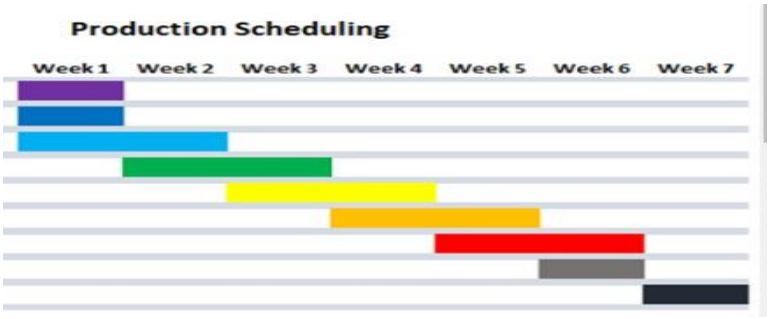
Machining

Level-IV

Based on October 2023 Curriculum Version II



Module Title: Process Planning and Production Scheduling

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Acronym

BI	Business intelligence
CBS	Cost break down
CNC	Computer numerical control
CMM	Economic order quality
JIT	Just in time
MRP	Material requirement planning
MPS	Material production schedule
OSHA	Occupational safety and health administration
PS	Product schedule
PPE	Personal protective equipment
QA	Quality assurance
SCM	Supply chain management
SPC	Static process control
WBS	Work break structure

Introduction to the Module

In welding filed; the **Planning and Production Scheduling** is provides a sound basic knowledge skills, and attitudes required to apply standard preparing knowledge, skills and attitudes required to link designed parts with basic programmed Planning and Production processes instrument standard, specification and equipment at the metal engineering workplace of weld manufacturing detailed welding metal products.

This module is designed to meet the industry requirement under the Scheduling occupational standard, particularly for the unit of competency: **Planning and Production Scheduling**

This module covers the units

- Set objectives
- Determine production sequence
- Identify And Analyze Production Requirements And Capacities
- Implement work plans
- Prepare Schedule For Production
- Manage and Review process specifications

Learning Objective of the Module

- Set objectives
- Determine production sequence
- Identify And Analyze Production Requirements And Capacities
- Implement work plans
- Prepare Schedule For Production
- Manage and Review process specifications

Module Instruction

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

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and
5. Read the identified reference book for Examples and exercise

Unit One:-Set objectives

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

- Planning objectives.
- Stating the Objectives
- Support and commitment of team members.
- Realistic and attainable objectives

This unit 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:

- Plan objectives.
- State the Objectives
- Reflect Support and commitment of team members.
- Identify Realistic and attainable objectives

1.1 Planning objectives.

- **Definition of Planning**

Simplistic definition of planning is "making decisions with the objective of influencing the future" i.e.,

- What tasks will be performed?
- How tasks will be performed?
- In what sequence the tasks will be performed?
- Who will perform the tasks?

Planning Elements

Key Planning Elements are Scope of Work which is transpired in Work Breakdown Structure (WBS) and Method of Execution which is identified in the logic diagram. Let us understand both these elements.

2.1.1. Work breakdown Structure:

The PMBOK Guide defines a WBS as a deliverable, orientated grouping of project elements, that organizes and defines the total scope of the project. By using a WBS, it allows the project team to plan a project by means of a hierarchical structure, by identifying the elements and sub elements. A work package, usually at the lowest level of a WBS, includes a series of tasks to be carried out as part of an element of work. The WBS is interfaced with the project plan and the coding structure within the WBS, allow reporting of cost and schedule forecasts to deliver the schedule and cost reports. Recent developments have initiated a Cost Breakdown Structure (CBS), which links to the WBS, but allows increased details of monitoring and cost control to take place.

2.1.2. Critical Path Logic Diagram:

The critical path logic diagram is the process of recording and presenting the logical interfaces between schedule activities. A more common name for this type of diagram is a PERT chart;

which is short for Program Evaluation Review Technique. The critical path logic diagram is created as a series of schedule activities represented by a box for each activity. Each activity box is linked to its dependencies by lines with arrow heads to show the sequence of the dependencies. The activity description is included in the information for each box. Traditionally the activity boxes and arrows are presented starting on the left and ending on the right.

The planning function:

1. It includes managerial activities which **set objectives** and appropriate means for achieving objectives.
2. It assumes a future focus, specifying what the organization is to accomplish in the future, and prepares the organization for the future.
3. It results in a written plan which specifies predetermined courses of action.
4. It is considered by many managers to be the reprimary management function.

The elements of planning are:

1. **Objectives** – specify future goals.
2. **Actions** – specific, preferred means to achieve objectives.
3. **Resources** – constraints on course of action. Budgeting identifies the resources and resource limits.
4. **Implementation** – assigning and directing personnel to carry out the plan.

Planning involves two important elements: **goals and plans**.

- **Goals (also Objectives)**
  - Desired outcomes for individuals, groups, or entire organizations
  - Provide direction and evaluation performance criteria.
- **Plans**
  - Documents that outline how goals are to be accomplished
  - Describe how resources are to be allocated and establish activity schedules

Type of Goal and Plans:

- **Type of Goal**

- **Financial Goals**:-Are related to the expected internal financial performance of the organization.
- **Strategic Goals**:-Are related to the performance of the firm relative to factors in its external environment (e.g., competitors).

Types of Plans

The most popular ways to describe organizational plans are by:

- ✓ their breadth (strategic versus operational),
- ✓ time frame (short term versus long term),
- ✓ specificity (directional versus specific), and
- ✓ frequency of use (single-use versus standing).

These planning classifications aren't independent. For example, strategic plans are long term, directional, and single use while Operational plans are short term, specific, and standing.

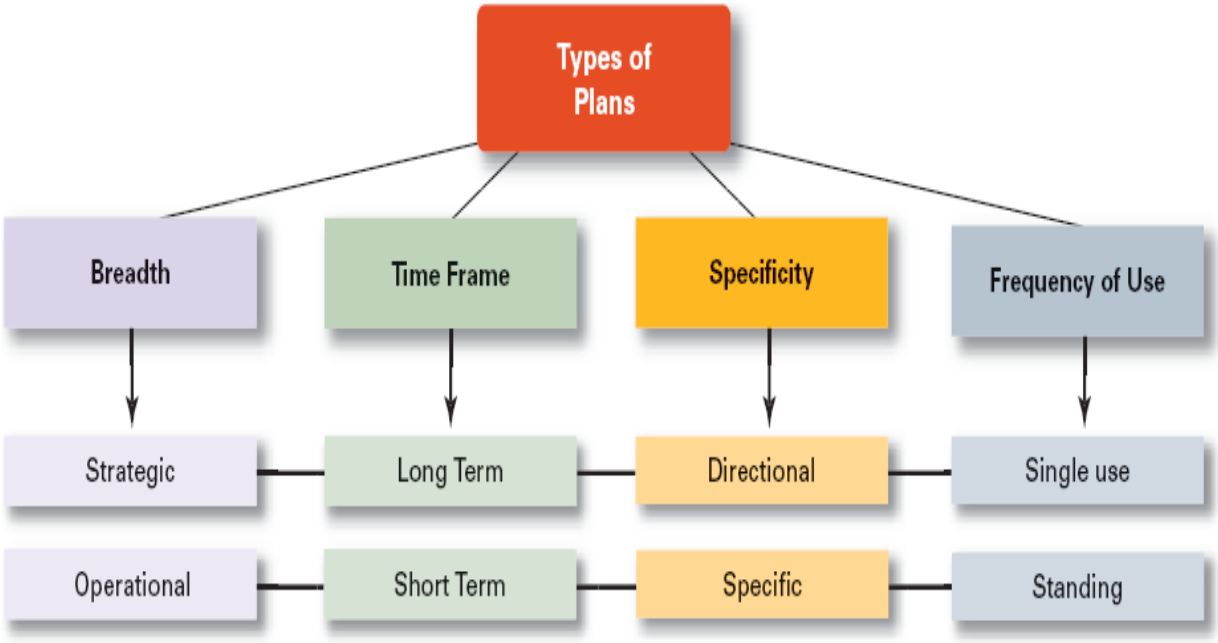


Figure 1.1 Types of plans

- **Strategic Plans**
  - Apply to the entire (whole) organization.
  - Establish the organization's overall goals.
  - Seek to position the organization in terms of its environment.

- Cover extended periods of time.

- **Operational Plans**
  - Specify the details of how the overall goals are to be achieved.
  - Cover a short time period.
- **Long-Term Plans**
  - Plans with time frames extending beyond three years
- **Short-Term Plans**
  - Plans with time frames of one year or less
- **Specific Plans**
  - Plans that are clearly defined and leave no room for interpretation

Eg. Cut costs by 4 percent and increase revenues by 6 percent in the next six months,

- **Directional Plans**
  - Flexible plans that set out general guidelines and provide focus, yet allow discretion in implementation

Eg. Improving profits by 5 to 10 percent over the next six months.

- **Single-Use Plan**
  - A one-time plan specifically designed to meet the need **of a unique situation.**

    i) Program - a collection two or more related projects.

    ii) Project - set of relatively short – term, narrow objectives and plans for achieving a major, one- time organizational goal.
- **Standing Plans**
  - Ongoing plans that provide guidance for activities performed repeatedly.
    i) **Policy**-A broad guide line to make decision
    ii) **Procedure** - it is a set of step – by – step directions for carrying out activities or tasks.
    iii) **Rule** - are usually "do" and "do not" statements established to promote employee safety, ensure the uniform treatment of employees and regulate civil behavior

The Importance of Planning

In spite of the fact that managers recognize the value of planning, many fail to plan properly because of various types of fears. The best way to overcome the fear of planning is to recognize the many benefits of planning:

- Planning facilitates professional growth.
- Plans provide the framework for the organization.
- Plans aid in delegating authority.
- Plans help motivate people.
- Planning aids communication flow.
- Planning helps shape the future.
- Plans help monitor work.
- Planning builds confidence.

Generally planning has the following purposes

- Provides direction
- Reduces uncertainty
- Minimizes waste and redundancy
- Sets the standards for controlling

Disadvantage of Planning

- Planning is expensive and time consuming
- Planning can sometimes be very frustrating because it requires an extremely detailed, careful and analytical thought process
- Planning itself can be hindrance (obstacle) to innovation (modernism).
- Planning become less likely important in turbulent (unstable) environment

2.1.3. Characteristics of a good Plan

Every sound business plan must be characterized by objectivity, futurity, flexibility, stability, comprehensiveness, clarity, and simplicity.

- **Objectivity** – planning should, first of all, be based on objective thinking and it should be factual, logical, and realistic.

- **Futurity** – since a plan is a forecast of some future action, it must have the quality of futurity; otherwise, it has little value as a basis for action.
- **Flexibility** – because no one can foresee the future, plans must have flexibility. They must adjust smoothly and quickly to changing conditions without seriously losing their effectiveness.
- **Stability** – is related to flexibility. A stable plan will not have to be abandoned because of long-term changes in the company's situation.
- **Comprehensiveness** – a business plan must be comprehensive enough to provide adequate guidance, but not so detailed as to be unduly restrictive.

Clarity and simplicity – although a good plan must be comprehensive, it should also be simple. A plan should not be ambiguous. Lack of clarity makes understanding and implementation difficult

1.2 Stating the Objectives

What is an objective? A good definition is:

"Objectives are statements of specific outcomes that are to be achieved"

As we shall see, objectives are set at various levels in a business - from the top (corporate) and through the layers underneath (functional and unit).

Objectives are often set in financial terms. That means that the objective is expressed in terms of a financial outcome that is to be achieved. Those could include:

- Desired sales or profit levels
- Rates of growth
- Amount of cash generated
- Value of the business or dividends paid to shareholders

However, it is incorrect to say that objectives have to be expressed in money terms, or that they have to be able to be measured. Some objectives are hard to measure, but are often important. For examplerat, an objective to be:

- An innovative player in the market
- A leading in the quality of customer service

A popular way to look at objectives is to see them as part of a **hierarchy** of forward-looking terms which help **set and shape the strategy of a business**. That hierarchy can be summarized as follows:

1.2.1. Corporate objectives

Corporate objectives are those that **relate to the business as a whole**. They are usually set by the top management of the business and they provide the focus for setting more detailed objectives for the main functional activities of the business.

This can be illustrated as follows:

Corporate objectives tend to focus on the desired performance and results of the business. It is important that corporate objectives cover a range of key areas where the business wants to achieve results rather than focusing on a single objective.

Peter Drucker suggested that corporate objectives should cover eight key areas:

Area	**Examples**
Market standing	Market share, customer satisfaction, product range
Innovation	New products, better processes, using technology
Productivity	Optimum use of resources, focus on core activities
Physical & financial resources	Factories, business locations, finance, supplies
Profitability	Level of profit, rates of return on investment
Management	Management structure; promotion & development
Employees	Organizational structure; employee relations
Public responsibility	Compliance with laws; social and ethical behavior

Functional objectives

A well-established business will divide its activities into several business functions. These traditionally include areas such as:

- Finance & administration
- Marketing & sales
- Production & operations
- Human resource management

Whilst each of these functional areas requires specialist expertise, their activities are not carried out in isolation from the rest of the business. It is vital in your studies to consider the ways in which the functional activities are connected to each other.

However, it is common for each functional area to be set its own objectives, which should be consistent with the higher-level corporate objectives.

So, functional objectives are:

Set for each major business function and are designed to ensure that the corporate objectives are achieved

Consider some example objectives for the marketing function. Examples of functional marketing objectives" might include:

- We aim to build customer database of at least 250,000 households within the next 12 months
- We aim to achieve a market share of 10%
- We aim to achieve 75% customer awareness of our brand in our target markets

SMART objectives

Many business textbooks suggest that both corporate and functional objectives need to conform to a set of criteria referred to as an acronym SMART.

The SMART criteria are summarized below:

Specific The objective should state exactly what is to be achieved.

Measurable

An objective should be capable of measurement – so that it is possible to determine whether (or how far) it has been achieved

Achievable

The objective should be realistic given the circumstances in which it is set and the resources available to the business.

Relevant

Objectives should be relevant to the people responsible for achieving them

Time Bound

Objectives should be set with a time-frame in mind. These deadlines also need to be realistic

Set objectives

The objectives must be:

- be focused on a result, not an activity
- be consistent
- be specific
- be measurable
- be related to time
- be attainable

Why Set Objectives?

Answer

An objective is a specific step, a milestone, which enables you to accomplish a goal. Setting objectives provides the necessary support and aids in there achievement ones goals. It involves a continuous process of research and decision-making.

how to **set** the **objective** of a resume?

1. Decide what information you want to include in your objective. This may be the industry you work in or the exact job title and a strong skill you want to put to use

How to Set the Objective of a Resume

The objective statement or summary is typically the first section of your resume, and will be the first item your potential employer reads. While an objective statement is typically a brief sentence explaining the job position you are seeking, this means every word you choose is vital if you are to make the best impression possible. The objective heading and section should be set up in a similar format to the other sections of your resume.

Instructions

1. Decide what information you want to include in your objective. This may be the industry you work in or the exact job title and a strong skill you want to put to use.
2. Write a sentence that includes those components. Be as specific as possible; do not say "programming skills" when you could name specifically what type of programming languages you are proficient in. Avoid the use of "I" and be succinct. A sample objective would be "Managerial position in sales, interest in using recruiting and training abilities."
3. Label the heading "Objective," using bold, all caps or both, left-justified on your resume and double-spaced beneath your header. The style you use for the heading will set the style for the rest of your resume.
4. Double space and type your statement from Step 2 in regular font, also left-justified.

How to set smart objectives?

1. Provide specific details. Your objectives should give clean and detailed information on what you hope to achieve. Keep in mind that the more specific your objectives are, the easier
2. Define your goals. Goals are your desired outcomes. They may include the desire to expand into a bigger office, give your staff a raise or increase profits by a specific date.

SMART Objectives

- Specific
- Measurable - that can quantify the results
- Achievable
- Relevant
- Time bounded - are governed by deadlines

Setting objectives

An important part of managing your research project is setting your own clear and achievable objectives. This is a valuable exercise as it will help you focus on the things that matter to your research and future plans, help you build a comprehensive set of skills and experiences that you can articulate. This section describes a strategy to help you set and achieve these.

What do you want to achieve?

1. What it is that you *actually* want to achieve? Completing your degree is a complex problem with a number of non- complementary goals that need to be satisfied. Look back at, or formulate your research question or research proposal as a starting point. As your research progresses you will amend the objectives of the project as you uncover new knowledge. You will also add objectives which relate to your personal and career development, if you have not done this already you may want to add them now.

Try writing out all of your objectives and then consider the following:

- does each look possible?
- is the number of objectives realistic?
- do any suggest other objectives or sub-objectives?

SMART: A tool to evaluate your objectives

SMART can help you critically evaluate the objectives that you have set yourself. For every objective confirm it meets the following criteria.

- **Specific:** in both meaning and focus
- **Measurable**: so that you know when you are achieving progress and can declare success
- **Advantageous**: what's in this for **you**? How might you report it in your CV? If you can see no personal advantages, don't waste your time; you won't be seriously motivated towards success
- **Realistic**: make sure that you are being realistic: you can get feedback to help you do this. Setting learning targets in this way will, through experience, gradually improve your ability to manage your own self-development and learning
- **Time limited**: set deadlines and 'milestones', times when you will sit down and reflect on and review your progress.

Turning your objectives into a plan

Once you have identified what you want to achieve you need to start the process of turning these objectives into a plan. Look again at your objectives and ask yourself:

- what is stopping me from achieving this objective?
- what/who will help me to achieve this objective?
- why haven't I achieved it already?

Answering these questions will help you to put together a viable project plan, not just for doing the research, but for developing the skills you need to complete it successfully. For more detail, see the project management section

S	M	A	R	T
Specific	Measurable	Attainable	Realistic	Timely
				
Be specific.	If you can't measure it, you can't do it.	A goal/outcome needs to be a challenge, but still be within reach.	A goal/outcome must be do-able.	A goal/outcome should have a time frame.
Know exactly what you want to happen.	The outcome must be measured in some way.		Be realistic about what you can achieve.	This gives you a clear target to aim for.

Goal Setting

Goals ⟹ Objectives ⟹ Action Plans/Activities ⟹ Evaluate

- **Goals s**hould include:
  - Who you are? (Define your role)
  - What you will provide? (What have we done? What should we do?)
  - What you want as a result? (Where do we want to go? What do we want to happen?)
  - How will you get that result?
- **Objectives** are needed for each goal.
  - These are specific actions to reach your goal/how you will reach your goal.
  - They should be explicit, measurable, concise but clear.
- **Action plans/Activities** for each objective should be developed.
  - These explain the steps and resources needed to meet the objective(s).
  - Activities must relate to an objective and
    - ✓ include the action that will take place,
    - ✓ who is assigned to do the tasks,

- ✓ what materials and resources are needed,
- ✓ when actions are to occur (any due dates?)
- ✓ how reports of progress are to be made

Example: use email, newsletters (each would have steps and resources needed)

- **Evaluate** at midterm and end of term.
  - Set a specific method for evaluation. Determine who will take responsibility
  - Anything need to be changed? Was goal met?
  - Questions that can help evaluate the effectiveness of a goal or a project:
    - ✓ Did it implement at least one of the purposes or relate to the mission?
    - ✓ Did it meet the needs of the community?
    - ✓ Did it involve members? Was it interesting or helpful to them?
    - ✓ Did it give us some useful information?

1.3. Support and commitment of team members.

Support and commitment from team members are crucial for successful planning and execution of any project. Here are some strategies to foster support and commitment among team members during the planning process:

Clear Communication: Ensure that the project goals, objectives, and expectations are clearly communicated to all team members. Make sure everyone understands the purpose of the project, their roles and responsibilities, and the timeline for completion.

Inclusion and Collaboration: Involve team members in the planning process to increase their sense of ownership and commitment. Encourage their input, ideas, and suggestions during brainstorming sessions and decision-making meetings. When people feel their opinions are valued, they are more likely to be committed to the plan.

Create a Positive Team Culture: Foster a positive and inclusive team culture where everyone feels respected, valued, and supported. Encourage open communication, active listening, and constructive feedback. Celebrate achievements and recognize individuals' contributions to boost morale and motivation.

Set Realistic Goals and Expectations: Ensure that the project goals and targets are realistic and achievable. Unrealistic goals can lead to frustration and demotivation. Involve team members in setting goals and defining success criteria to create a shared understanding and commitment.

Provide Resources and Support: Ensure that team members have the necessary resources, tools, and training to execute their tasks effectively. Support them by addressing any roadblocks or challenges they may encounter during the planning process. Providing the right support demonstrates your commitment to their success.

Foster Trust and Collaboration: Encourage collaboration and teamwork among team members. Foster an environment where individuals feel comfortable sharing their ideas, concerns, and challenges. Encourage cross-functional collaboration to leverage diverse skills and perspectives.

Regular Check-ins and Feedback: Schedule regular check-ins to review progress, address concerns, and provide feedback. This shows that you're invested in their success and allows for early course correction if needed. Provide constructive feedback and recognize achievements to keep team members motivated and engaged.

Lead by Example: As a leader or project manager, demonstrate your own commitment and dedication to the planning process. Be available to support and guide team members when needed. Your enthusiasm and commitment will inspire others to follow suit.

Remember, building support and commitment is an ongoing process that requires consistent effort and attention. By implementing these strategies and staying attuned to the needs of your team members, you can create an environment that fosters strong support and commitment during the planning process and beyond.

1.4. Realistic And Attainable Objectives

How to make our plan realistic and attainable

Planning realistic and attainable objectives is essential for the success of any project or initiative. Here's a step-by-step approach to help you plan objectives that are both realistic and achievable:

Understand the Project Scope: Begin by gaining a clear understanding of the project scope, including its purpose, desired outcomes, and constraints. This will help you align the objectives with the overall project goals and ensure they are realistic within the given context.

Conduct a Needs and Resource Assessment: Evaluate the resources available for the project, such as budget, time, manpower, and technology. Consider the skills and expertise of your team members as well. Assess the specific needs and requirements of the project to determine what can be realistically accomplished within the given resources.

Define Specific and Measurable Objectives: Objectives should be specific and clearly defined, so there is no ambiguity about what needs to be achieved. Use the SMART framework to ensure your objectives are Specific, Measurable, Achievable, Relevant, and Time-bound. This will provide a clear roadmap for success and enable you to track progress effectively.

Break Down Objectives into Milestones and Tasks: Once you have defined the main objectives, break them down into smaller milestones and tasks. This helps to create a more manageable and actionable plan. Each milestone and task should contribute to the overall objective and be realistic in terms of the available resources and time frame.

Consider Constraints and Risks: Identify any potential constraints or risks that may affect the achievement of the objectives. This could include factors such as budget limitations, time constraints, technical challenges, or external dependencies. By considering these factors upfront, you can develop contingency plans and ensure that your objectives remain realistic and attainable.

Involve Stakeholders and Subject Matter Experts: Seek input and feedback from stakeholders and subject matter experts during the planning process. Their insights and perspectives can help you validate the feasibility and realism of the objectives. Engaging key stakeholders also creates a sense of ownership and commitment to the objectives.

Conduct a Feasibility Analysis: Analyze the feasibility of each objective by assessing the available resources, expertise, and potential risks. Consider factors such as the complexity of the task, the skills required, and any dependencies on external factors. This analysis will help you determine if the objectives are realistic and attainable within the given constraints.

Prioritize and Sequence Objectives: If you have multiple objectives, prioritize them based on their importance and potential impact on the project. Consider dependencies between objectives and sequence them in a logical order. This ensures that you focus on the most critical objectives first and create a roadmap for their achievement.

Review and Revise Objectives: Regularly review and revise your objectives as the project progresses. As you gain more information and insights, you may need to adjust the objectives to

align with the changing circumstances. Be open to feedback and adapt your objectives as needed to maintain their realism and attainability.

Monitor Progress and Adjust as Required: Continuously monitor the progress towards your objectives and track key performance indicators (KPIs) to gauge success. If you encounter challenges or deviations from the plan, be prepared to adjust your objectives or reallocate resources to keep them realistic and achievable.

By following these steps, you can develop objectives that are grounded in reality, align with project goals, and have a higher probability of successful completion.

Self-check 1.1

Part I: Multiple Choices

Instructions: choose the correct answer and circle the letter of your choice from the Given alternatives

1. Which of the following are **not** the elements of planning?

a. policy b. Implementation

c. procedure d. program

2. ---------- Are related to the performance of the firm relative to factors in its external environment.

a. financial goals b. resources

c. operational plan d. strategic goal

3. Which one is included under the strategic plan?

a. Cover a short time period

b. Establish the organizations overall goals

c. Plan with time frames extending beyond three years

d. collecting two or more related project

4. Which one of the following is **not** the benefit of planning?

a. planning facilitate professional growth

b. planning helps to shape the future

c. planning build monitor

d. planning can increase west age of time

5. ----------Is the characteristics of good plan.

a. Comprehensiveness b. Rate of growth

c. amount of cash generate d. production

part II: True or false questions

Instruction II : Say true if the statements is true say false if the Statement is false

1. Time bounded mean it is not governed by dead line.
2. Measurable is that you know when you are achieving progress and declare success.
3. Action plan can't explain the steps and resources needed to meet the objectives.
4. Clear communication is insuring the project goal objectives and expectation are clearly Communicated to all members
5. Realistic is not making you are being realistic.

Unit Two: - Determine production sequence

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

- Process and flow charts of production
- Material Preparation and parts lists
- Documenting tools and equipment.
- Documenting Process steps.

This unit 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:

- Identify Process and flow charts of production
- Perform Material Preparation and parts lists
- Perform Documenting tools and equipment.
- Perform Documenting Process steps.

2.1. Process and flow charts of production

Dentify Steps required for the process and produce flow charts

Steps is A degree in progress or a grade or rank in a scale.

Steps required for the process are identified and flow charts are produced where required in accordance with standard operating procedures.

Manufacturing Systems

steps involved in VARIANT CAPP are as follows:

- Define the coding system.
- Group the parts into part families.
- Develop a standard process plan.
- Retrieve and modify the standard plan

The main steps that are taken in planning process are as follows:

1. Establishing Objectives: Establishing the objectives is the first step in planning. ...
2. Determining Planning Premises. ...
3. Determining Alternative Courses. ...
4. Evaluating Alternative Courses. ...
5. Selecting the Best Course. ...
6. Formulating Derivative Plans. ...
7. Implementation of Plans.

Process planning is a preparatory step before manufacturing, which determines the sequence of operations or processes needed to produce a part or an assembly. ... A route sheet is a document which lists the exact sequence of operations needed to complete the job.

Process planning is also called: manufacturing planning, process planning, material processing, process engineering, and machine routing.

- Which machining processes and parameters are to be used (as well as those machines capable of performing these processes) to convert (machine) a piece part from its initial form to a final form predetermined (usually by a design engineer) from an engineering drawing.

- The act of preparing detailed work instructions to produce a part.
- How to realize a given product design.

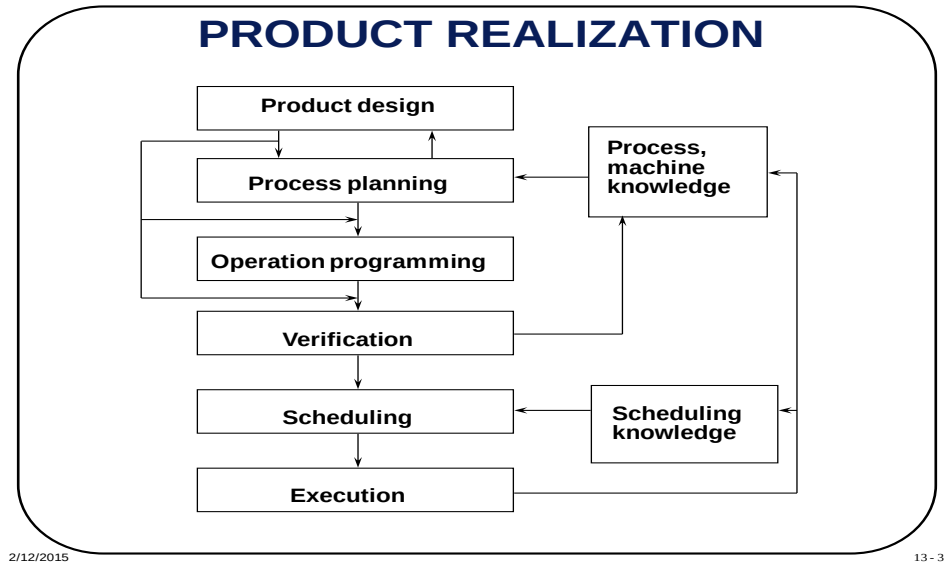


Figure 2.1 product realization

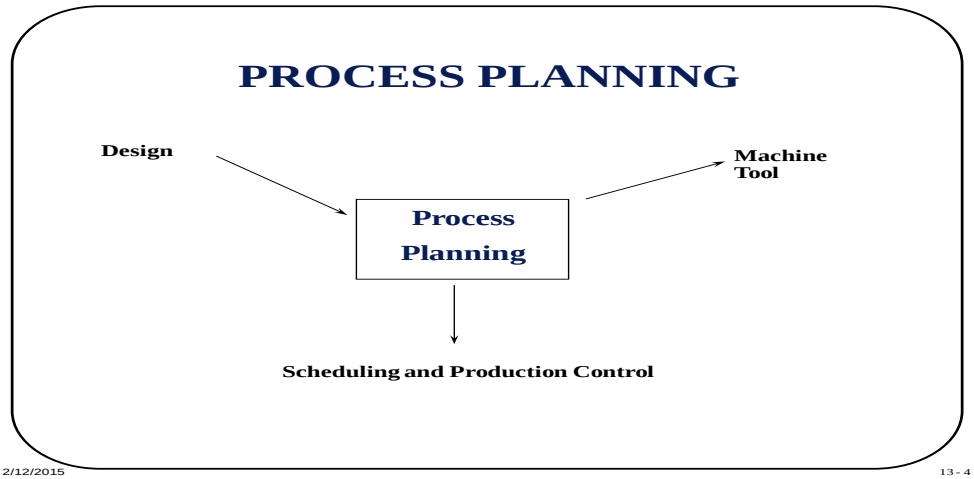


Figure 2.2 process plan

Process Plan

Process Plan also called: operation sheet, route sheet, operation planning summary, or another similar name.

The detailed plan contains:

- ✓ Route
- ✓ Processes
- ✓ Process parameters
- ✓ Machine and tool selections

Fixtures

- ✓ How detail the plan is depends on the application.
- ✓ Operation: a process
- ✓ Operation Plan (Op-plan): contains the description of an operation, includes tools, machines to be used, process parameters, machining time, etc.
- ✓ Op-plan sequence: Summary of a process plan.

Factors Affecting Process Plan Selection

Shape

Tolerance

Surface finish

Size

Material type

Quantity

Value of the product

Urgency

Manufacturing system itself etc.

Process Planning Classification

Manual

Computer-Aided

- ✓ Variant
- ✓ GT based
- ✓ Computer aids for editing
- ✓ Parameters selection

Generative

- ✓ Some kind of decision logic

- ✓ Decision tree/table
- ✓ Artificial Intelligence
- ✓ Objective-Oriented
- ✓ Still experience based

Automatic

- ✓ Design understanding
- ✓ Geometric reasoning capability

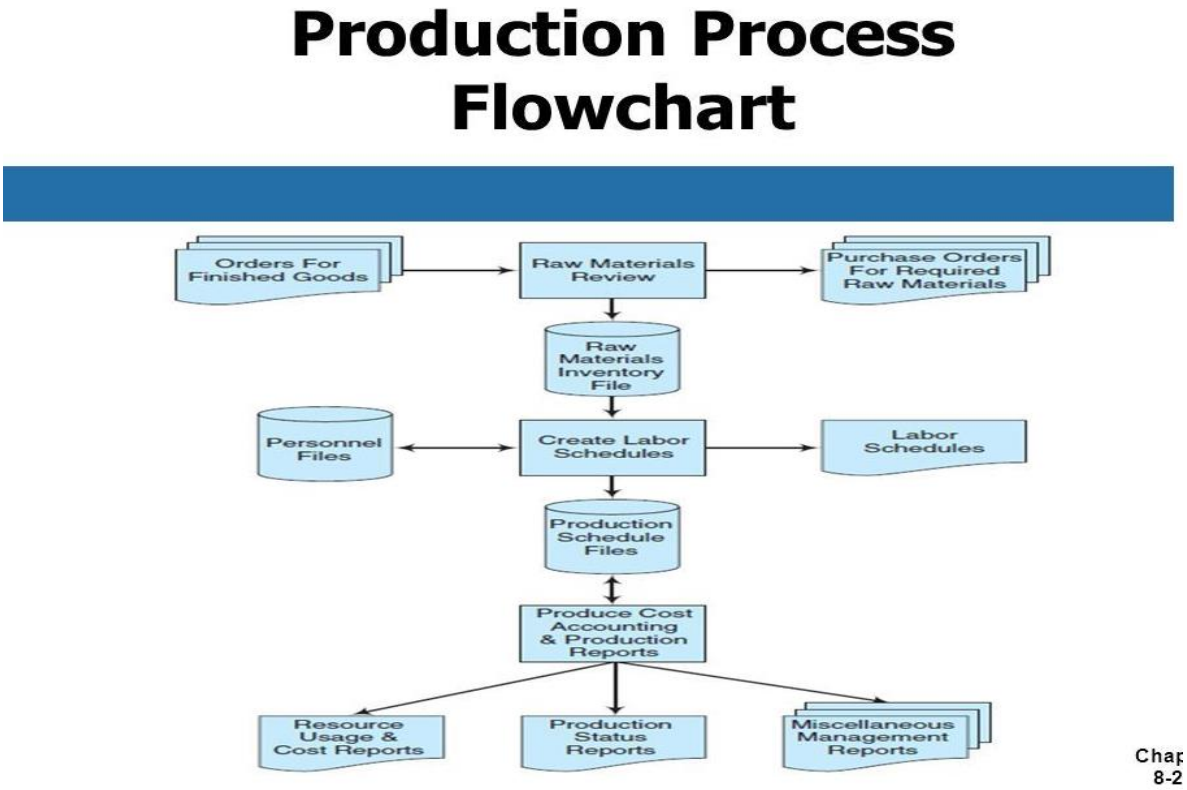


Figure 2.3 production process flow chart

2.2. Material Preparation and parts lists

Prepare Material and parts list

Material and parts lists should prepare also with CAD in accordance with standard operating procedures.

Bill of materials: A list of the materials or parts needed to make a product

Part print analysis: Examining the working drawings to find the most efficient and effective way of producing the part

Process chart: A chart detailing the manufacturing sequence

Tooling-up: Preparation of tools and equipment in order to begin production

Pilot run: A practice runs of a production system in which all parts of the system are operated together before production actually begins

A bill of materials is a list of the materials or parts needed to make one product

- Quantity
- Order of operations

Working drawings provide specific features and dimensions. They are used to create a part print analysis that includes the finished shape and size of the part, the materials needed and the tolerances

A process chart (flow chart) organizes the processes for each part of a product into a logical sequence

PROCESS PLANNING STEPS

Study the overall shape of the part. Use this information to classify the part and determine the type of workstation needed.

Thoroughly study the drawing. Try to identify every manufacturing features and notes.

If raw stock is not given, determine the best raw material shape to use.

Identify datum surfaces. Use information on datum surfaces to determine the setups.

Select machines for each setup.

For each setup determine the rough sequence of operations necessary to create all the features.

- Sequence the operations determined in the previous step.

- Select tools for each operation. Try to use the same tool for several operations if it is possible. Keep in mind the trade off on tool change time and estimated machining time.
- Select or design fixtures for each setup.
- Evaluate the plan generate thus far and make necessary modifications.
- Select cutting parameters for each operation.
- Prepare the final process plan document.

Requirements In Manual Process Planning

- Ability to interpret an engineering drawing.
- Familiar with manufacturing processes and practice.
- Familiar with tooling and fixtures.
- Know what resources are available in the shop.
- Know how to use reference books, such as machinability data handbook.
- Able to do computations on machining time and cost.
- Familiar with the raw materials.
- Know the relative costs of processes, tooling, and raw materials.

COMPUTER-AIDED PROCESS PLANNING

ADVANTAGES

1. It can reduce the skill required of a planner.
2. It can reduce the process planning time.
3. It can reduce both process planning and manufacturing cost.
4. It can create more consistent plans.
5. It can produce more accurate plans.
6. It can increase productivity.

- **AUTOMATED PROCESS PLANNING**

➢ Shortening the lead-time

➢ Manufacturability feedback

➢ Lowering the production cost

• Consistent process plans

Example for PROCESS PLANNING



Design

- Work piece Selection
- Process Selection
- Tool Selection
- Feed, Speed Selection
- Operation Sequencing
- Setup Planning
- Filtering Planning
- Part Programming

2.3. Documenting tooling and/or equipment

Documenting tooling and equipment is crucial for maintaining an organized and efficient project or operation. Proper documentation ensures that the necessary tools and equipment are available, properly maintained, and used effectively. Here's a step-by-step guide to help you document tooling and equipment:

Create a Comprehensive Inventory: Begin by creating a comprehensive inventory of all the tools and equipment relevant to your project or operation. This includes both specialized tools and general equipment. Take stock of what you have and gather information about each item, such as its name, description, model or serial number, manufacturer, and any associated documentation or certifications.

. **Categorize and Group:** Categorize and group the tools and equipment based on their function, type, or any other relevant criteria. This helps in organizing and locating items more efficiently.

For example, you can group tools by hand tools, power tools, measuring instruments, safety equipment, etc.

Document Key Details: Document key details for each tool and equipment item in your inventory. This may include specifications, technical data, usage instructions, safety guidelines, and maintenance requirements. Include any relevant diagrams, user manuals, or reference materials to supplement the documentation.

Establish a Naming or Labeling System: Establish a naming or labeling system to uniquely identify each tool or equipment item. This can be as simple as assigning a unique number or code to each item and using labels or tags to display the identification. Implementing a consistent naming system helps in tracking and locating tools efficiently.

Capture Maintenance and Inspection Information: Document the maintenance and inspection schedules for each tool and equipment item. This includes routine maintenance tasks, calibration requirements, inspection intervals, and any specific procedures or checklists. Keep track of maintenance records, including dates, performed tasks, and responsible individuals.

Note Location and Availability: Document the location of each tool and equipment item, whether it is stored in a specific area, assigned to a person or team, or in active use at a particular work location. Note the availability of each item to ensure that it can be easily located when needed.

Implement a Check-out/Check-in System: If applicable, implement a check-out/check-in system for tools and equipment. This helps track the movement of items, identify who is responsible for their use, and ensure their return after use. Develop a log or digital system to record the details of check-out and check-in transactions.

Provide Training and Guidelines: Ensure that users receive proper training on the safe and effective use of tools and equipment. Develop guidelines or standard operating procedures (SOPs) for using specific items, covering topics such as setup, operation, cleaning, and storage. Make this information easily accessible to all relevant personnel.

Regularly Update and Review: Regularly update the tooling and equipment documentation to reflect changes, additions, or retirements. Conduct periodic reviews to ensure the accuracy and relevance of the information. Engage the team members who use the tools and equipment to gather feedback and incorporate improvements.

Communicate and Share Information: Establish a centralized system or platform for sharing tooling and equipment documentation. This could be a shared drive, cloud-based storage, or a dedicated project management tool. Ensure that the information is easily accessible to authorized personnel and regularly communicate any updates or changes.

By following these steps, you can effectively document tooling and equipment, enabling efficient usage, maintenance, and tracking. This documentation contributes to the overall organization, safety, and productivity of your project or operation.

Types of Requirements

- Functional requirements
- Performance requirements
  - Speed, accuracy, frequency, throughput
- External interface requirements
- Design constraints
  - Requirements are usually about "what", this is a "how".
- Quality attributes
  - i.e. reliability, portability, maintainability, supportability

Requirements vs. Design

Requirements	Design
Describe what will be delivered[3]	Describe how it will be done[3]
Primary goal of analysis: **UNDERSTANDING[3]**	Primary goal of design: **OPTIMIZATION[3]**
There is more than one solution	There is only one (final) solution
Customer interested	Customer not interested (Most of the time) except for external

Figure 2.4: Requirement vs. Design

- **These are requirements that are not *features (functions)* of the product**
  - hardware platform requirements --

- system requirements -- supported host o.s.'s, peripherals, companion software
- environmental requirements -- temperature, shock, humidity, radiation, usage conditions, resource availability, maintenance issues, type of error recovery
- applicable standards -- legal, regulatory, communications

2.4. Documenting Process steps.

2.4.1. Document Process steps and represent clearly

Documenting process steps is essential for ensuring consistency, clarity, and efficient execution of tasks within a project or operation. Here's a step-by-step guide to help you document process steps effectively:

Identify the Process: Start by identifying the specific process or workflow that you want to document. Clearly define the purpose and boundaries of the process and determine its inputs, outputs, and desired outcomes.

Break Down the Process: Break down the process into smaller, manageable steps. Identify the key activities, tasks, or milestones that need to be completed to accomplish the process. Consider the logical flow and dependencies between steps.

Use a Standard Format: Choose a standard format for documenting process steps, such as a flowchart, checklist, or written instructions. The format should be clear, concise, and easily understood by the intended audience. Ensure that it captures the necessary information for each step.

Describe Each Step: For each process step, describe the actions or activities that need to be performed. Use clear and specific language to explain what needs to be done. Include any relevant details, such as tools, equipment, or resources required, as well as any specific guidelines or procedures to follow.

Define Roles and Responsibilities: Specify the roles and responsibilities associated with each process step. Clearly identify who is responsible for performing each task or activity. **Include Decision Points and Criteria**: Identify any decision points within the process where certain conditions or criteria need to be met. Document the criteria that must be considered and the decision-making process to follow.

Provide Supporting Documentation: If there are specific documents, templates, or forms associated with each process step, provide links or references to them. This helps users access the necessary supporting materials easily.

Visualize the Process: If appropriate, use visual aids such as flowcharts, diagrams, or diagrams to represent the process steps visually. Visual representations can enhance understanding and make complex processes easier to follow.

Review and Validate: Review the documented process steps with the relevant stakeholders, subject matter experts, or process owners. Seek their feedback and validation to ensure accuracy and completeness. Incorporate any necessary revisions or suggestions.

Make it Accessible: Store and share the documented process steps in a centralized location or a platform that is easily accessible to the relevant individuals.

Train and Communicate: Conduct training sessions or workshops to familiarize the team members with the documented process steps. Clearly communicate any changes or updates to the process and provide opportunities for clarifications or questions.

Continuously Improve: Regularly review and refine the documented process steps as needed. Encourage feedback from the users and stakeholders to identify areas for improvement or optimization.

- Process steps are documented and clearly represented in accordance with standard operating procedures

Documentation Requirements

- What must be developed to support successful deployment?
  - User Manual?
  - Online Help?
  - Installation guide? Read Me file?
  - Labeling, packaging?

Self-check 2.1

Part I: Multiple Choices

Instructions: choose the correct answer and circle the letter of your choice from the Given alternatives

1. ---------- Factors affecting process plan selection

   a. value of the product b. process parameter

   c. machine and tool selection d. operation

2. Which one of the following is a requirement in manual process planning?

   a. Familiar with manufacturing process and practice

b. select cutting parameters for each operation

c. Prepare the final process plan document

d. operational plan sequence

3. Which one of the following is the first step in planning process ?

a .Determining alternative course

b. Selecting the best course

c. Establishing objectives

d. Implementation of plan

4. ---------- Affecting process plan selection.

a. Processes parameter

b. surface finish

b. Manufacturing feedback

d. Part programing

5. ----------Examining the working drawings to find the most efficient and effective way of producing the part.

a. Bill of materials

b. process chart

c. part print analysis

d. pilot run

part II: short answer

Instruction II : Give short and brief answer for the following questions

1. List the main steps that are taken in planning process

2. What are the automated processes planning?

3. List the steps helps us for document tooling and equipment?

4. What are the types of requirement?

5. what make documenting process essential

Unit Three:-Identify and Analyze Production Requirements and Capacities

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

- Engineering production data.
- Inventory capacities and requirements.
- Procurement and supply requirements and constraints..
- Production capacity and constraints.
- Standard times for production.
- Production requirements

This unit 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:

- Identify Engineering production data.
- Identify iinventory capacities and requirements
- Analyse Procurement and supply requirements and constraints..
- Analyse Production capacity and constraints.
- Identify Standard times for production.
- Obtain Production requirements

3.1. Engineering production data.

Identify and obtain Engineering production data

Engineering production data should be identified and obtained in accordance with workplace procedures.

- **Some of the Engineering production data are**

- Problem Identification
- Research Phase
- Requirements Specification
- Concept Generation
- Design Phase
- Prototyping Phase
- System Integration
- Maintenance Phase

3.1.2. Problem Identification and Requirements Specification

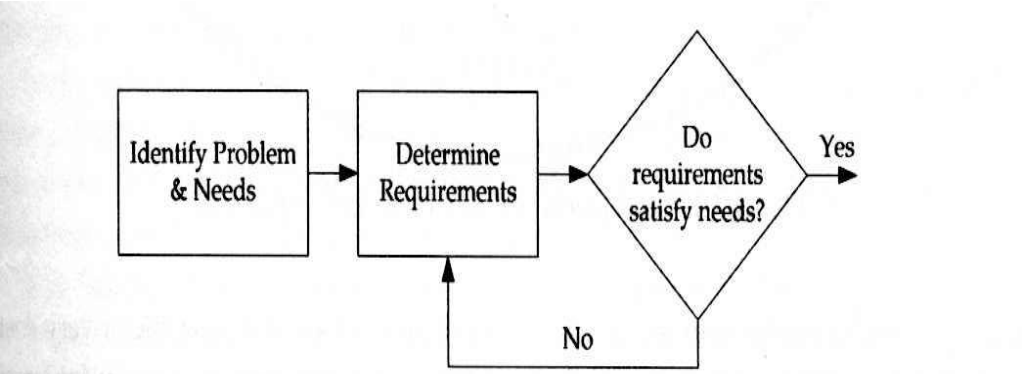


Figure 1.1 A prescriptive design process for problem identification and requirements selection.

Figure 3.1 A perspective design process for problem identification selecton

- **Needs Identification**

- What is the Problem?

1. Collect information
2. Interpret information
3. Organize needs hierarchy
4. Determine relative importance of needs

5. Review outcomes and process

Identify and obtain Inventory capacities and requirements in accordance with workplace procedures.

- Inventory capacities and requirements shall be identified and obtained in accordance with workplace procedures.
- **Capacity Requirements Planning**
  - The process of determining short-range capacity requirements from MRP outputs
  - Load reports/profiles show known and expected future capacity requirements vs. expected capacity availability

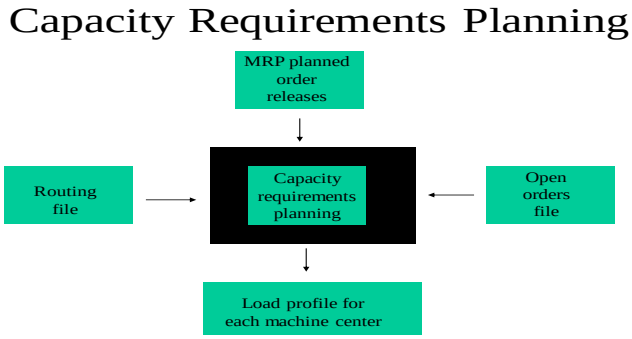


Figure3.2 capacity requirement planning

3.2. Inventory Capacities and Requirements

Inventory capacities and requirements are crucial considerations for effective inventory management. Understanding your inventory capacities helps ensure that you have adequate space and resources to store and manage your inventory, while identifying inventory requirements helps determine how much inventory you need to meet customer demand and operational needs. Here's a guide to help you assess and manage inventory capacities and requirements:

Determine Storage Space Capacity: Assess the physical storage space available to you, whether it's a warehouse, a designated area, or shelves within your facility. Measure the dimensions of the space and calculate its total capacity in terms of square footage or cubic footage.

Analyze Storage Equipment and Infrastructure: Evaluate the storage equipment and infrastructure you have in place, such as racks, shelves, bins, pallets, and storage containers. Determine the maximum weight capacity and volume capacity of each storage unit.

Assess Inventory Turnover: Analyze historical sales data or demand patterns to understand the rate at which your inventory is turning over. Calculate the average inventory turnover ratio, which is the ratio of cost of goods sold (COGS) to the average inventory value.

Consider Lead Time and Replenishment Frequency: Evaluate the lead time required to replenish your inventory from suppliers. Determine the frequency at which you can restock inventory or receive new shipments. This information is crucial for calculating safety stock levels and ensuring that you have enough inventory to cover demand during lead times and replenishment cycles.

Determine Inventory Holding Cost: Calculate the cost of holding inventory, including expenses such as storage space rent, utilities, insurance, and labor. Analyze the financial impact of carrying excess inventory or holding inventory for extended periods. This information helps in optimizing inventory levels and minimizing holding costs.

Evaluate Seasonal or Cyclical Demand: Consider any seasonal or cyclical fluctuations in demand for your products. Analyze historical data to identify peak seasons or periods of high demand. Adjust inventory capacities and requirements accordingly to meet increased demand during these periods without overstocking during slower periods.

Implement Inventory Management Systems: Utilize inventory management systems or software to track and manage inventory capacities and requirements. These systems provide real-time visibility into inventory levels, demand forecasts, and replenishment needs.

Regularly Monitor and Adjust: Continuously monitor inventory levels, sales trends, and customer demand. Regularly review and analyze inventory capacities and requirements to ensure they align with business goals and changing market conditions.

Collaborate with Suppliers and Partners: Establish effective communication channels with suppliers and partners involved in the supply chain. Share inventory capacities and requirements information to facilitate collaborative planning, improve lead times, and ensure timely deliveries.

Conduct Regular Audits: Conduct regular physical and system audits to verify inventory accuracy and reconcile any discrepancies. This helps maintain data integrity, identify obsolete or

slow-moving inventory, and ensure that inventory capacities and requirements are aligned with actual inventory levels.

By assessing and managing inventory capacities and requirements effectively, you can optimize inventory levels, improve operational efficiency, and meet customer demand while minimizing costs and storage constraints.

3.3. Procurement And Supply Requirements And Constraints.

- Procurement (raw materials) and supply requirements and constraints must be identified and obtained in accordance with workplace procedures.

3.3.1. What is the Supply Chain Management (SCM)

- The best companies around the world are discovering a powerful new source of competitive advantage.
- It's called supply-chain management and it encompasses all of those integrated activities that bring product to market and create satisfied customers.
- **T**he Supply Chain Management Program integrates topics from manufacturing operations, purchasing, transportation, and physical distribution into a unified program.
- Successful supply chain management, then, coordinates and integrates all of these activities into a seamless process.
- Simply stated, ***"The supply chain encompasses all of those activities associated with moving goods from the raw-materials stage through to the end user."***
- **Definition of supply-chain management as follows: "**The delivery of enhanced customer and economic value through synchronized management of the flow of physical goods and associated information from sourcing to consumption. "

3.3.2. Importance of Supply Chain Management

- Managers these days recognize that getting products to customers faster than the competition will improve a company's competitive position.

➢ Supply Chain Management department functions:

- ✓ Inventory management
- ✓ Transportation service procurement

- ✓ Materials handling
- ✓ Inbound transportation
- ✓ Transportation operations management
- ✓ Warehousing management

- Thus the functions most often cited as planning to formally include in the Supply Chain Management department are:
  - ➢ Customer service performance monitoring
  - ➢ Order processing/customer service
  - ➢ Supply Chain Management budget forecasting

3.3.3. Today Supply Chain Management includes services such as:

- ➢ Operational Analysis and Design Materials Handling
- ➢ Distribution Strategy
- ➢ Operational Improvements, Distribution Management
- ➢ Computer Systems
- ➢ Warehouse Design Project Management
- ➢ Operational Commissioning
- ➢ Computer Simulation
- ➢ Technical seminars

3.3.4. Supply Chain Management Tomorrow

- The future for Supply Chain Management looks very bright.
- Two major trends are benefiting Supply Chain Management operations. These are
  - ➢ Customer service focus
  - ➢ Information technology

  Successful organizations must be excellent in both of these areas, so the importance of Supply Chain Management and the tools available to do the job right will continue to expand.

3.3.5. Objectives of Supply Chain Management

- The fundamental objective is to "add value".

Five areas in which supply chain management can have a direct effect on corporate value. They include:

- **Profitable growth.** Supply chain management contributes to profitable growth by allowing assembly of "perfect orders," supporting after-sales service and getting involved in new product development.
- **According to A.T. Kearney's research**, inefficiencies in the supply chain can waste up to 25% of a company's operating costs. With profit margins of only 3% to 4%, the consultants point out, even a 5-percent reduction in supply-chain waste can double a company's profitability.
- **Working-capital reductions**. Increasing inventory turns, managing receivables and payables, minimizing days of supply in inventory, and accelerating the cash-to-cash cycle all are affected by supply chain execution.

3.4. Production capacity and constraints

Production capacity and constraints should identify and obtained in accordance with workplace procedures.

3.4.1. Production capacity is governed by:

Production capacity is governed by several factors that influence the maximum output a production system can achieve within a given timeframe. These factors include:

Equipment and Machinery: The availability, efficiency, and capacity of production equipment and machinery play a significant role in determining production capacity.

Labor Resources: The quantity and skill level of available labor resources are critical in determining production capacity.

Production Process Efficiency: The efficiency and effectiveness of the production process impact production capacity. Streamlined and well-optimized processes can increase output, reduce bottlenecks, and minimize downtime, leading to higher production capacity.

Production Line Layout: The layout and design of the production line can affect the production capacity. An efficient layout that minimizes material handling, reduces movement, and optimizes the flow of materials and goods can contribute to increased production capacity.

Available Time: The amount of time available for production operations affects production capacity. Factors such as operating hours, shifts, and downtime for maintenance or changeovers can limit or expand the production capacity.

Raw Material Availability: The availability and timely supply of raw materials and components are crucial for maintaining production capacity. Any shortages or delays in the supply chain can limit the ability to produce at full capacity.

Quality Control: Effective quality control measures ensure that the produced goods meet the required standards. Efficient quality control processes minimize rework, scrap, and defects, allowing the production system to operate at its maximum capacity.

Technology and Automation: The level of technology and automation implemented in the production system can significantly impact production capacity. Advanced technologies, robotics, and automation can increase efficiency, reduce errors, and enhance production output.

Facility and Space: The physical space and layout of the production facility determine the maximum production capacity. Sufficient space for equipment, storage, workstations, and material handling is necessary to accommodate the desired production levels.

Demand and Sales Forecasts: Anticipated market demand and sales forecasts influence production capacity planning. Aligning production levels with market demand ensures optimal utilization of resources and avoids overstocking or underutilization.

Regulatory and Compliance Requirements: Compliance with regulatory standards, safety protocols, and environmental regulations can affect production capacity. Adhering to these requirements may introduce constraints or additional steps that impact overall output.

Considering these factors and optimizing them to their fullest potential can help maximize production capacity. It's important to regularly review and assess these factors to identify areas

for improvement, enhance efficiency, and adapt to changing market conditions and business needs.

3.5. Standard times for production.

Identify and obtain Standard times in accordance with workplace procedures.

Standard times must be identified and obtained in accordance with workplace procedures.

To **set time standard** all the activity that is going to performed should be listed first and way of **controlling mechanism must be set**.

- For the purpose of this standard, the word "product" or "project" is used to identify an item that has been either manufactured, constructed, overhauled, or repaired.
- When it is completed, it represents an asset that is typically identified with the mission and purpose of the industrial activity.
- The product or project can be any one of a wide variety of items, of any size, cost, or degree of complexity, ranging from small arms ammunition to a large nuclear-powered aircraft carrier.

Production control is

- the planning of production in advance of actual operations;
- establishing the exact route of each individual item, part, or assembly;
- setting the start and completion dates for each important item and assembly, as well as the finished product;
- Determining the specific type of labor and number of hours required for each phase of the operation; and calculating all the materials, services, and the production schedule lead time required.

Many positions that are concerned with current or immediate production are responsible for the preparation and release of necessary work packages and job orders, as well as initiating any appropriate follow up action.

- The full performance level for production controllers will vary from one activity to another depending on
  - ✓ The difficulty and the complexity of the product,

- ✓ production methods, and
- ✓ Procedures.

Basic duties in common as they all are required to perform almost all of the following functions:

1. Prepare production plans for specific projects and operations through the compilation of customer requirements, engineering designs, specifications, and machining process data;
2. compile estimates for different types of skilled labor and the number of worker-hours required for production operations;
3. advise procurement or supply activities on a variety of material requirements and production schedule due dates;
4. Schedule and control primary work assignments to manufacturing activities based upon production line or shop capacity, priority, and due date;
5. Determine the status of work in progress, time required to complete the job, the availability of materials, tools required, and reassess priorities;
6. Expedite jobs in progress by any appropriate means;
7. Monitor, record, and report the status of production funding.

3.6. Production Requirements

3.6.1. Production requirements have to be obtained with the existing resources and strategies are evolved to fit with it.

Production requirements refer to the specific criteria, specifications, and needs that must be met during the manufacturing or production process to fulfill customer demand and achieve business objectives. These requirements vary depending on the nature of the product, industry, and market. Here are some common types of production requirements:

Quantity: Production requirements specify the quantity of products that need to be manufactured within a specified timeframe. This includes determining the desired production volume, batch sizes, or units required to meet customer demand.

Quality Standards: Production requirements define the quality standards that products must meet. This includes specifications for dimensions, performance, durability, reliability, safety, and any other relevant quality criteria.

Timelines: Production requirements include time-related constraints and deadlines. This involves determining production lead times, cycle times, production schedules, and delivery timelines to ensure timely product availability.

Cost Targets: Production requirements outline cost-related targets, such as production costs, labor costs, and overhead expenses. These targets help in managing the cost efficiency of the production process.

Materials and Components: Production requirements specify the materials, components, and raw materials needed for the manufacturing process. This includes identifying the specific types, quantities, and quality standards for each input.

Equipment and Tools: Production requirements define the equipment, machinery, tools, and technology needed to perform the production process. This includes specifying the capacity, capabilities, and maintenance requirements of the production equipment.

Workforce Skills and Training: Production requirements outline the required skills, expertise, and training needed for the workforce involved in the production process. This ensures that the right knowledge and capabilities are available to meet production needs.

Regulatory Compliance: Production requirements encompass compliance with industry regulations, safety standards, environmental guidelines, and any other applicable legal requirements. This ensures that the production process meets the necessary regulatory obligations.

Scalability and Flexibility: Production requirements consider the ability to scale up or down production levels based on changing demand. This includes designing the production process to be adaptable and flexible to accommodate variations in demand.

Documentation and Reporting: Production requirements may include documentation and reporting needs. This involves maintaining production records, tracking metrics, and generating reports to monitor and analyze production performance.

Continuous Improvement: Production requirements encourage continuous improvement initiatives. This involves implementing lean manufacturing principles, identifying areas for optimization, reducing waste, and enhancing overall production efficiency.

Sustainability and Environmental Considerations: Production requirements may incorporate sustainability goals and environmental considerations. This includes minimizing waste, reducing energy consumption, using environmentally friendly materials, and adopting eco-friendly production practices.

By defining and aligning with these production requirements, businesses can ensure that their manufacturing processes are optimized, products meet customer expectations, and operational goals are achieved. Regular review and adjustment of production requirements help adapt to evolving market needs and enhance competitiveness.

Self-check 3.1

Part I: Multiple Choices

Instructions: choose the correct answer and circle the letter of your choice from the Given alternatives

1. ---------- is Establish effective communication channels with suppliers and partners involved in the supply chain .
   a. Conduct Regular Audits
   b. Regularly Monitor and Adjust
   c. Collaborate with Suppliers and Partners
   d. Determine Inventory Holding Cost

2. Which one of the following is supply chain management department function ?
   a. Material handling b. collecting information
   c. Organize needs hierarchy d. System Integration

3. ---------- is governed by several factors that influence the maximum output a production system can achieve within a given timeframe.
   a. Customer service focus b. Production capacity
   c. Labor Resources d. Facility and Space

4. One of the following is **not** types of production requirements
   a. Quality standard b. Facility and Space
   b. Quantity d. Cost targets

5----------is Production requirements include time-related constraints and deadlines.
   a. Materials and Components b. Equipment and Tools
   c. Timelines d. Regulatory Compliance

part II: True or false questions

Instruction II : Say true if the statement is true say false if the Statement is false

1. Determine Storage Space Capacity can evaluate the storage equipment and Infrastructure.
2. . Determine Inventory Holding Cost Calculate the cost of holding inventory, Including expenses such as storage space rent, utilities, insurance, and labor.
3. Conduct Regular Audits Conduct regular physical and system audits to verify Inventory accuracy and reconcile any discrepancies
4. Supply Chain Management department can not functions Materials handling
5. Today Supply Chain Management includes services such like Operational Commissioning.

part III: short answer

Instruction II : Give short and brief answer for the following questions

1. What is the Supply Chain Management?

2. What is the importance of supply chain management?

3 .List and explain types of production requirements ?

4. What is demand and sales forecast?

Unit Four:Implement work plans

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

- Work methods and practices.
- Work plans

This unit 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:

- Identify Work methods and practices.
- Implement Work plans

4.1. Work methods and practices

4.1.1. Legislated regulations and codes of practice

Legislated regulations and codes of practice are legal frameworks and guidelines established by government authorities or industry organizations to ensure compliance and promote safe and ethical practices in various sectors. These regulations and codes play a crucial role in maintaining standards, protecting the rights and safety of individuals, and promoting responsible business conduct. Here are some examples of legislated regulations and codes of practice:

Occupational Health and Safety Regulations: These regulations aim to ensure a safe and healthy work environment for employees. They outline standards and requirements for workplace safety, hazard identification and control, personal protective equipment, emergency preparedness, and employee training.

Environmental Regulations: These regulations are designed to protect the environment and prevent pollution. They establish requirements for waste management, air and water quality, hazardous substance handling and disposal, emissions control, and environmental impact assessments. .

Consumer Protection Regulations: These regulations aim to protect consumers from unfair, deceptive, or unsafe business practices. They cover areas such as product safety, labeling and packaging requirements, advertising standards, fair pricing, warranties, and consumer rights..

Data Protection and Privacy Regulations: These regulations govern the collection, storage, use, and sharing of personal data to protect individual privacy rights. They establish requirements for data security, consent mechanisms, data breach notification, and the rights of individuals to access and control their personal information.

Financial and Corporate Regulations: These regulations govern the operations and conduct of financial institutions, corporations, and financial markets. They establish standards for financial reporting, corporate governance, anti-money laundering, fraud prevention, securities trading, and investor protection.

Professional Codes of Practice: These codes are guidelines developed by professional bodies or associations to define ethical standards and best practices within specific professions. They outline

expectations for professional conduct, competence, confidentiality, conflicts of interest, and client relationships.

It's important for businesses and individuals to be aware of and comply with legislated regulations and codes of practice relevant to their industry and operations.

Industry regulations and codes of practice

Industry regulations and codes of practice are specific rules and guidelines that govern the operations, practices, and standards within a particular industry.

Financial Industry Regulations: In the financial sector, there are regulations and codes of practice that govern various activities such as banking, insurance, securities, and investment.

Healthcare Industry Regulations: The healthcare industry is subject to numerous regulations and codes of practice to ensure patient safety, privacy, and quality of care.

Food and Beverage Industry Regulations: The food and beverage industry is regulated to ensure food safety, quality, and labeling standards.

Construction Industry Regulations: The construction industry is subject to regulations and codes of practice to ensure safety, quality, and compliance with building standards.

Information Technology Industry Regulations: The IT industry is regulated to address privacy, security, and ethical concerns associated with data handling and technology use.

Environmental Industry Regulations: The environmental industry is subject to regulations and codes of practice to promote sustainable practices, protect natural resources, and minimize pollution.

It's essential for businesses operating in specific industries to understand and comply with the relevant regulations and codes of practice. Compliance helps maintain legal and ethical standards, ensures consumer trust, and minimizes the risk of penalties, fines, or reputational damage. Industry associations, regulatory bodies, and legal advisors can provide guidance on the specific regulations and codes applicable to a particular industry and jurisdiction.

4.2. Work plans

4.1.2. Daily work plan

A daily work plan, also known as a daily work schedule or daily task list, is a tool that helps individuals organize and prioritize their tasks and activities for a specific day. It provides a structured approach to manage time effectively, stay focused, and accomplish goals. While the specific details of a daily work plan may vary depending on individual preferences and job requirements, here are some general steps to create a daily work plan:

Review and Prioritize Tasks: Start by reviewing your to-do list or task backlog. Identify the tasks that need to be completed on the current day. Consider deadlines, urgency, importance, and any dependencies between tasks. Prioritize your tasks based on these factors.

Set Realistic Goals: Determine what you want to accomplish during the day. Set specific, measurable, attainable, relevant, and time-bound (SMART) goals that align with your overall objectives. Break down larger tasks into smaller, manageable sub-tasks.

Allocate Time Slots: Estimate the time required to complete each task. Assign time slots for each task in your schedule. Be realistic and consider any potential interruptions or unexpected events that may arise during the day. Allow some buffer time for contingencies.

Consider Energy Levels and Focus: Take into account your personal energy levels and focus patterns throughout the day. Assign tasks that require high concentration or creative thinking during your peak productivity periods. Schedule routine or less demanding tasks during times when your energy levels are lower.

Create a Schedule: Use a daily planner, calendar, spreadsheet, or task management tool to create a visual representation of your daily schedule.

Project plans

A project plan is a comprehensive document that outlines the objectives, scope, deliverables, timelines, resources, and tasks required to successfully complete a project. It serves as a roadmap for project execution, guiding team members and stakeholders throughout the project lifecycle.

Remember, the project plan should be a dynamic document that is regularly reviewed, updated, and communicated to stakeholders as the project progresses.

4.1.3. Resource plans

A resource plan, also known as a resource management plan, is a document that outlines the resources required for a project or program. It helps project or program managers effectively allocate and manage resources to ensure that they are available when needed, and to optimize their utilization.

By creating and following a resource plan, project or program managers can ensure that resources are effectively allocated, utilized, and managed throughout the project lifecycle. This helps minimize resource constraints, optimize productivity, and increase the chances of project or program success

4.2.5. Skills development plans

A skills development plan is a structured approach to identifying, assessing, and enhancing the skills and competencies of individuals or a team within an organization. It outlines the learning and development activities required to improve knowledge, abilities, and performance in order to meet current and future job requirements.

Self-check 4.1

Part I: Multiple Choices

Instructions: choose the correct answer and circle the letter of your choice from the Given alternatives

1. --------- --- These regulations are designed to protect the environment and prevent Pollution

a. Consumer Protection Regulations b. Environmental Regulations

c. Financial and Corporate Regulations d. personal protection

2. ---------- is a structured approach to identifying, assessing, and enhancing the skills and competencies of individuals or a team within an organization

a. Resource plan b. Project plan

c. Skills development plans d. Daily work plan

3. ----------is determine what you want to accomplish during the day.

a. allocate time slot b. Create schedule

c. Set Realistic Goals d. Review and Prioritize Tasks

part II: short answer

Instruction II : Give short and brief answer for the following questions

1. Define and explain occupational health and safety regulation?

2. What is the aim of consumer protection regulations?

3. How do you explain financial industry regulation?

4. Explain work plan?

5. Explain resource plans?

Unit Five: - Prepare Schedule for Production

This Unit Is Developed To Provide You The Necessary Information Regarding The Following Content Coverage And Topics:

- Production of component
- Production schedule

This Unit 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:

- Schedule Production Of Component
- Document Production schedule

5.1. Production of component

To produce a component, whether it's a part of a larger product or a standalone item, there are several key steps involved. Here's a general outline of the production process:

Design and engineering: Begin by creating a detailed design for the component. This involves defining its specifications, dimensions, materials, and any other relevant features.

Procurement of raw materials: Identify the necessary raw materials required to manufacture the component. Source and procure these materials from reliable suppliers, ensuring they meet the required specifications and quality standards.

Manufacturing process selection: Determine the most suitable manufacturing process for producing the component based on its design and material requirements

Production planning: Develop a production plan that outlines the sequence of operations and resources required for manufacturing the component. Consider factors such as production volume, lead times, equipment availability, and workforce capacity.

Manufacturing operations: Execute the manufacturing operations as per the chosen process. This typically involves setting up and operating machinery, performing material shaping or transformation, and applying any necessary finishing processes such as polishing or coating.

Quality control: Implement quality control measures throughout the production process to ensure the component meets the required standards..

Assembly (if applicable): If the component is part of a larger product, it may need to undergo assembly to integrate it into the final product. Follow assembly instructions and ensure proper fit, alignment, and functionality.

Packaging and labeling: Once the component is manufactured or assembled, package it appropriately to protect it during storage and transportation. Apply labels, barcodes, or other identification markings as necessary for traceability and inventory management.

Quality assurance: Conduct final quality checks on the finished component to ensure it meets all specified requirements. This may involve functional testing, dimensional inspections, or other validation procedures.

Inventory management: Store the produced components in a controlled inventory system, tracking quantities, locations, and any specific storage requirements. This helps ensure efficient

supply chain management and facilitates timely delivery to customers or downstream assembly processes.

Shipping and distribution: Prepare the components for shipment, considering factors such as packaging, transportation logistics, and any necessary documentation (e.g., customs forms). Coordinate with shipping carriers or logistics providers to ensure timely delivery to customers or other designated locations.

Continuous improvement: Monitor the production process and outcomes to identify opportunities for improvement..

It's important to note that the specific steps and considerations may vary depending on the complexity of the component, the industry, and the manufacturing capabilities available

5.1.1. Prepare schedule for production of a component/part

Schedule Production of component in accordance with production, inventory, procurements, time constraints, supply capacities and requirements.

- Production of component should be scheduled in accordance with production, inventory, procurements, time constraints, supply capacities and requirements.

5.1.2. Material Requirements Planning (MRP)

1. Better response to customer orders
2. Faster response to market changes
3. Improved utilization of facilities and labor
4. Reduced inventory levels

5.2 Production Schedule (PS)

A production schedule is a detailed plan that outlines the specific tasks, activities, and timelines required to manufacture or produce goods or services. It serves as a roadmap for allocating resources, coordinating activities, and ensuring efficient production processes. Here are the key steps involved in creating a production schedule:

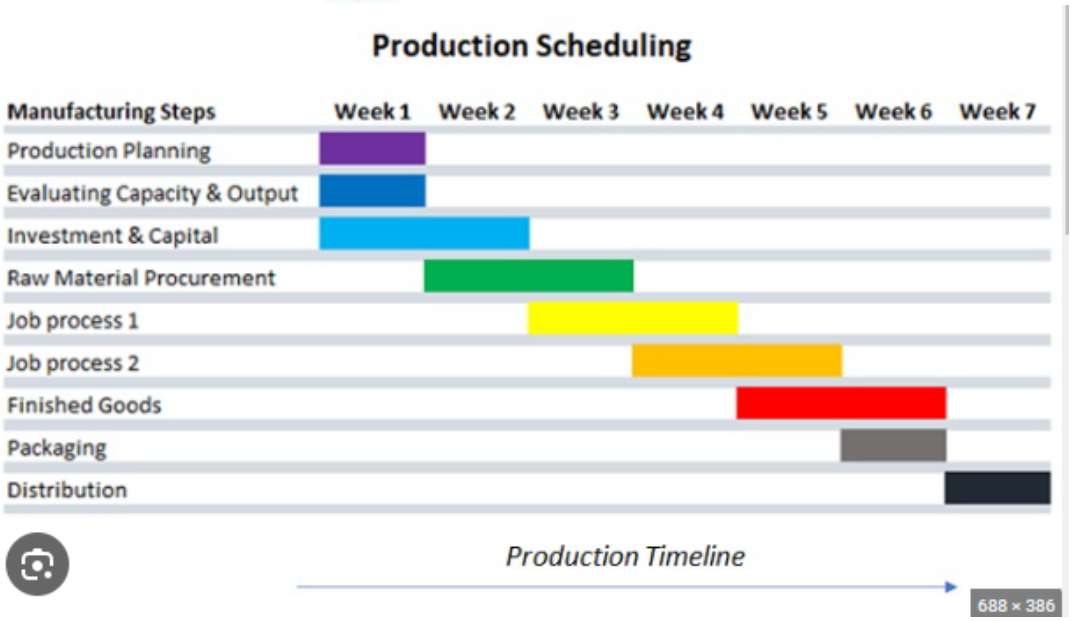


Figure 5.1 production timelines

5.2.1. Master Production Schedule (MPS)

☑ Specifies what is to be made and when

☑ Must be in accordance with the aggregate production plan

☑ Inputs from financial plans, customer demand, engineering, supplier performance

☑ As the process moves from planning to execution, each step must be tested for feasibility

☑ The MPS is the result of the production planning process

☑ MPS is established in terms of specific products

☑ Schedule must be followed for a reasonable length of time

☑ The MPS is quite often fixed or frozen in the near term part of the plan

☑ The MPS is a rolling schedule

The MPS is a statement of what is to be produced, not a forecast of demand

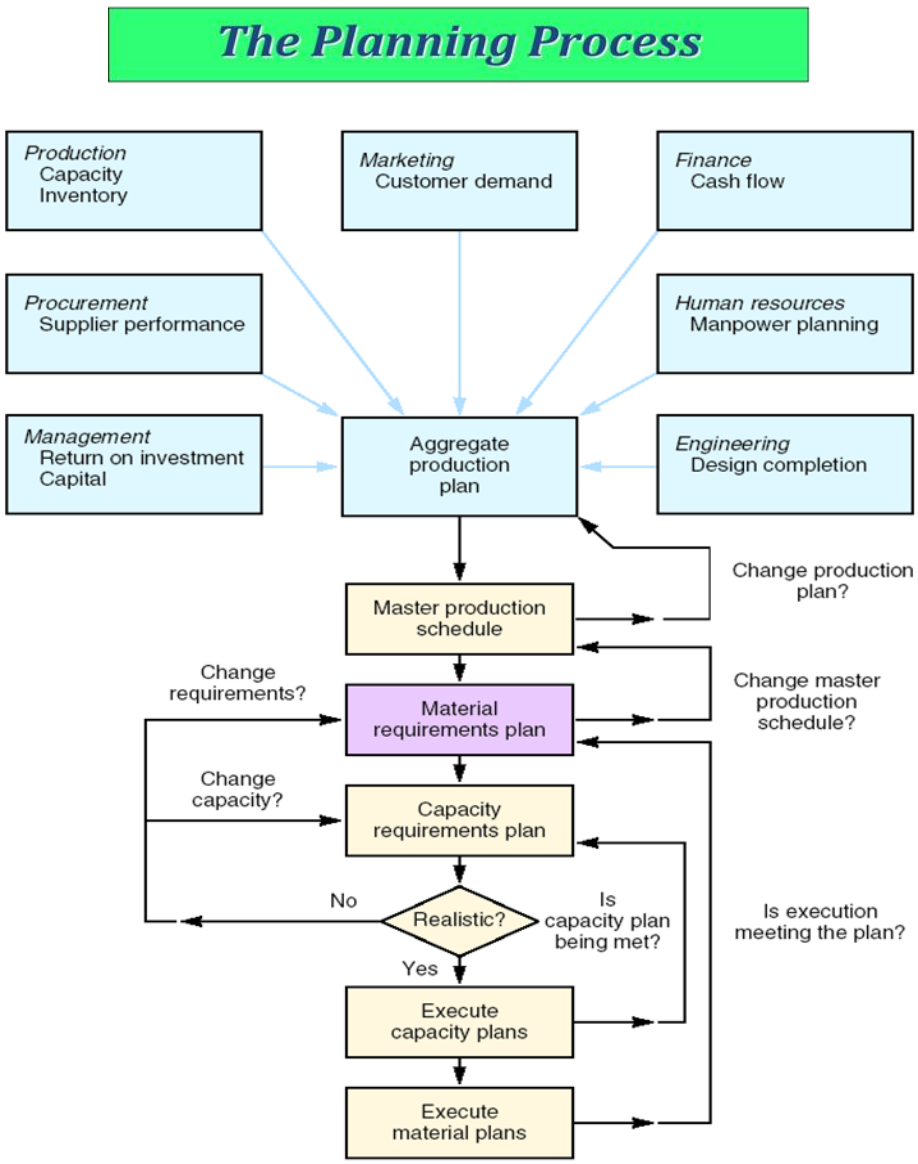


Figure 5.1. planning process

5.2.2. Can be expressed in any of the following terms:

☑ A customer order in a job shop (make-to-order) company

☑ Modules in a repetitive (assemble-to-order or forecast) company

☑ An end item in a continuous (stock-to-forecast) company

- **Lead Times**

☑ **The time required to purchase, produce, or assemble an item**

☑ **For production –** the sum of the order, wait, move, setup, store, and run times

☑ **For purchased items –** the time between the recognition of a need and the availability of the item for production

- **Safety Stock**

☑ BOMs, inventory records, purchase and production quantities may not be perfect

☑ Consideration of safety stock may be prudent

☑ Should be minimized and ultimately eliminated

5.2.3. T Master Requirement plan(MRP) and Just In Time(JIT)

☑ MRP is a planning system that does not do detailed scheduling

☑ MRP requires fixed lead times which might actually vary with batch size

☑ JIT excels at rapidly moving small batches of material through the system

- **Small Bucket Approach**

1. MRP "buckets" are reduced to daily or hourly

☑ The most common planning period (time bucket) for MRP systems is weekly

2. Planned receipts are used internally to sequence production
3. Inventory is moved through the plant on a JIT basis
4. Back flushing based on the BOM is used to deduct inventory that was used in production

- **Balanced Flow**

☑ Used in repetitive operations

☑ MRP plans are executed using JIT techniques based on "pull" principles

☑ Flows are carefully balanced with small lot sizes

☑ **Economic order quantity (EOQ)**

☑ EOQ expects a known constant demand and MRP systems often deal with unknown and variable demand

Self-check 5.1

Part I: Multiple Choices Instructions: choose the correct answer and circle the letter of your choice from the Given alternatives

1. Which of the following is used to involve defining its specifications, dimensions?

Material and any other relevant features

a. Production planning b. Quality control

c. Manufacturing operations d. Inventory management

2. Which of the following is the benefit of material requirements of planning?

a. Reduced inventory levels b. faster response to market change

c. a & b is answers d. negative responses for costumers

3. ---------- is a detailed plan that outlines the specific tasks, activities, and

Time lines required to manufacture or produce goods or services.

a. Continuous improvement b . Production Schedule

c. planning process d. packaging and labeling

4. ---------- is Conduct final quality checks on the finished component to ensure it

meets all specified requirements.

a. Inventory management b. Quality control

c. Quality assurance d. Production planning

5. Which one of the following is not the advantage of job-shop production system?

A. Full potential of operators can be utilized.
B. Opportunity exists for creative methods and innovative ideas.
C. Higher cost due to frequent set up changes.
D. Because of general purpose machines and facilities variety of products can be produced.

part II: short answer

Instruction II : Give short and brief answer for the following questions

1. Sketch the flow of production process?

2. What are the classification of production system and sketch it ?

3. Define and explain manufacturing operations ?

4. What is the benefit of balanced flow ?

5. Sketch the planning process chart /?

Unit Six: - Manage and Review process specifications

This Unit Is Developed To Provide You The Necessary Information Regarding The Following Content Coverage And Topics:

- Engineering and production data
- Production processes
- Operational specifications.
- Roles and responsibilities.
- Technical process
- Safety with chemical handling

This Unit 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:

- Analysed Engineering and production data
- Determined Production processes
- Obtain Operational specifications
- Allocate Roles and responsibilities.
- Monitor technical process
- Monitor Safety with chemical handling

6.1. Engineering and production data

- **The key issues for engineering support are to coordinate the participants and to provide each engineer an environment, also called a workspace where they can ...**

Production data is **data** that is essential to completing day-to-day business tasks and processes. **Production data** must be readily available for frequent and efficient access and is stored persistently. It is therefore often stored on high-performing Tier-1 storage that can be easily managed.

6.1.1. Engineering data

is a set of operations aimed at creating interfaces and mechanisms for the flow and access of information? It takes dedicated specialists – data engineers – to maintain data so that it remains available and usable by others. In short, data engineers set up and operate the organization's data infrastructure preparing it for further analysis by data analysts and scientist

To understand data engineering in simple terms, let's turn to databases – collections of consistent and accessible information. Within a large organization, there are usually many different types of operations management software: ERP, CRM, production systems, and more. And so there are many different databases as well. As the number of data sources multiplies, having data scattered all over in various formats prevents the organization from seeing the full and clear picture of their business state. It's necessary to figure out how to get sales data from its dedicated database talk with inventory records kept in a SQL server, for instance. This creates the necessity for integrating data in a unified storage system where data is collected, reformatted, and ready for use – a data warehouse. Now, data scientists and business intelligence (BI) engineers can connect to the warehouse, access the needed data in the needed format, and start yielding valuable insights from it.

The process of moving data from one system to another, be it a Sa aS application, a data warehouse (DW), or just another database, is maintained by data engineers. A data architect, however, is responsible for building a DW – designing its structure, defining data sources, and choosing a unified data format.

6.1.2. **Production management** is defined as the planning and **control** of all activities necessary to **produce** a set of products. For a typical metalworking job shop type of company, **production management** thus comprises important functions such as: **Product** development and technological planning. **Production** planning and **control**.

- **Determine project milestones.**

A milestone is defined as a point in time representing a key or important intermediate event in the life of a project. A milestone should be capable of validation by meeting all of the items prescribed in a defining checklist as agreed with the stakeholders. Milestones have zero duration and consume no resources. Milestones are used within the preliminary schedule to highlight the beginning and end of major units of work, dependencies with subprojects and significant project events. They also facilitate reporting processes and monitoring of high-level tasks. In addition:

- Once all of the task and project dependencies have been defined, define the project milestones;
- Milestones can have different levels of importance within the same project;
- Normally, milestones are used for summary monitoring and reporting;
- Ensure that the milestones exist for all key checkpoints; and
- Avoid the temptation to make every deliverable a milestone.

6.1.3. **Production management** means planning, organizing, directing and controlling of **production activities**. **Production management** deals with converting raw materials into finished goods or products. **Production management** also deals with decision-making regarding the quality, quantity, cost, etc., of **production**.

- The skills required to perform such work are as diverse as the function itself. The most important skills are:

- **Organizational abilities.** Organizing processes in an organization requires a set of skills from planning and prioritizing through execution to monitoring. These abilities together help the manager achieve productivity and efficiency.

- **Analytic capabilities/understanding of process.** The capability to understand processes in your area often includes a broad understanding of other functions, too. An attention to detail is often helpful to go deeper in the analysis.
- **Coordination of processes.** Once processes are analyzed and understood, they can be optimized for maximum efficiency. Quick decision-making is a real advantage here, as well as a clear focus problem-solving.
- **People skills.** Flaws in the interactions with employees or member of senior management can seriously harm productivity, so an operation manager has to have people skills to properly navigate the fine lines with their colleagues. Furthermore, clear communication of the tasks and goals serves as great motivation and to give a purpose for everyone.
- **Creativity.** Again, problem-solving skills are essential for a creative approach if things don't go in the right direction. When they do, creativity helps find new ways to improve corporate performance.
- **Tech-suaveness.** In order to understand and design processes in a time when operations are getting increasingly technology-dependent, affinity for technology is a skill that can't be underestimated. Operations managers have to be familiar with the most common technologies used in their industries, and have an even deeper understanding of the specific operation technology at their organizations.

6.2. Production Processes

Production processes refer to the series of steps or activities involved in transforming raw materials or inputs into finished products or services. These processes are designed to ensure efficient and effective manufacturing or delivery of goods and services.

6.1.4. machining production process

The machining production process involves the use of machines and tools to shape, cut, or remove material from a work piece in order to create a desired final product. It is commonly used in industries such as automotive, aerospace, machinery manufacturing, and precision engineering. Here are the key steps involved in the machining production process:

Design and Planning: The process begins with the design of the desired product and the creation of a machining plan. This includes selecting the appropriate materials, determining the dimensions and specifications, and identifying the machining operations required.

Work piece Preparation: The work piece, which can be a raw material or a partially finished part, is prepared for machining. This may involve cleaning, marking, and securing the work piece in a fixture or clamping device to ensure stability during machining.

Machine Setup: The machining equipment, such as a lathe, milling machine, or CNC (Computer Numerical Control) machine, is set up according to the machining plan. This includes installing the necessary cutting tools, adjusting the machine parameters, and aligning the work piece with the machine's axis.

- **Machining Operations**: Various machining operations are performed on the work piece to shape it according to the design specifications. Common machining operations include:
  - **Turning**: Rotating the work piece while a cutting tool removes material to create cylindrical shapes, such as shafts or cylindrical features.
  - **Milling**: Using rotary cutters to remove material from the work piece to create flat or contoured surfaces, slots, or holes.
  - **Drilling**: Creating holes in the work piece using a rotating drill bit.
  - **Grinding:** Using abrasive wheels or belts to remove material and achieve precise surface finishes or dimensional accuracy.
  - **Boring**: Enlarging or refining existing holes by using a single-point cutting tool.
  - **Tapping**: Creating internal threads in the work piece using a tapping tool.
  - **Sawing:** Cutting the work piece into desired lengths or shapes using saw blades

Inspection and Quality Control: Throughout the machining process, inspections are conducted to ensure the dimensional accuracy and quality of the machined parts. This may involve using measuring instruments such as calipers, micrometers, or coordinate measuring machines (CMMs).

Finishing Operations: After the primary machining operations, additional finishing operations may be performed to improve the surface quality, remove burrs, or add specific features. This can include processes like deburring, polishing, or coating.

Final Inspection and Packaging: Once the machining operations and finishing are complete, a final inspection is conducted to verify that the product meets the required specifications. The machined parts are then packaged and prepared for shipment or further assembly processes.

It's worth noting that the specific steps and techniques involved in the machining production process can vary depending on factors such as the type of machining operation, the complexity of the work piece, and the level of automation (e.g., manual machining or CNC).

6.3. Operational specifications.

Operational specifications, also known as operational requirements or operational parameters, are detailed specifications that define the operational characteristics, performance criteria, and functional requirements of a system, product, or process.

6.1.5. machining, operational specifications

In the context of machining, operational specifications refer to the specific requirements and parameters that define the operational characteristics and performance criteria of the machining process. These specifications help ensure that the machining operations are carried out effectively and produce the desired results. Here are some examples of operational specifications in machining:

Dimensional Accuracy: Machining processes typically have specific dimensional tolerances that need to be achieved. Operational specifications may define the acceptable range of dimensional variations, such as the maximum allowable deviation from the desired measurements or the required surface finish.

Material Removal Rate: The operational specifications may include the desired material removal rate, which is the amount of material that should be removed per unit of time. This specification helps determine the machining parameters such as cutting speed, feed rate, and depth of cut.

Tool Life and Tool Wear: Operational specifications may include requirements for the expected tool life or acceptable levels of tool wear. This specification helps determine the appropriate cutting tool materials, tool coatings, and cutting parameters to achieve the desired tool life and minimize tool changeovers.

Surface Quality: Machined parts often have specific requirements for surface roughness or smoothness. Operational specifications may define the acceptable surface finish parameters, such

as Ra (average roughness) or Rz (maximum roughness depth), to ensure the desired surface quality is achieved.

Machining Time: The operational specifications may include requirements for the maximum allowable machining time or cycle time. This specification helps determine the machining parameters and optimize the process to meet production schedules and throughput requirements

Cutting Forces and Power Consumption: Operational specifications may include limits or targets for cutting forces exerted during machining and the power consumption of the machining equipment. These specifications help ensure that the machining process does not exceed the machine's capacity and minimize energy consumption.

Chip Control and Swarf Management: Machining operations produce chips or swarf as a byproduct. Operational specifications may include requirements for chip control and swarf management, such as chip size, chip evacuation methods, and coolant flow rates, to ensure efficient chip removal and prevent chip-related issues.

Machine Tool Capability: Operational specifications may define the required capabilities of the machine tool, such as the maximum spindle speed, available axes of motion, tool change time, or accuracy of positioning. These specifications ensure that the machine tool is suitable for the intended machining operations.

Operational specifications in machining are typically determined based on the specific requirements of the work piece, the desired product quality, production volume, and other factors. They serve as a guideline for selecting appropriate machining strategies, machine tools, cutting parameters, and tooling to achieve the desired results efficiently and consistently.

6.4. Roles and Responsibilities.

The term "role and responsibility" is a broad concept that applies to various contexts, such as within an organization, a project team, or even in personal relationships. It refers to the specific functions, tasks, and obligations that individuals or groups are expected to fulfill in order to achieve certain objectives or fulfill their designated roles. Here is a general explanation of roles and responsibilities:

Role: A role refers to a position or function that an individual or a group assumes within a particular context. It defines the expectations, authorities, and responsibilities associated with that position. Roles can be formal, such as job titles in an organization, or informal, such as team leader or project coordinator within a project team.

Responsibility: Responsibility refers to the obligations and duties that individuals or groups have in relation to their roles. It involves being accountable for specific tasks, decisions, actions, or outcomes. Responsibilities are typically defined by the role and are essential for the effective functioning and success of the individual or group.

Here are some examples of roles and corresponding responsibilities in different contexts:

6.4.1. Organizational Roles:

Manager: Responsible for setting goals, managing resources, making decisions, and overseeing the performance of a team or department.

Sales Representative: Responsible for generating sales, building relationships with customers, and achieving sales targets.

Human Resources Specialist: Responsible for recruiting, onboarding, and managing employee relations within an organization.

6.4.2. Project Team Roles:

Project Manager: Responsible for planning, organizing, and executing a project, including defining objectives, managing resources, and ensuring deliverables are met.

Team Member: Responsible for completing assigned tasks, collaborating with other team members, and contributing to the overall project objectives.

Subject Matter Expert: Responsible for providing specialized knowledge and expertise in a specific area to support the project's success.

6.4.3. Personal Relationships:

Parent: Responsible for nurturing and caring for a child, providing guidance, and ensuring their well-being.

Friend: Responsible for offering support, being trustworthy, and maintaining a mutually beneficial relationship.

Spouse/Partner: Responsible for supporting and caring for each other, sharing responsibilities, and maintaining a healthy relationship.

It's important to note that roles and responsibilities may vary depending on the context, organizational structure, and specific requirements. Clear communication and understanding of roles and responsibilities are crucial to ensure effective collaboration, accountability, and successful achievement of goals.

6.5 Technical process

A technical process refers to a series of steps or activities that are performed in a systematic and organized manner to achieve a specific technical objective. It involves applying technical knowledge, skills, and tools to accomplish a desired outcome. Technical processes can vary widely depending on the specific field or industry, but they generally follow a structured approach.

- **Here are the common elements of a technical process**:

6.5.1. Analysis and Planning:

Define the problem or objective: Clearly identify the problem or goal that the technical process aims to address or achieve.

Gather requirements: Collect relevant information, data, and specifications needed to guide the process.

Analyze the situation: Evaluate the current state, constraints, and potential risks or challenges associated with the project.

Develop a plan: Create a detailed plan outlining the steps, resources, and timeline required to complete the process successfully.

6.5.2. Design and Development:

Conceptualization and ideation: Generate ideas and concepts for the technical solution.

Detailed design: Create a comprehensive design or blueprint that outlines the technical specifications, components, and interfaces of the solution.

Prototyping and testing: Build a prototype or model to validate the design and functionality.

Iterative refinement: Continuously review, refine, and improve the design based on feedback and test results.

6.5.3. Implementation and Execution:

Procurement and preparation: Acquire the necessary materials, equipment, or software needed for implementation.

Installation and configuration: Set up and configure the required hardware or software components.

Assembly or construction: Build or assemble the components according to the design specifications.

Coding or programming: Develop the necessary code or scripts to implement the technical solution.

Testing and validation: Verify that the implemented solution meets the desired requirements and functions correctly.

Documentation: Create documentation that describes the technical details, setup instructions, and troubleshooting guidelines.

6.5.4. Deployment and Maintenance:

Deployment and integration: Install and integrate the technical solution into the intended environment or system.

Operation and monitoring: Monitor the solution's performance, ensure proper functioning, and address any issues that arise.

Maintenance and updates: Perform routine maintenance tasks, apply updates or patches, and address any necessary repairs or improvements.

User training and support: Provide training and support materials to end-users to ensure they can effectively use and maintain the technical solution.

6.5.5. Evaluation and Continuous Improvement:

Evaluate the effectiveness: Assess the performance, reliability, and efficiency of the implemented technical solution.

Identify areas for improvement: Analyze feedback, user experiences, and data to identify areas where the technical process can be enhanced.

-**Implement improvements**: Apply changes, updates, or modifications to enhance the technical solution or the underlying process.

It's important to note that the specific steps and activities in a technical process can vary based on the industry, project requirements, and the nature of the technical objective. Additionally, iterative and agile approaches are often employed to accommodate feedback and adapt to changing needs during the technical process.

6.6. Safety with chemical handling

Safety is of paramount importance when it comes to handling chemicals. Mishandling or improper storage of chemicals can lead to accidents, injuries, and health hazards. Here are some key considerations and practices to ensure safety when handling chemicals:

6.6.1. Knowledge and Training:

Acquire proper knowledge: Understand the properties, hazards, and safe handling procedures of the chemicals you are working with. Read the safety data sheets (SDS) provided by the manufacturer or supplier.

Training: Ensure that all personnel involved in handling chemicals receive appropriate training on safe handling, storage, and emergency procedures. Regularly update their knowledge and skills.

6.6.2. Personal Protective Equipment (PPE):

Use appropriate PPE: Wear the necessary personal protective equipment, including gloves, safety goggles, lab coats, aprons, and respiratory protection, based on the nature of the chemicals being handled.

6.6.3. Storage and Handling:

Proper storage: Store chemicals in designated areas that are well-ventilated, secure, and away from incompatible substances. Follow the manufacturer's recommendations for storage conditions (temperature, light exposure, etc.).

Labeling: Clearly label all containers with the name of the chemical, hazards, and handling instructions. Use appropriate color-coded labels or tags to indicate specific hazards.

Segregation: Separate incompatible chemicals to prevent reactions. Store flammable materials away from ignition sources, and keep oxidizing agents separate from flammables.

- **Handling procedures**: Follow proper procedures for transferring, pouring, and mixing chemicals. Use appropriate equipment, such as funnels, pipettes, and dispensing tools.

6.6.4. Emergency Preparedness:

- **Emergency equipment**: Keep emergency equipment accessible, such as eyewash stations, safety showers, fire extinguishers, and first aid kits. Ensure that personnel are trained in their proper use.

- **Regular inspection**s: Inspect and maintain safety equipment, such as fire suppression systems, eyewash stations, and emergency showers, on a regular basis.

Remember, safety measures should be tailored to the specific chemicals being handled and the environment in which they are used. Always consult applicable regulations, guidelines, and best practices to ensure the highest level of safety when handling chemicals.

Self-check 6.1

Part I: Multiple Choices

Instructions: choose the correct answer and circle the letter of your choice from the Given alternatives

1. ---------- is defined as the planning and **control** of all activities necessary to **produce** a set of products.

a. engineering data b. Production management

c. Creativity d. Coordination of processes

2. ---------- Creating holes in the work piece using a rotating drill bit

a. turning b. sawing

c. Grinding d. Drilling

3. Which on of the following examples of operational specification ?

a. Material Removal Rate b. Machining Time

c. a &b are answers d. Machine Setup

4. ---------- refers to the obligations and duties that individuals or groups have in relation . to their roles.

a. Role b. Manager

c. Responsibility d. Team member

5. ----------is responsible for providing specialized knowledge and expertise in a specific area to support the project's success.

a. Friend b. Parent

c. Subject Matter Expert d. Spouse/Partner

part II: True or false questions

Instruction : Say true if the statement is true say false if the

Statement is false

1. Production data is data that is **not** essential to completing day-to-day business tasks and processes.

2. Production management means planning, organizing, directing and controlling of production activities

3. work piece preparation is one of key steps involve in machining production.

4. Machining operations are performed on the work piece to shape it according to the design specifications.

5. Machining processes typically have specific dimensional tolerances that need to be achieved.

Part III: short answer

Instruction: Give short and brief answer for the following questions

1.list down analysis and planning steps

2.Define and explain knowledge and training

3. what is labelling ?

4.define what is emergency preparedness ?

Unit Seven: - Assure Quality Workplace Operations

This Unit Is Developed To Provide You The Necessary Information Regarding The Following Content Coverage And Topics:

- Quality assurance
- Procedures and systems.
- Work place challenges.

This Unit 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:

- Initiate Quality assurance
- Improve Procedures and systems.
- Improve Work place challenges

7.1. Quality Assurance

Quality assurance (QA) is a systematic process implemented to ensure that products, services, or processes meet or exceed predefined quality standards and customer expectations. It involves monitoring and evaluating various aspects of the production or service delivery process to identify and resolve any issues or deviations from the desired quality.

7.1.1. Machining quality assurance

Machining quality assurance is a crucial aspect of the manufacturing process that ensures the produced machined parts meet the required specifications and standards. It involves implementing various measures and practices to monitor, control, and improve the quality of machined components. Here are some key considerations for machining quality assurance:

7.2. Procedures and systems

Documentation and Specifications:

Define specifications: Clearly define the required specifications, dimensions, tolerances, surface finish, and other quality criteria for the machined parts.

Documentation control: Establish a system to control and manage all relevant documents, such as engineering drawings, work instructions, and quality standards.

7.2.1. Process Control:

Standardized processes: Develop and follow standardized machining processes, including setup, tooling, cutting parameters, and inspection techniques.

Process validation: Validate the machining processes to ensure they consistently produce parts that meet the required specifications.

Monitoring and control: Implement monitoring and control mechanisms to track the key process parameters, such as tool wear, cutting forces, temperature, and machine performance.

7.2.2. Inspection and Measurement:

- **Metrology equipment**: Utilize appropriate measuring instruments, such as calipers, micrometers, height gauges, coordinate measuring machines (CMMs), and optical measurement systems, to inspect and measure the machined parts accurately..

Statistical Process Control (SPC):

Data collection: Collect and analyze data on key quality parameters throughout the machining process.

Control charts: Use control charts to monitor process variations and identify any trends or out-of-control conditions that may affect quality.

Statistical analysis: Apply statistical techniques to analyze process data and make data-driven decisions for process improvements.

7.2.3. Corrective and Preventive Actions:

Non-conformance management: Establish a system to identify, document, and address non-conforming parts or processes.

Root cause analysis: Conduct thorough investigations to identify the root causes of quality issues and implement corrective actions to prevent their recurrence.

Continuous improvement: Foster a culture of continuous improvement by encouraging feedback, implementing suggestions, and regularly reviewing and updating machining processes and quality control procedures.

7.2.4. Training and Competence:

Employee training: Provide comprehensive training to machinists, operators, and quality personnel on machining techniques, measurement methods, quality standards, and the use of inspection equipment.

Competence assessment: Regularly assess the competence and skills of personnel involved in machining to ensure they are capable of meeting quality requirements.

7.2.5. Supplier Quality Management:

Supplier evaluation: Evaluate and select suppliers based on their quality systems, capabilities, and track record.

Incoming inspection: Perform incoming inspections on raw materials, purchased components, and tooling to ensure their compliance with specifications.

Supplier collaboration: Collaborate with suppliers to address quality issues, improve processes, and establish effective communication channels.

By implementing robust machining quality assurance practices, manufacturers can consistently produce high-quality machined parts that meet customer requirements, reduce waste and rework, and enhance overall customer satisfaction.

7.3. Work place challenges.

The workplace can present a variety of challenges that individuals and organizations need to navigate. Here are some common workplace challenges and strategies for addressing them:

Communication Issues:

Lack of clarity: Ensure that communication is clear, concise, and specific to avoid misunderstandings.

Poor listening: Encourage active listening and provide opportunities for open and honest dialogue.

Language and cultural barriers: Foster inclusivity and provide language and cultural sensitivity training when necessary.

7.3.1. Interpersonal Conflicts:

Promote a positive work environment: Encourage respect, empathy, and collaboration among team members.

Mediation and conflict resolution: Provide mechanisms for resolving conflicts through mediation or facilitated discussions.

7.3.2. Workload and Time Management:

Prioritization: Help employees set realistic priorities and manage their workload effectively.

Delegation: Encourage delegation of tasks and responsibilities to distribute work more evenly.

Time management training: Provide training on time management techniques and tools to improve productivity and efficiency.

7.3.3. Change Management:

Communicate effectively: Provide clear and timely communication about the reasons for change, its impact, and the benefits it brings.

-**Involve employees**: Involve employees in the change process, seek their input, and address their concerns.

Work-Life Balance:

Flexible work arrangements: Consider flexible work hours, remote work options, or compressed workweeks to promote work-life balance.

Encourage boundaries: Encourage employees to set boundaries between work and personal life and promote a culture that respects those boundaries.

7.3.4. Lack of Recognition and Motivation:

Regular feedback: Provide constructive feedback and recognize employees' achievements and contributions.

-**Employee recognition programs**: Implement programs that acknowledge and reward exceptional performance.

Diversity and Inclusion**:**

Foster inclusivity: Create a culture that values diversity and promotes inclusion, where all employees feel respected and valued.

Training and awareness: Provide diversity and inclusion training to raise awareness and address unconscious biases.

Professional Development:

- **Training and development programs**: Offer opportunities for employees to enhance their skills and knowledge through training, workshops, and conferences.

- **Individual development plans**: Encourage employees to create personal development plans that align with their career aspirations.

It's important to note that each workplace is unique, and the specific challenges faced may vary. Addressing workplace challenges requires a combination of effective communication, leadership, employee engagement, and supportive policies and practices

Self-check 7.1

part I: True or false questions

Instruction : Say true if the statement is true say false if the Statement is false

1. One of the following is the key consideration quality assurance

   a. press validation b. process control

   b. Risk management d. documentation

2. ---------- is Utilize appropriate measuring instruments, such as calipers, micrometers, height gauges, coordinate measuring machines.

   a. Process validation b. Monitoring and control

   c. Metrology equipment d. Standardized processes

3. One of the following is common work place challenge and strategy?

   a. Competence assessment b. poor listening

   c. Process validation d. Data collection

4. Which one is included under process control?

   a. Monitoring and control b. Define specifications

   c. Metrology equipment d. Statistical analysis

5. ----------is Encourage delegation of tasks and responsibilities to distribute work more evenly.

   a. Prioritization b. Time management training

   c. Delegation c. Lack of clarity

Part II: short answer

Instruction: Give short and brief answer for the following questions

1. Define and explain machining quality assurance?
2. Explain the difference b/n documentation control and define specification?
3. What is the impact of poor listening?
4. What is work load and time management?
5. What is the impact of lack of recognition and motivation?

References

1. C. A. Bartlett and S. Ghoshal, “Matrix Management: Not a Structure, a Frame of Mind,” Harvard Business Review, pp. 138-45 (July-August1990).

2. D.J.Duck,“ManagingChange:TheArtofBalancing,”HarvardBusinessReview,pp. 109-118 (November–December 1993).

3. J.J.GabarroandJ.P.Kotter,“ManagingYourBoss,”HarvardBusinessReview,pp. 150-157 (May-June 1993)

4. R. H. Schaffer and H. A. Thomson, “Successful Change Programs Begin with Results,” Harvard Business Review, pp. 80 – 89 (January-February1992)

5. A. van de Lliet, “To Beat the Best,” Management Today, pp. 56-60 (January1996)

6. R. M. Kanter, “Collaborative Advantages: The Art of Alliance,” Harvard Business Review, pp.96-108 (July-August1994)

7. John A. Byrne, “Management‟s New Gurus,” Business Week, pp. 44-51 (August 31, 1992)

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