An industrial project, big or small, must be managed effectively to ensure the project’s objectives are met. Project managers must be aware of their roles and responsibilities and fully understand how to use the tools that are available to monitor and assess the performance of the project. There is a wide range of project management tools and software available and in some cases project managers or team members might decide to develop their own.

The role of a project manager is extremely important to the success of any project. For example, in larger projects, being able to work effectively with others and lead a team of project members is essential. Using tools and techniques to identify critical activities, giving those activities higher priority, and allocating adequate and appropriate resources to them, is vital to ensure a successful and timely project.

This topic guide covers:
• a project manager’s roles and responsibilities
• the principles, processes, tools and techniques of project management.
1 A project manager’s roles and responsibilities

Before you start
As Unit 34 is delivered and assessed in the workplace, it is important to look for existing opportunities to cover the requirements of the unit. This can best be achieved if you are managing a project within your current working environment.

Think about your current roles and responsibilities.
• Do you currently manage a project?
• If you do, what tools and techniques do you use to manage it, and how effective are these tools?
• How might you improve these tools and techniques if you were given the opportunity?

If you are not currently managing a project, talk to your employer and explore if it is possible for you to be assigned a project. An alternative method is to investigate if some of your existing roles and responsibilities can be redefined as a project to give you the opportunity to fully understand and implement the contents of Unit 34. It is also important to make sure the environmental aspects of the project are considered and assessed.

Activity
Write a list of the roles and responsibilities of a project manager. Discuss your list with some of the more experienced supervisors and project managers in your workplace and update your list accordingly.

When discussing the roles with experienced project managers, ask them to explain the environmental and sustainability aspects of projects they are managing – issues such as recyclability, different types of pollution, waste disposal and other impacts on the environment.

Portfolio activity (1.1, 1.2)
Have a closer look at the list you created for the activity above. Can any of these duties be used to explain the principles and processes of project management in general? For example, if a project manager’s role is to clearly define a project’s aims and objectives, then it probably follows that part of the project management process is to have a well-defined project with clear objectives.

Create a list of the principles and processes you come up with and discuss your list with your assessor.

Retain copies of both lists you have created for your portfolio.

The roles and responsibilities of a project manager can vary substantially. What they do depends on factors such as the type and nature of the project, the project size, the industry, the environmental impact of the project and related laws and legislation. However, there are some general expectations of a project manager. Figure 34.1.1 outlines the main tasks involved when directing a project.
As an example, if you are managing a manufacturing project that involves the design and manufacturing of various parts to build an assembly at a later stage, and your employer is very conscious of the environment and health and safety, then generally you are expected to:

- have a detailed plan of how you will be managing the project
- identify all the tasks and deadlines for each task (a task with no time limit and restrictions is not likely to be carried out)
- identify the project’s targets and objectives
- identify each task’s targets and objectives
- use tools and techniques to monitor the progress of each task and take appropriate actions, when needed
- arrange and participate in various meetings, when needed
- keep an accurate record of important documents and data
- effectively communicate relevant aspects of the project to team members and other stakeholders
- ensure the project complies with company policies and regulations
- ensure the project complies with health and safety rules and legislation
- ensure the project complies with any related environmental legislation
- try to make the project as ‘green’ and sustainable as possible.

**Activity**

What are the tools and techniques of project management? Why are they used?

1. Create a list of the tools and techniques that are used by project managers, based on discussions you have with your line manager, more experienced supervisors and project managers.
2. Carry out internet and library research to update your list.

From your research, are there any available tools you have found that are not currently used in your organisation, which you might find beneficial? If there are, aim to discuss them with your line manager.

**Portfolio activity (1.2)**

Use your updated list from the activity above, together with the results of your research and conversations with your line manager, as evidence for your portfolio. Ask your line manager to provide a witness statement of the discussion you had about new tools and techniques that are available for project management.
The principles, processes, tools and techniques of project management

Although projects can be very different in nature, there are some general principles and processes that can be applied to most projects. Different tools and techniques are used to help project managers and team members carry out these processes accurately and effectively.

In general, there are five major processes for each project. These are:

1. Project definition and initiation
2. Project planning process
3. Execution of the project
4. Project monitoring and control
5. Sign-off and delivery.

Different tools are implemented during each of these stages of a project.

### Project definition and initiation

In a manufacturing engineering organisation, a simple example of this first process can be an order from a customer. Any tools and procedures used to capture these orders are considered project management tools. Tools can be as simple as an email received from a customer or a set of engineering drawings and detailed requirements and specifications. Some companies have specific forms that need to be filled in with details of costs, advantages, disadvantages, risks and outcomes before a project can be approved and initiated.

### Project planning process

At this stage, the ultimate aims and objectives of the project are discussed and agreed. It is decided what actions and activities need to take place, who is responsible for each activity, what the time constraints and priorities for different activities are, and what is a realistic approach to achieve the project aims and objectives. Topics also discussed are what resources are needed, how many of these resources are available and how the rest will be obtained. There are different tools available to assist project managers with this process. For example, to plan and monitor a project schedule and the timely completion of a project’s sub-activities, a project manager could use:

- milestone charts (see Figure 34.1.2)
- Gantt charts (see Figure 34.1.3)
- network diagrams (see Figure 34.1.4)
- simple task lists.

Some project managers might prefer to have the start and completion dates of different activities simply set on their calendar.

For larger projects, it is important to use techniques such as critical path method (CPM) to identify critical activities that need fast tracking, extra attention and additional resources allocated to them.

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**Key terms**

- **Project management tools** – tools, techniques, procedures and activities that are used to help project managers and team members successfully initiate and complete a project on time and within budget by tracking all the components of the project. There is a wide range of project management tools currently available in the form of computer software.

- **Milestone chart** – a project timeline that displays the major activities and tasks of a project and their expected completion dates.

- **Gantt chart** – sometimes referred to as a bar chart, each project task and activity is represented by a bar. The left edge of the bar displays the predicted start date of the activity and the right edge of the bar indicates the planned end date.

- **Network diagram** – a sequence of steps representing project tasks and activities that are laid out in the order in which they need to be carried out – i.e. in flow chart format.

- **Critical path method (CPM)** – a method that uses a pictorial representation of tasks and activities on a network diagram to determine the shortest possible time to complete a project. It also helps to identify the activities that are critical to achieving the completion date.
Unit 34: Plan and manage a project

34.1: The principles, processes, tools and techniques of project management

Figure 34.1.2: A milestone chart displays the major activities and tasks of a project and their expected completion dates.

Figure 34.1.3: A Gantt chart displays the predicted start and end date of each activity and task.

Figure 34.1.4: A network diagram is a representation of project tasks and activities in flow chart format.
Case study: Critical path analysis example

The following activities have to be completed during the production of a batch of wooden stools.

Activity A: Preparation of manufacturing machines = 2 days
Activity B: Receiving the raw materials for packaging and the stools = 3 days
Activity C: Manufacturing and assembly of stools = 4 days
Activity D: Finishing and painting of the stools = 2 days
Activity E: Production of the packaging = 1 day
Activity F: Finishing and painting of the packaging = 3 days

The CPM diagram for this example is given in Figure 34.1.5. The critical path in this example starts with activity B followed by C and D (BCD) and the minimum time to finish this project is 9 days.

Execution of the project

This stage involves completing all of the defined activities of the project within the allocated time frames and specifications. This is the main part of the project where the majority of the effort is focused. The most important project management task at this stage is to allocate adequate resources to each task to make sure they are completed to the required quality and on time. Procurement tools and procedures are used to communicate with, and buy services and products from, vendors and suppliers. A MIS (management information system) will be used to store data and facilitate communication between team members and other stakeholders. Meetings will be arranged when needed to discuss progress and issues.

Project monitoring and control

This process simply involves reviewing the project’s current position compared to the plans that were set during stage two. During this process the project manager uses different tools and techniques to monitor the progress of activities. Sometimes project activities have to be revised to ensure the final project objectives are delivered. The type of monitoring and control systems and tools used will vary considerably based on individual projects but some common measures include:

• short meetings with the project team to obtain an update on progress
  – various reports may be generated automatically by the MIS system or individual team members
• technical and programme review meetings to consider the current status of the project and any technical difficulties
• forecasting methods (used in larger projects) in which the progress of the project to date is used to extrapolate the predicted end date.

**Sign-off and delivery**

The last process is the project closeout. This involves the final sign-off and delivery of the project to the customer. This is more of an administrative task, during which the project manager will make sure that:

• all tasks have been completed
• any relevant documentation and products have been delivered
• all necessary approval meetings, forms and signatures have been completed
• any lessons learned are captured and documented appropriately.

Examples of tools used at this stage are meetings, completed documents (including approval and acceptance forms) and sometimes a project resource pack.

**Portfolio activity (1.2)**

1. Create a critical path analysis of a recent project in your organisation. This can be an ongoing or finalised project.
2. Complete the following table.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Evidence and discussions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain how project-type requests are received and processed in your organisation and the types of documentation your organisation normally receives. Who approves a project and how is it approved?</td>
<td>This can include projects defined within the organisation, for example, if the quality control section of the organisation needs a specific tool to measure the accuracy of a part, how is this documented and processed?</td>
<td></td>
</tr>
<tr>
<td>How is the timely completion of projects monitored in your organisation?</td>
<td>Do all project managers use the same method? How are critical activities identified? What measures will be in place to ensure these activities are completed on time so a delay will not occur in completion of the project?</td>
<td></td>
</tr>
<tr>
<td>What are the procurement procedures in your organisation?</td>
<td>Do you use any purchasing software?</td>
<td></td>
</tr>
<tr>
<td>What type of MIS is in place and how is technical and non-technical information shared between members of a project team in your organisation?</td>
<td>Explain the communication software and methods used generally and specifically by the project team.</td>
<td></td>
</tr>
<tr>
<td>How is the progress of a project controlled and monitored in your organisation?</td>
<td>Is any computer software in use? Do all project managers use the same method? Does this vary between small and larger projects? If you are a project manager, what methods do you use?</td>
<td></td>
</tr>
<tr>
<td>How does a project obtain final approval of completion in your organisation?</td>
<td>What documentation is available for projects that have been completed previously? How is the documentation stored and how can others in the organisation access it?</td>
<td></td>
</tr>
</tbody>
</table>

Take it further

Now that you are familiar with some project management methodologies, carry out further research on your own to:

1. identify at least three more methodologies
2. identify what the advantages are of using these methodologies
3. identify whether these methodologies can be applied to a project you are managing.
Checklist
At the end of this topic guide you should be familiar with:
✓ the roles and responsibilities of project managers
✓ the pivotal role of the project manager in the successful completion of a project
✓ project implementation processes and project management tools used in each process.

Further reading and resources
Burke, R., Fundamentals of Project Management: Tools and Techniques (Burke Publishing, 2013)
ISBN 9780958273367
www.mindtools.com/pages/main/newMN_PPM.htm

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