalate.

#### 5. Redundancy Analysis:

- Identify components that are critical due to their lack of redundancy.
- Assess the availability of backup systems or spare parts for critical components.

#### 6. Operational Impact:

- Evaluate the operational impact of each component.

- Consider dependencies between components and their role in supporting overall system functionality.

#### 7. Safety Considerations:

- Prioritize components that have safety implications if they fail.
- Consider the potential impact on personnel and the environment.

#### 8. Regulatory Compliance:

- Identify components that are critical for compliance with industry regulations and standards.
- Ensure that maintenance activities for these components align with regulatory requirements.

#### 9. Stakeholder Input:

- Consult with operators, maintenance personnel, and other stakeholders to gather input on the criticality of components.
- Consider the expertise and insights of those directly involved with the equipment.

### Identifying Critical Software:

#### 1. Software Inventory:

- Create a comprehensive inventory of software systems used in maintenance, including CMMS, monitoring tools, and analysis software.
- Document the purpose and functionality of each software.

#### 2. Impact on Maintenance Processes:

- Assess the impact of each software system on maintenance processes.
- Identify software that is integral to planning, scheduling, monitoring, and reporting.

#### 3. Integration with Other Systems:

- Identify software that plays a key role in integrating with other organizational systems.
- Consider the impact on data flow and information exchange.

#### 4. Data Integrity and Security:

- Prioritize software systems that are critical for ensuring data integrity and security.
- Assess the role of software in maintaining the confidentiality and integrity of

maintenance data.

#### **5. Reporting and Analysis Capabilities:**

- Evaluate the reporting and analysis features of software systems.
- Identify software that provides insights into maintenance performance and asset health.

#### **6. User Training and Competence:**

- Prioritize software systems that require specialized training.
- Ensure that maintenance personnel are adequately trained to use critical software effectively.

#### **7. Support and Maintenance of Software:**

- Assess the availability of support and maintenance services for each software system.
- Consider the vendor's commitment to updates, bug fixes, and ongoing improvements.

#### **8. Security Measures:**

- Identify software that plays a role in enforcing security measures.
- Consider access controls, encryption, and other security features.

#### **9. Regulatory Compliance:**

- Identify software systems that are critical for compliance with industry regulations.
- Ensure that the use of software aligns with regulatory requirements.

#### **10. Feedback from Users:**

- Gather feedback from users of software systems.
- Consider their experiences and insights into the criticality of different software tools.

Systematically identifying critical components and software, organizations can tailor their maintenance strategy to prioritize resources where they are most needed, ultimately improving overall reliability and minimizing the impact of failures on business operations. Regular reviews and updates ensure that the identification of critical elements remains aligned with the evolving needs of the organization.

## 1.6. Identifying risks and problems

Identifying risks and potential problems is a crucial step in developing a robust maintenance strategy. By recognizing potential challenges, organizations can proactively plan and implement measures to mitigate these risks. Here's a comprehensive guide to identifying risks and problems for a maintenance strategy:

### 1. Asset Criticality and Failure Modes:

- **Risk:** Failure of critical assets can significantly impact operations.
- **Identify:** Assess the criticality of each asset and identify potential failure modes and their consequences.

### 2. Preventive Maintenance Schedule:

- **Risk:** Over-reliance on preventive maintenance can lead to unnecessary costs.
- **Identify:** Evaluate the preventive maintenance schedule to ensure it aligns with equipment needs and industry best practices.

### 3. Reactive Maintenance:

- **Risk:** Relying solely on reactive maintenance can lead to unplanned downtime.
- **Identify:** Evaluate the frequency and impact of unplanned breakdowns.

### 4. Predictive Maintenance Accuracy:

- **Risk:** Inaccurate predictions from predictive maintenance tools can lead to unnecessary interventions.
- **Identify:** Assess the accuracy and reliability of predictive maintenance data and systems.

### 5. Equipment Aging and Obsolescence:

- **Risk:** Aging equipment and obsolescence can lead to increased failure rates.
- **Identify:** Evaluate the age and condition of critical equipment. Plan for equipment upgrades or replacements.

### 6. Supply Chain Disruptions:

- **Risk:** Delays or disruptions in the supply chain can impact the availability of spare parts.
- **Identify:** Assess the resilience of the supply chain and identify alternative sources for critical components.

### 7. Human Factors:

- **Risk:** Lack of skilled personnel or human error can impact maintenance effectiveness.

- **Identify:** Evaluate the skills of maintenance personnel and provide training as needed. Implement procedures to minimize human error.

By systematically identifying risks and potential problems, organizations can develop a more resilient maintenance strategy and better prepare for challenges. Regular reviews and updates are crucial to ensuring the ongoing effectiveness of the maintenance strategy in the dynamic business environment.

### 1.7. Developing maintenance solutions

Developing maintenance solutions involves creating actionable plans to address identified risks, problems, and challenges within a maintenance strategy. The goal is to enhance the reliability, efficiency, and effectiveness of maintenance processes. Here's a step-by-step guide for developing maintenance solutions:

#### 1. Prioritize Identified Issues:

- **Objective:** Prioritize the risks and problems identified in the maintenance strategy.
- **Actions:**
  - Categorize issues based on criticality.
  - Consider the potential impact on safety, production, and overall business objectives.

#### 2. Root Cause Analysis:

- **Objective:** Understand the root causes of critical issues.
- **Actions:**
  - Conduct root cause analysis for major failures or recurring problems.
  - Identify underlying factors contributing to maintenance challenges.

#### 3. Cross-Functional Collaboration:

- **Objective:** Foster collaboration between maintenance, operations, procurement, and other relevant departments.
- **Actions:**
  - Establish regular meetings to facilitate communication.
  - Encourage knowledge sharing and a holistic approach to problem-solving.

#### 4. Implement Predictive Maintenance Technologies:

- **Objective:** Enhance maintenance efficiency through predictive technologies.

- **Actions:**

- Invest in sensors, IoT devices, and data analytics for real-time equipment monitoring.
- Implement predictive maintenance tools to identify potential issues before failures occur.

## 5. Optimize Preventive Maintenance Schedules:

- **Objective:** Ensure preventive maintenance activities are timely and cost-effective.

- **Actions:**

- Review and optimize preventive maintenance schedules based on equipment condition and usage patterns.
- Implement condition-based maintenance where applicable.

## 6. Training and Skill Development:

- **Objective:** Enhance the skills of maintenance personnel.

- **Actions:**

- Provide regular training on new technologies and best practices.
- Cross-train employees to reduce dependency on specific individuals.

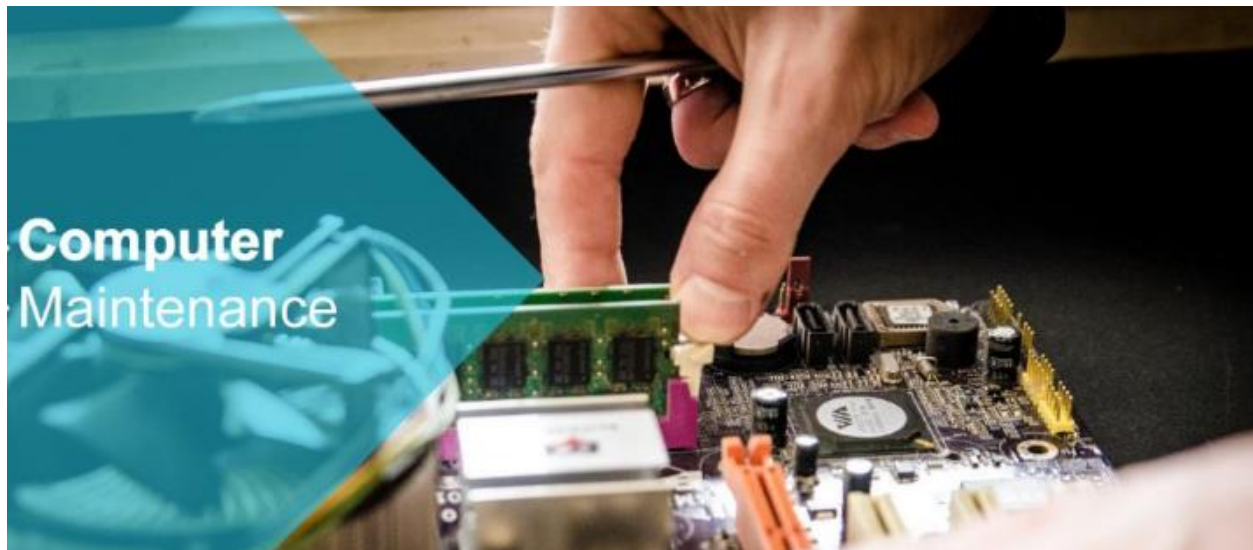


Figure 11.7. Developing maintenance solutions

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## Self-check -1

**Instruction:-**Read all questions which given below and you to answer the correct one.

### I. Write true if the questions are correct and write false if the questions are incorrect.

1. Evaluation of costs means considering the total cost of ownership over the lifespan of each asset
2. When we document the assets must be categorized based on their warranty status
3. Provide clear documentation on the procedures for initiating warranty claims
4. Identifying risks and potential problems is a crucial step in maintenance strategy.

### II. Choose the best answer from the questions listed below.

1. What failure possibly will identified and analyzed during failure mode and effects analysis of maintenance needs
 

A. Identify Failure Modes	C. Assess Consequences
B. Risk Prioritization	D. All
2. Reviewing systems architecture and configuration documentation can approach the review of:-
 

A. Critical Components	C. Maintenance History
B. Compliance with Standards	D. All
3. What we concerns in the systems Architecture of our review
 

A. Critical components	C. Redundancies
B. Any specific limitations	D. All
4. One is not included in the equipment audit of maintenance strategy
 

A. Security Measures	C. Asset Inventory
B. Asset Criticality	D. Maintenance Records

### III. Matching the following from column “A” into column “B“

- | A                       | B                              |
|-------------------------|--------------------------------|
| 1. Asset Inventory      | A. Data Collection             |
| 2. Critical Assessment  | B. Documentation               |
| 3. Condition Monitoring | C. Identify common root causes |
| 4. Failure Patterns     | D. Risk Analysis               |

### IV. List and Fill in the blank space for the following questions.

1. Discuss on how to conduct an effective equipment and software audit for maintenance strategy
2. List some of systematic approach to identify critical components and software within your maintenance strategy:
3. List the steps that guide for developing maintenance solutions:



## Unit Two:- Service level agreements

This unit is developed to provide you the necessary information regarding the following content coverage and topics

- Client views and requirements in order to maintenance requirements
- Service-level agreement to match client and business requirements

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this module, you will be able to:

- Determine the requirements of the client
- Prepare Service-level agreement

## 2.1. Service Level Agreement

A Service Level Agreement (SLA) is a formal document that outlines the terms, expectations, and standards for the services provided by one party to another. In the context of maintenance strategy, SLAs play a crucial role in establishing clear guidelines and expectations between the maintenance provider (internal maintenance team or external service provider) and the stakeholders (such as operations, management, or clients). Here's a short overview of SLAs based on maintenance strategy:

### Purpose of Maintenance SLAs:

#### 1. Define Service Scope:

- **Objective:** Clearly outline the scope of maintenance services, specifying the equipment, systems, or facilities covered by the agreement.

#### 2. Establish Performance Metrics:

- **Objective:** Set measurable performance metrics to evaluate the effectiveness of maintenance activities, such as equipment uptime, response times, and resolution rates.

#### 3. Clarify Responsibilities:

- **Objective:** Clearly define the responsibilities of both the maintenance provider and the stakeholders, including tasks, communication protocols, and reporting requirements.

#### 4. Ensure Accountability:

- **Objective:** Assign accountability for meeting performance targets and addressing issues promptly, fostering a sense of responsibility for the maintenance provider.

#### 5. Manage Expectations:

- **Objective:** Set realistic expectations for service levels, response times, and resolution processes to align with the organization's goals and priorities.

### Key Components of Maintenance SLAs:

#### 1. Service Description:

- Clearly define the scope of maintenance services, including the types of equipment or systems covered and the specific tasks to be performed.

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**2. Performance Metrics:**

- Specify measurable performance indicators such as uptime percentage, mean time between failures (MTBF), and mean time to repair (MTTR).

**3. Responsibilities and Roles:**

- Outline the roles and responsibilities of the maintenance provider and the stakeholders, ensuring a clear understanding of who is accountable for each aspect of maintenance.

**4. Response and Resolution Times:**

- Define the expected response times for addressing maintenance issues and the timeframes for resolving problems based on their priority levels.

**5. Communication Protocols:**

- Establish communication channels, reporting formats, and the frequency of updates to ensure effective and transparent communication between parties.

**6. Performance Reviews:**

- Specify the frequency and format of performance reviews, including regular assessments of key performance indicators and discussions about continuous improvement.

**7. Contract Duration and Renewal Terms:**

- Outline the duration of the SLA, including start and end dates, as well as any renewal terms and conditions.

**8. Penalties and Incentives:**

- Include provisions for penalties or incentives based on the maintenance provider's performance, encouraging adherence to SLA terms.

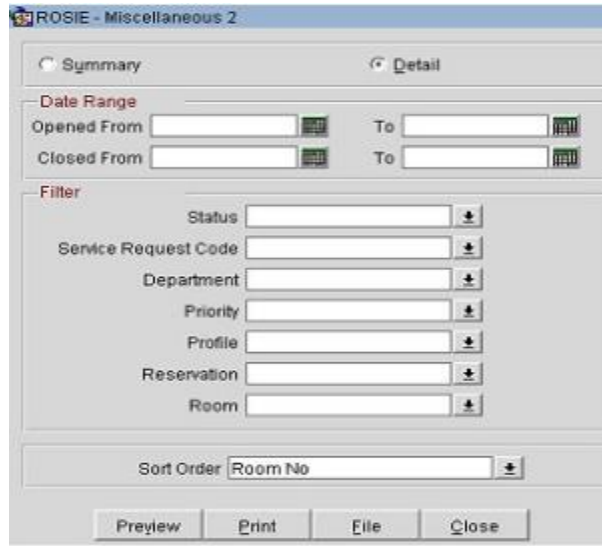


Figure 2 2. Service Level Agreement

## Benefits of Maintenance SLAs:

### 1. Clarity and Alignment:

- Establish a clear understanding of maintenance expectations and align service delivery with organizational goals.

### 2. Performance Monitoring:

- Facilitate ongoing monitoring and assessment of maintenance performance, enabling prompt identification and resolution of issues.

### 3. Accountability:

- Clearly assign responsibilities, fostering a sense of accountability among maintenance providers.

### 4. Continuous Improvement:

- Provide a framework for continuous improvement by regularly reviewing performance metrics and identifying areas for enhancement.

In summary, maintenance SLAs are essential tools for formalizing expectations, ensuring accountability, and optimizing the effectiveness of maintenance strategies. They serve as a foundation for building strong relationships between maintenance providers and stakeholders while promoting transparency and continuous improvement.

## 2.2. Determining client views and requirements

Determining client views and requirements for a maintenance strategy is a critical step in

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aligning organizational goals with the expectations and needs of key stakeholders. Here's a guide on how to effectively determine client views and requirements:

### 1. Stakeholder Identification:

- **Objective:** Identify all relevant stakeholders, including clients, end-users, management, and any other parties affected by or influencing the maintenance strategy.
- **Actions:**
  - Conduct stakeholder analysis to understand their roles, interests, and influence.

### 2. Client Engagement:

- **Objective:** Actively engage with clients to gather their perspectives on maintenance needs and expectations.
- **Actions:**
  - Schedule regular meetings, workshops, or surveys to involve clients in the discussion.

### 3. Needs Assessment:

- **Objective:** Understand the specific maintenance needs and challenges from the client's perspective.
- **Actions:**
  - Conduct interviews or surveys to gather information about current challenges, priorities, and desired outcomes.

### 4. Review Historical Data and Feedback:

- **Objective:** Analyze historical maintenance data and feedback from clients to identify recurring issues and areas for improvement.
- **Actions:**
  - Review maintenance records, incident reports, and client feedback.

### 5. Alignment with Business Objectives:

- **Objective:** Ensure that the maintenance strategy aligns with the overall business objectives of the client.
- **Actions:**
  - Understand the client's business goals and how maintenance supports these goals.

### 6. Budget Constraints and Resource Allocation:

- **Objective:** Gain insights into the client's budget constraints and resource allocation

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preferences for maintenance activities.

- **Actions:**

- Budgetary considerations and explore options for optimizing resource allocation.

### 2.3. Preparing service-level agreement

Creating a Service Level Agreement (SLA) based on a maintenance strategy involves clearly defining the scope, responsibilities, performance metrics, and expectations for both the maintenance provider and the client. At the end of this unit (**Operation Sheet 1**) there is a template that you can customize to suit your specific maintenance strategy and organizational needs.

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## Self-check -2

**Part I:- Write true if the questions are correct and write false if the questions are incorrect.**

1. SLAs play a crucial role in establishing clear expectations of maintenance strategy
2. Facilitate ongoing monitoring and assessment of maintenance performance, enabling prompt identification and resolution of issues.
3. A continuous improvement and regularly reviews can help to identifying areas for enhancement

**Part II:- Choose the best answer from the questions listed below.**

1. Purpose of maintenance Service level agreement is \_\_\_\_\_  
 A. Service Scope  
 B. Clarify Responsibilities  
 C. Performance Metrics  
 D. All
2. Key components of maintenance Service level agreement is \_\_\_\_\_  
 A. Service Description  
 B. Response Times  
 C. Performance Metrics  
 D. All
3. From the elements of service level agreement, which one is a measurable performance indicators?  
 A. Up-time percentage,  
 B. Mean time to repair  
 C. Mean time between failures  
 D. All

**Part III:- Matching the following from column “A” into column “B”**

- | A                                | B                                        |
|----------------------------------|------------------------------------------|
| 1. Service Scope                 | A. The timeframes for resolving problems |
| 2. Roles and responsibilities    | B. Facilities covered by the agreement   |
| 3. Response and Resolution Times | C. Facilities covered by the agreement   |

**Part IV:- List and Fill in the blank space for the following questions.**

1. Describe in details a service level agreement
2. Define the term Escalation
3. List the benefits of maintenance service level agreement

## Operation sheet 1

Below is a template that you can customize to suit your specific maintenance strategy and organizational needs.

### **Task: Preparation of a service-level agreement**

Assume you are a maintenance provider and deliver a service for your clients. So to make an effective delivery of maintenance services first you have to prepare an important business tool known as service level agreement (SLA) because it can establish trust and peace of mind among you and your clients.

Follow the steps from number 1 to 20 you have to prepare a SLA based on your maintenance service.

### **Service Level Agreement (SLA) for Maintenance Services**

**1. Introduction:** This Service Level Agreement (SLA) outlines the terms and expectations for maintenance services provided by [Maintenance Provider] to [Client]. The purpose of this agreement is to establish clear guidelines, responsibilities, and performance metrics to ensure the effective delivery of maintenance services.

### **2. Parties Involved:**

- **Maintenance Provider:** [Name and Contact Information]
- **Client:** [Name and Contact Information]

### **3. Scope of Maintenance Services:**

The maintenance services covered by this SLA include but are not limited to:

- Preventive maintenance activities
- Reactive maintenance and breakdown response
- Predictive maintenance based on data analytics
- Emergency response and crisis management
- Continuous improvement initiatives

### **4. Responsibilities:**

#### **Maintenance Provider Responsibilities:**

- Conduct regular inspections and preventive maintenance as per the agreed schedule.



- Respond promptly to maintenance requests and breakdowns.
- Implement predictive maintenance strategies to minimize unplanned downtime.
- Maintain accurate records of all maintenance activities.
- Provide regular performance reports to the client.

**Client Responsibilities:**

- Notify the maintenance provider of any maintenance issues promptly.
- Provide access to equipment and facilities for scheduled maintenance activities.
- Cooperate in the implementation of preventive and predictive maintenance strategies.
- Collaborate with the maintenance provider in emergency response planning.

**5. Performance Metrics:**

The following key performance indicators (KPIs) will be used to measure the performance of maintenance services:

- Equipment Uptime Percentage
- Mean Time Between Failures (MTBF)
- Mean Time to Repair (MTTR)
- Response Time to Maintenance Requests
- Compliance with Preventive Maintenance Schedules

**6. Response and Resolution Times:**

- **Response Time:** [Specify acceptable time for acknowledging maintenance requests]
- **Resolution Time:** [Specify acceptable time for resolving maintenance issues]

**7. Communication Protocols:**

- Establish regular communication channels, including [Specify modes of communication - emails, meetings, etc.].
- Emergency communication plan for immediate response to critical issues.

**8. Escalation Procedures:**

Define procedures for escalating maintenance issues that cannot be resolved within the specified timeframes, including contacts and escalation levels.

**9. Emergency Response and Crisis Management:**

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- Develop and regularly review emergency response plans.
- Clearly outline roles and responsibilities during crisis situations.

#### **10. Performance Reviews:**

- Conduct regular performance reviews based on agreed-upon KPIs.
- Discuss areas for improvement and implement necessary changes.

#### **11. Contract Duration and Renewal Terms:**

- Specify the duration of this SLA.
- Include terms and conditions for renewal or termination.

#### **12. Penalties and Incentives:**

- Define penalties for failure to meet agreed-upon performance metrics.
- Include incentives for exceeding performance expectations.

#### **13. Technology Integration:**

- Specify the use of technology in maintenance processes.
- Agree on the integration of new technologies for enhanced performance.

#### **14. Continuous Improvement:**

- Foster a culture of continuous improvement.
- Regularly review and update maintenance strategies based on lessons learned.

#### **15. Documentation and Reporting:**

- Define reporting formats, frequency, and documentation standards.
- Ensure all maintenance activities are thoroughly documented.

#### **16. Legal and Contractual Considerations:**

- Ensure compliance with legal and contractual requirements.
- Regularly review and update the SLA to reflect changes in regulations.

#### **17. Employee Training and Competency:**

- Specify training requirements for maintenance personnel.
- Ensure ongoing competency development.

#### **18. Budget Constraints and Resource Allocation:**

- Discuss budgetary considerations for maintenance activities.

- Optimize resource allocation based on organizational priorities.

#### 19. Feedback Mechanisms:

- Establish mechanisms for receiving ongoing feedback from both parties.
- Regularly review and act upon feedback received.

#### 20. Signatures:

This SLA is agreed upon by the undersigned representatives of the Maintenance Provider and the Client.

- **Maintenance Provider Representative:**

- [Name, Title, Signature, Date]

- **Client Representative:**

- [Name, Title, Signature, Date]

This template provides a framework that you can adapt to your specific maintenance strategy, organizational structure, and client needs. Ensure that both parties thoroughly review and agree upon all terms before formalizing the SLA. Regular reviews and updates are essential to maintaining the relevance and effectiveness of the agreement over time.

## Lap test 1

**Instructions:** You are required to perform the following individually with the presence of your teacher.

1. Follow the information's on the operation sheet 1 carefully
2. Prepare a Service Level Agreement.

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### Unit Three:- Formulate maintenance strategy

This unit is developed to provide you the necessary information regarding the following content coverage and topics

- Identify and Examine maintenance options and strategy
- Negotiating a maintenance strategy with client
- Documenting procedure for approval

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this module, you will be able to:

- Identify and Examine maintenance options and strategy
- Negotiating a maintenance strategy with client
- Documenting procedure for approval

### 3. Formulate maintenance strategy

#### 3.1. Identify and Examine maintenance options and strategy

Identifying and examining maintenance options and strategies involve a thorough analysis of various approaches to managing assets, equipment, and facilities. Here are several maintenance options and strategies that organizations commonly consider:

##### 1. Preventive Maintenance:

- **Description:** Scheduled maintenance activities performed to prevent equipment failure.
- **Advantages:**
  - Reduces the likelihood of unexpected breakdowns.
  - Extends the lifespan of equipment.
- **Considerations:**
  - Requires regular scheduling and adherence to maintenance plans.

##### 2. Predictive Maintenance:

- **Description:** Monitors equipment conditions in real-time to predict when maintenance is needed.
- **Advantages:**
  - Minimizes downtime by addressing issues just before failure.
  - Optimizes maintenance efforts based on actual equipment conditions.
- **Considerations:**
  - Requires advanced monitoring technology and data analytics.

##### 3. Corrective Maintenance:

- **Description:** Addresses issues as they arise, typically in response to equipment failures or breakdowns.
- **Advantages:**
  - Immediate response to urgent issues.
  - May be cost-effective for less critical equipment.
- **Considerations:**
  - Can result in unplanned downtime and higher repair costs.

#### 4. Reliability-Centered Maintenance (RCM):

- **Description:** Analytical approach to identify the most efficient maintenance strategies for critical assets.
- **Advantages:**
  - Optimizes maintenance efforts based on criticality.
  - Aligns maintenance activities with business goals.
- **Considerations:**
  - Requires a detailed analysis of asset criticality.

#### 5. Condition-Based Maintenance:

- **Description:** Maintenance is performed based on the actual condition of equipment, as determined by monitoring parameters such as vibration, temperature, or fluid levels.
- **Advantages:**
  - Minimizes unnecessary maintenance.
  - Reduces the risk of over-maintenance.
- **Considerations:**
  - Requires reliable condition monitoring systems.

#### 6. Total Productive Maintenance (TPM):

- **Description:** Focuses on maximizing the productivity of equipment by involving all employees in the maintenance process.
- **Advantages:**
  - Enhances overall equipment effectiveness.
  - Promotes a culture of continuous improvement.
- **Considerations:**
  - Requires training and engagement of all personnel.

#### 7. Run-to-Failure (RTF) Maintenance:

- **Description:** Allows equipment to run until it fails, then addresses issues as needed.
- **Advantages:**
  - Simple approach for non-critical equipment.
  - Minimizes proactive maintenance costs.

- **Considerations:**
  - Can lead to higher repair costs and downtime.

## 8. Proactive Maintenance:

- **Description:** Identifies and addresses potential issues before they cause equipment failure.
- **Advantages:**
  - Minimizes the risk of major breakdowns.
  - Improves overall equipment reliability.
- **Considerations:**
  - Requires thorough analysis and planning.

## 9. Outsourced Maintenance:

- **Description:** Engaging external service providers to perform maintenance activities.
- **Advantages:**
  - Access to specialized expertise.
  - Cost-effective for certain tasks.
- **Considerations:**
  - Requires effective management of vendor relationships.

### 3.2. Negotiating a maintenance strategy with client

Negotiating a maintenance strategy with a client involves effective communication, collaboration, and alignment of expectations. Here is a step-by-step guide to help you navigate the negotiation process:

#### 1. Understand Client Needs:

- **Objective:** Gain a deep understanding of the client's operational and business needs.
- **Actions:**
  - Conduct meetings and interviews to discuss current challenges, priorities, and desired outcomes.
  - Review historical maintenance data and feedback.

#### 2. Define Scope and Objectives:

- **Objective:** Clearly define the scope and objectives of the maintenance strategy.

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- **Actions:**
  - Clearly articulate what assets and systems are covered.
  - Align objectives with the client's business goals and performance expectations.

### 3. Present Maintenance Options:

- **Objective:** Provide the client with various maintenance options based on their needs and industry best practices.
- **Actions:**
  - Discuss the pros and cons of preventive, predictive, and corrective maintenance.
  - Tailor options to the client's budget and risk tolerance.

### 4. Discuss Roles and Responsibilities:

- **Objective:** Clearly define the roles and responsibilities of both the client and the maintenance provider.
- **Actions:**
  - Outline what the client is expected to provide in terms of access, information, and cooperation.
  - Clarify the responsibilities of the maintenance provider, including reporting and documentation.

### 5. Establish Communication Protocols:

- **Objective:** Agree on communication channels, frequency, and reporting mechanisms.
- **Actions:**
  - Define how issues will be reported and resolved.
  - Ensure that there is a clear escalation path for critical matters.

### 6. Negotiate Performance Levels:

- **Objective:** Discuss and agree on acceptable performance levels for maintenance activities.
- **Actions:**
  - Negotiate response times, resolution times, and other critical performance metrics.
  - Establish expectations for emergency response and crisis management.

### 7. Consider Budget Constraints:

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- **Objective:** Align the maintenance strategy with the client's budget constraints.
- **Actions:**
  - Discuss budget allocations for different types of maintenance activities.
  - Propose cost-effective solutions without compromising quality.

### 9. Explore Technology Integration:

- **Objective:** Discuss the use of technology to enhance maintenance processes.
- **Actions:**
  - Explore the adoption of IoT devices, predictive maintenance tools, or CMMS.
  - Address any concerns or limitations related to technology integration.

### 3.3. Documenting procedure for approval

Documenting the procedure for the approval of a maintenance strategy is crucial to ensure clarity, transparency, and a systematic approach to gaining the necessary approvals. Below is a template that you can customize to fit your organization's specific processes and requirements:

#### Maintenance Strategy Approval Procedure

##### Objective:

The purpose of this document is to outline the step-by-step procedure for the approval of the maintenance strategy within [Organization Name].

##### Procedure:

#### 1. Initiation of Maintenance Strategy Development:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**
  - Identify the need for the development or update of the maintenance strategy based on organizational goals, changes in equipment, or other relevant factors.
  - Assemble a cross-functional team with representatives from maintenance, operations, safety, and other relevant departments.

#### 2. Drafting the Maintenance Strategy:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**

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- Develop a comprehensive maintenance strategy document that includes details on preventive, predictive, and corrective maintenance approaches, key performance indicators (KPIs), and risk assessments.
- Ensure alignment with organizational objectives and industry best practices.

### 3. Internal Review:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**
  - Conduct an internal review of the draft maintenance strategy document.
  - Seek input and feedback from key stakeholders, including maintenance personnel, operations, safety officers, and relevant managers.

### 4. Revision and Improvement:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**
  - Incorporate feedback from the internal review into the maintenance strategy document.
  - Make necessary revisions to enhance clarity, completeness, and effectiveness.

### 5. Management Approval Request:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**
  - Prepare a formal request for approval, including the revised maintenance strategy document and a summary of changes made based on internal feedback.
  - Submit the approval request to the management team for review.

### 6. Management Review:

- **Responsibility:** Management Team
- **Action:**
  - Review the submitted maintenance strategy document and the associated approval request.
  - Evaluate the alignment of the strategy with organizational goals, regulatory requirements, and industry standards.

- Provide feedback and request additional information or revisions if necessary.

#### 7. Revision and Finalization:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**
  - Address any feedback or requests for revisions from the management team.
  - Make final adjustments to the maintenance strategy document to ensure it meets all requirements and expectations.

#### 8. Approval Submission:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**
  - Submit the finalized maintenance strategy document, along with any supporting documentation, to the designated approver for formal approval.

#### 9. Formal Approval:

- **Responsibility:** Designated Approver (e.g., Chief Operations Officer, Maintenance Manager)
- **Action:**
  - Review the submitted maintenance strategy document.
  - Approve or reject the document based on alignment with organizational goals, feasibility, and compliance with standards.
  - If approved, provide a formal written approval.

#### 10. Implementation and Monitoring:

- **Responsibility:** Maintenance Team
- **Action:**
  - Implement the approved maintenance strategy as outlined in the document.
  - Monitor and measure key performance indicators to ensure the strategy's effectiveness.

#### 11. Periodic Review and Update:

- **Responsibility:** Maintenance Strategy Development Team
- **Action:**

- Schedule periodic reviews of the maintenance strategy to assess its effectiveness.
- Update the strategy as needed based on lessons learned, changes in equipment, or shifts in organizational priorities.

**Documentation:**

- All versions of the maintenance strategy document, including internal reviews, revisions, and the final approved version, should be appropriately documented and stored in a designated repository.

By following this documented procedure, organizations can establish a structured and transparent process for the approval of their maintenance strategy, ensuring that it aligns with organizational objectives and meets the necessary standards. Regular reviews and updates should be conducted to adapt the strategy to evolving needs and circumstances.

### Self-check -3

**I. Write true if the questions are correct and write false if the questions are incorrect.**

1. Modern industrial equipment requires tools and staff to carry out maintenance activities.
2. Unplanned maintenance strategies are proactive in nature and can be divided into two groups' preventive and condition monitoring.
3. Run-to-Failure fix the equipment when it fails but do not perform any scheduled maintenance.

**II. Choose the best answer from the questions listed below.**

1. \_\_\_\_\_ are the most common contractor performance measures.
 

A. Quality of work	C. Schedule compliance
B. Safety indexes	D. All
2. A \_\_\_\_\_ strategy outlines the maintenance work to be undertaken and the purpose of this work.
 

A. Risk management strategy	C. Technical strategy
B. Procurement strategy	D. Management strategy
3. \_\_\_\_\_ is a reactive strategy, which is unplanned and is carried out after failure has occurred.
 

A. Corrective maintenance	C. Preventive maintenance
B. Unplanned maintenance	D. Planned maintenance

**III. Matching the following from column "A" into column "B"**

- | A                              | B                                                 |
|--------------------------------|---------------------------------------------------|
| 1. Procurement strategy        | A. Overhaul the equipment on a scheduled basis.   |
| 2. Planned maintenance         | B. A scheduled basis to discover hidden failures. |
| 3. Predictive Maintenance      | C. Methods used to procure maintenance services   |
| 4. Failure Finding Inspections | D. Carried out on periodic inspections            |
| 5. Repair                      | E. A maintenance carried out at regular intervals |
|                                | F. Replace the equipment on a scheduled basis     |

**IV. List and Fill in the blank space for the following questions.**

1. List the benefits of preventive maintenance
2. List the ways to create a preventive maintenance plan

## Unit Four:- Client and supplier processes and standards

This unit is developed to provide you the necessary information regarding the following content coverage and topics

- Creating reporting procedures for service requests
- Response time standards with client and suppliers
- Creating escalation procedures

Setting help desk or other support function

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Creating reporting procedures for service requests
- Response time standards with client and suppliers
- Creating escalation procedures
- Setting help desk or other support function

## 4. Client and supplier processes and standards

### 4.1. Creating reporting procedures for service requests

Creating effective reporting procedures for service requests is essential to ensure that requests are properly documented, tracked, and addressed in a timely manner. Below is a template that you can use as a starting point for developing reporting procedures for service requests. Customize it based on your organization's specific needs and processes.

#### Service Request Reporting Procedures

##### Objective:

The purpose of these reporting procedures is to establish a structured and efficient process for capturing, documenting, and addressing service requests within [Organization Name].

##### Procedure:

#### 1. Request Submission:

- **Objective:** Ensure a standardized method for submitting service requests.
- **Actions:**
  - Clients or users should submit service requests through [specified channels: online portal, email, phone, etc.].
  - Include mandatory fields such as contact information, description of the issue, and priority level.

#### 2. Request Categorization:

- **Objective:** Classify service requests based on predefined categories.
- **Actions:**
  - Upon submission, categorize the service request into relevant groups (e.g., IT, facilities, maintenance).
  - Use a standardized classification system for consistency.

#### 3. Priority Assignment:

- **Objective:** Determine the urgency and impact of the service request.
- **Actions:**
  - Assign a priority level (e.g., low, medium, high, critical) based on the impact on

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operations and urgency.

- Use predefined criteria to determine priority.

#### 4. Initial Triage:

- **Objective:** Conduct an initial assessment to gather additional details.
- **Actions:**
  - Designate a triage team to review and gather additional information.
  - If necessary, communicate with the requester to clarify details.

#### 5. Ticket Creation:

- **Objective:** Formally document the service request as a ticket.
- **Actions:**
  - Create a dedicated ticket for each service request in the [Ticketing System].
  - Include all relevant details, categorization, and priority level.

#### 6. Assignment to Responsible Party:

- **Objective:** Assign the service request to the appropriate department or individual.
- **Actions:**
  - Assign the ticket to the relevant department or individual responsible for addressing the request.
  - Clearly communicate responsibilities and timelines.

#### 7. Acknowledgment to Requester:

- **Objective:** Confirm receipt of the service request to the requester.
- **Actions:**
  - Send an acknowledgment to the requester, confirming that the service request has been received.
  - Provide a unique ticket reference for future correspondence.

#### 8. Resolution Timeframe Agreement:

- **Objective:** Agree on a timeframe for issue resolution.
- **Actions:**
  - Work with the responsible party to determine a realistic resolution timeframe.
  - Communicate the expected resolution time to the requester.

## 9. Regular Updates to Requester:

- **Objective:** Keep the requester informed about the status of their service request.
- **Actions:**
  - Provide regular updates on the progress of the request.
  - Communicate any delays or changes in the resolution timeframe.

## 4.2. Response time standards with client and suppliers

Establishing response time standards with clients and suppliers is essential to ensure clear expectations, effective communication, and timely resolution of issues. The specific standards may vary based on the nature of the business, the type of services or products involved, and the criticality of the requests. Below are general guidelines for setting response time standards with both clients and suppliers:

### Response Time Standards with Clients:

#### 1. Initial Acknowledgment:

- **Standard:** Within 24 hours of receiving a service request.
- **Rationale:** Prompt acknowledgment reassures the client that their request has been received and is being addressed.

#### 2. Issue Resolution Timeframe:

- **Standard:** Depending on the nature and urgency of the issue, define specific resolution timeframes (e.g., 24 hours for critical issues, 72 hours for non-critical issues).
- **Rationale:** Clearly communicating expected resolution times helps manage client expectations and demonstrates commitment to timely service delivery.

#### 3. Regular Updates:

- **Standard:** Provide updates to the client at least every 24 to 48 hours during the resolution process.
- **Rationale:** Regular communication keeps the client informed about the progress and shows transparency in the resolution efforts.

#### 4. Escalation Process:

- **Standard:** Define an escalation process for issues that cannot be resolved within the

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agreed-upon timeframe.

- **Rationale:** Having an escalation process ensures that critical issues are addressed promptly and higher management is involved when needed.

#### 5. Post-Resolution Follow-up:

- **Standard:** Conduct a follow-up with the client within 48 hours after the issue has been resolved.
- **Rationale:** Post-resolution follow-ups allow for feedback collection, ensuring client satisfaction and identifying areas for improvement.

### Response Time Standards with Suppliers:

#### 1. Order Confirmation:

- **Standard:** Suppliers should confirm receipt of purchase orders or requests within 24 to 48 hours.
- **Rationale:** Quick order confirmation ensures that the procurement process is underway and helps manage inventory and production timelines.

#### 2. Query Response Time:

- **Standard:** Suppliers should respond to inquiries or questions within 24 hours.
- **Rationale:** Timely responses to queries facilitate smooth communication and decision-making in the supply chain.

#### 3. Delivery Timeframe:

- **Standard:** Define agreed-upon delivery timeframes based on the type of products or services being supplied.
- **Rationale:** Clear expectations around delivery times help in inventory planning and meeting production schedules.

#### 4. Quality Issues Resolution:

- **Standard:** In the event of quality issues, suppliers should acknowledge and propose a resolution plan within 48 hours.
- **Rationale:** Quick resolution of quality issues minimizes disruptions in production or operations.

#### 5. Changes in Product/Service Availability:

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- **Standard:** Suppliers should promptly communicate any changes in product or service availability.
- **Rationale:** Early communication allows for adjustments in procurement plans and minimizes potential disruptions.

#### 6. Escalation Process:

- **Standard:** Define an escalation process for significant delays or recurring issues.
- **Rationale:** Escalation processes ensure that critical supply chain issues are addressed at higher levels of the supplier organization.

#### 7. Contractual Review Meetings:

- **Standard:** Conduct regular review meetings (e.g., quarterly) to discuss performance, challenges, and improvements.
- **Rationale:** Review meetings provide an opportunity to address concerns, identify areas for improvement, and strengthen the client-supplier relationship.

#### 8. Post-Delivery Follow-up:

- **Standard:** Conduct a follow-up after the delivery to ensure that products or services meet expectations.
- **Rationale:** Post-delivery follow-ups contribute to ongoing quality improvement and help build a collaborative relationship.

#### General Considerations:

##### - Technology Utilization:

- Leverage technology such as automated acknowledgment systems, ticketing systems, and communication platforms to streamline and enhance response times.

##### - Clear Communication:

- Clearly communicate response time standards to both clients and suppliers, emphasizing the importance of timely communication in fostering a successful partnership.

##### - Continuous Improvement:

- Regularly review and update response time standards based on feedback, changing business dynamics, and opportunities for improvement.

Establishing and adhering to these response time standards promotes accountability, transparency, and client and supplier satisfaction. Regular reviews and adjustments should be made to ensure the standards align with evolving business needs.

### 4.3. Creating escalation procedures

Creating effective escalation procedures based on a maintenance strategy is crucial to ensure that issues are addressed promptly and efficiently. The following template provides a starting point for developing escalation procedures in the context of maintenance strategy. Customize it according to your organization's specific needs and processes:

#### Maintenance Strategy Escalation Procedures

##### Objective:

The purpose of these escalation procedures is to establish a clear and structured process for escalating issues within the maintenance strategy framework in [Organization Name].

##### Escalation Levels:

#### Level 1: Initial Triage and Response

- **Responsibility:**
  - Maintenance Team
- **Objective:**
  - Address and resolve routine maintenance issues.
- **Actions:**
  - Maintenance team conducts initial triage and resolves issues within standard response times.
  - Regularly communicate progress to the requester.

#### Level 2: Departmental Escalation

- **Responsibility:**
  - Department Head or Supervisor
- **Objective:**
  - Resolve issues that require higher expertise or resources.
- **Actions:**

- Escalate the issue to the relevant department head or supervisor if resolution is beyond Level 1.
- Provide additional resources or expertise as needed.

### Level 3: Management Review

- **Responsibility:**
  - Maintenance Manager or Equivalent
- **Objective:**
  - Address escalated issues that cannot be resolved at lower levels.
- **Actions:**
  - Conduct a comprehensive review of the escalated issue.
  - Involve higher management if necessary for decision-making or resource allocation.

### Level 4: Executive Escalation

- **Responsibility:**
  - Chief Operations Officer (COO) or Equivalent
- **Objective:**
  - Resolve critical issues that impact operations or business continuity.
- **Actions:**
  - Escalate the issue to the COO or equivalent executive for immediate attention.
  - Mobilize additional resources or make strategic decisions.

### Escalation Triggers:

#### 1. Issue Severity:

- **Trigger:**
  - The severity level of the maintenance issue exceeds predefined thresholds.
- **Actions:**
  - Automatically escalate issues with high severity to the next level.

#### 2. Resolution Time Exceeded:

- **Trigger:**
  - The maintenance issue has not been resolved within the agreed-upon timeframe.

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- **Actions:**

- If the resolution time exceeds predefined limits, escalate the issue to the next level.

### 3. Recurring Issues:

- **Trigger:**

- The same issue recurs within a short timeframe.

- **Actions:**

- Escalate issues that exhibit a pattern of recurrence for in-depth analysis and preventive measures.

### 4. Client or Stakeholder Escalation Request:

- **Trigger:**

- The client or a stakeholder explicitly requests escalation due to dissatisfaction or urgency.

- **Actions:**

- Respond promptly to client or stakeholder requests for escalation and initiate the appropriate level.

### Escalation Process:

#### 1. Identification:

- **Action:**

- Clearly define criteria for identifying issues that require escalation.
- Establish communication channels for stakeholders to request escalation.

#### 2. Notification:

- **Action:**

- Implement an automated notification system to alert relevant parties about the escalation.
- Ensure timely communication to all stakeholders involved.

#### 3. Documentation:

- **Action:**

- Document all details of the escalated issue, including history, actions taken, and

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responses.

- Maintain a central repository for easy access and reference.

#### 4. Analysis and Review:

- **Action:**

- Conduct a thorough analysis of the escalated issue.
- Review previous escalations for patterns and trends.

#### 5. Decision-Making:

- **Action:**

- Establish a clear decision-making process for each escalation level.
- Define the authority and responsibilities of each level.

#### 6. Resolution and Follow-Up:

- **Action:**

- Work towards a resolution of the escalated issue.
- Follow up with stakeholders and document the resolution process.

#### 7. Feedback and Improvement:

- **Action:**

- Collect feedback from stakeholders involved in the escalation process.
- Use insights to continually improve the maintenance strategy and escalation procedures.

#### Documentation:

- All escalations, including triggers, actions taken, and resolutions, should be documented in a designated system.
- Conduct regular reviews of the escalation procedures to identify opportunities for improvement.

By implementing these escalation procedures, organizations can ensure that maintenance issues are addressed promptly and efficiently, minimizing the impact on operations and maintaining a high level of client satisfaction. Regular reviews and updates to the procedures should be conducted to adapt to changing needs and circumstances.



#### 4.4. Setting help desk or other support function

Setting up a help desk or support function based on a maintenance strategy involves establishing a structured system to receive, prioritize, and resolve maintenance-related issues efficiently. Below is a guide to help you design and implement a help desk or support function aligned with your maintenance strategy:

##### 1. Define Objectives:

- Clearly articulate the objectives of the help desk within the context of the maintenance strategy.
- Determine the primary goals, such as minimizing downtime, optimizing asset performance, and ensuring client satisfaction.

##### 2. Choose a Support Model:

- Decide on a support model that aligns with your maintenance strategy. Common models include:
  - **Centralized Help Desk:** A single point of contact for all maintenance-related issues.
  - **Decentralized Support Teams:** Separate teams for different maintenance areas (e.g., IT, facilities, equipment).
  - **Self-Service Portals:** Enable users to troubleshoot and resolve common issues independently.

##### 3. Staffing and Skills:

- Identify the skills and expertise required for support staff.
- Determine the staffing levels needed based on the volume and complexity of maintenance issues.

##### 4. Ticketing System:

- Implement a robust ticketing system to track and manage maintenance requests.
- Ensure that the system allows for categorization, prioritization, and easy assignment of tickets.

##### 5. Communication Channels:

- Define multiple channels for reporting maintenance issues (e.g., online portal, email, phone).
- Clearly communicate these channels to all stakeholders.

##### 6. Response Time Standards:

- Establish response time standards for acknowledging and addressing maintenance requests.
- Differentiate between response times based on issue severity and impact on operations.

##### 7. Categorization and Prioritization:

- Develop a standardized system for categorizing and prioritizing maintenance issues.
- Align categorization with the maintenance strategy's key components (e.g., preventive, predictive,

corrective).

#### **8. Escalation Procedures:**

- Create escalation procedures for issues that cannot be resolved at the initial support level.
- Define triggers for escalation, such as severity, resolution time, or client request.

#### **9. Knowledge Base:**

- Establish a comprehensive knowledge base with troubleshooting guides, FAQs, and solutions.
- Encourage support staff to continuously update and expand the knowledge base.

#### **10. Training Programs:**

- Provide ongoing training for support staff to enhance technical skills and improve issue resolution capabilities.
- Include training on the organization's maintenance strategy and processes.

#### **11. Client Communication:**

- Implement a communication plan to keep clients informed about the status of their maintenance requests.
- Provide regular updates, especially for issues with longer resolution times.

#### **12. Performance Metrics:**

- Define key performance indicators (KPIs) to measure the effectiveness of the help desk.
- Include metrics such as response time, resolution time, client satisfaction, and ticket closure rates.

#### **13. Continuous Improvement:**

- Establish a process for continuous improvement based on feedback, data analysis, and industry best practices.
- Regularly review and update support processes to enhance efficiency.

#### **14. Integration with Maintenance Software:**

- Integrate the help desk system with other maintenance software tools (e.g., CMMS - Computerized Maintenance Management System).
- Ensure seamless information flow between support functions and maintenance activities.

#### **15. Client Education and Awareness:**

- Educate clients on how to effectively use the help desk and report maintenance issues.
- Promote awareness of preventive maintenance measures to reduce support requests.

#### **16. Documentation and Reporting:**

- Maintain detailed documentation of all maintenance requests, resolutions, and feedback.

- Generate regular reports to analyze trends, identify recurring issues, and measure overall performance.

#### **17. Client Feedback Mechanism:**

- Implement a system for collecting client feedback on support experiences.
- Use feedback to identify areas for improvement and acknowledge successful resolutions.

#### **18. Collaboration with Maintenance Teams:**

- Foster collaboration between the help desk and maintenance teams.
- Establish clear communication channels for transferring escalated issues or seeking expert advice.

#### **19. Security and Compliance:**

- Ensure that the help desk complies with security and privacy standards, especially when dealing with sensitive maintenance information.

#### **20. Emergency Response Plan:**

- Develop a clear plan for handling emergency maintenance situations.
- Define roles, responsibilities, and communication procedures during emergencies.

#### **21. Regular Audits and Assessments:**

- Conduct regular audits and assessments of the help desk's performance.
- Use audits to identify areas for improvement and ensure compliance with established standards.

#### **22. Documentation Repository:**

- Create a centralized repository for all help desk documentation, including procedures, training materials, and policies.

By systematically addressing these elements, you can establish a robust help desk or support function that aligns with your maintenance strategy, contributing to efficient issue resolution and the overall success of your maintenance initiatives. Regularly review and update these processes to adapt to changing needs and technologies.

### Self-check -4

**I. Write true if the questions are correct and write false if the questions are incorrect.**

1. The process of resolving a user's service request and managing the entire life cycle of a service request is called request fulfillment.
2. Service request management is an essential ITSM practice, and it relates to other ITSM practices such as incident, problem, and change management.
3. Any unplanned interruption to an IT service or reduction in the quality of an IT service is known as service request.
4. Requests for services often exceed the supply of available time and resources.

**II. Choose the best answer from the questions listed below.**

1. A strong service request management practice is\_\_\_\_\_
  - A. Customer focused
  - B. Knowledge centric
  - C. Streamlined with automation
  - D. All
2. Reports derived from records can reveal trends that may indicate the need for\_\_\_\_\_
  - A. A change in hardware
  - B. A change in software
  - C. User training
  - D. All
3. In the standard process \_\_\_\_\_ deliveries from the suppliers are checked by the customer in accordance with the contract using standard dynamic sampling, in the incoming goods facility and rejected if deviations from the specification are identified.
  - A. Escalation level 0
  - B. Escalation level 1
  - C. Escalation level 2
  - D. Escalation level 3

**III. Matching the following from column “A” into column “B“**

- | A                          | B                                                       |
|----------------------------|---------------------------------------------------------|
| 1. Escalation level 2      | A. As close to the front line and customer as possible. |
| 2. Shift left              | B. Warning                                              |
| 3. Escalation Level 3      | C. Rating the priority of a service request             |
| 4. Standard response times | D. New Business Hold (NBH)                              |
| 5. Escalation level 1      | E. Standard process                                     |
|                            | F. Intensified process                                  |

**IV. List and Fill in the blank space for the following questions.**

1. Differentiate between a Service request and an incident
2. List the elements of service request management priorities
3. Define the term Escalation

## References

- "Maintenance Planning and Scheduling Handbook" by Richard (Doc) Palmer:
- "Uptime: Strategies for Excellence in Maintenance Management" by John D. Campbell and James V. Reyes-Picknell:
- "Reliability-Centered Maintenance" by Anthony M. Smith:
- "Total Productive Maintenance" by Terry Wireman:
- "Maintenance and Reliability Best Practices" by Ramesh Gulati:

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