



INDUSTRIAL MANAGEMENT

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UNIT-1

- **University Syllabus:**

- **Introduction:**

- Concept, Development, application and scope of Industrial Management.

- **Productivity:**

- Definition, measurement, productivity index, types of production system, Industrial Ownership.

Concept of Industrial Management

- Application of Management theories & concepts are now all pervasive and all encompassing.
- With Best engineering skills and knowledge, professional cannot just sustain since any operational issues require application of management techniques.
- Any engineer by profession is also a manager, as engineers also qualify in the classical test of managerial roles, interpersonal roles, and informational roles and decisional role.

Industrial Management

- Industrial management, as a branch of engineering facilitates creation of management systems and integrates the same with people and their activities to productively utilize the resources.
- The subject emphasizes studying the performance of machines and so also the people.
- Industrial management, therefore, in the structured approach to manage the operational activities of an organization.

Process of Development of Industrial Management

S. No.	Orientation	Pioneered by	Definition concerned with
1.	Productivity orientation	F.W. Taylor & J. F. Mee	Increased Productivity
2.	Human Relations Orientation	L. A. Applay & H. Knortz	Emphasis on people
3	Decision making Orientation	Ross Moore & Stanley Vance	Decision making as primary management function
4.	Leadership Orientation	Donald J. Clough & Ralph C.	Leadership is the essence of Management
5.	Process Orientation	Dalton, & McFarland	Management as process

Development of Management

1. Classical School of Thought

F.W. Taylor	Development of Scientific Management	(1856- 1915)
F. B. Gilberth	Time & Motion Studies	(1868- 1924)
Henry L. Gantt	The Gantt Chart	(1861- 1919)
Administrative Theory		
H. Fayol	General Theory of Management	
Max Weber	Rules	

2. Neo- Classical Thought

Mark Parker Follet	Group Influences	(1868-1933)
Elton Mayo	Effect of human motivation on productivity & output	(1880- 1949)
A. Maslow	Relates human motivation to hierarchy of needs	
Douglas Mc Gregor	Puts emphasis on human characteristics Theory X & theory Y and the corresponding style of leadership	(1906- 1964)
Chris Argyris	Human & Organizational Development	

3. Modern Approaches

Quantitative School of thought

System Theory Approach

The Contingency Theory

Scientific Management Approach

- **Taylor** emphasized following points to achieve organizational efficiency
 - Develop scientific way of performing jobs.
 - Train and develop workers to perform the job.
 - Establish harmonious relation between management and workers.
- Taylor suggested two important practices:
 - Piece rate incentive system.
 - Time and motion study.

- 👉 **Piece rate system** rewards the workers who produce the maximum output.
- 👉 **Time study** helps in determination of time required, recording analyzing and synthesizing the time elements of each operation.
- 👉 **Motion study** on the other hand involves study of movements in doing jobs in parts and eliminates wasteful movements and retains only necessary movements. It makes a job simpler, easier and better.
- 👉 **Time and Motion Study** concepts were developed by **F.W.Taylor** in association with **Frank** and **Lillian Gilberth**.
- 👉 **Gilberth** conducted research on motion studies. They had classified 17 basic hand motions like **search, select, position, hold** etc. They called this therbligs . Their approach helps to analyse the exact elements of a workers' hand movement.
- 👉 **Henry Gantt** worked with Taylor. His contributions are introduction of **task** and **bonus plan**, and **Gantt chart**. As per his incentive plan worker gets daily wage even if he does not complete his job, but gets bonus if the jobs is completed in less than normal time.
- 👉 **Gantt chart** is used for production control indicating **progress of production in terms of time**.

Drawback of Scientific Management Approach

- **Scientific Management** principles revolve around operational level problems do not focus on managerial issues essential for managing organization.
- This theory also ignores the human desire for job satisfaction.

Administrative Theory

- Administrative Theory another part of classical school of thought focuses on principles to coordinate the internal activities of the organization. Henry Fayol classified business operations into 6 activities.
 - **Technical** : Activities relating to production and manufacturing.
 - **Commercial** : Activities relating to buying selling and exchange.
 - **Financial** : Activities ensuring optimal use of capital.
 - **Security** : Activities to ensure protection to employees and property.
 - **Accounting** : Activities concern with costs, profits, liabilities, balance sheet.
 - **Managerial** : It is functional approach to management. i.e. planning, organizing, directing, coordinating and controlling.

Bureaucratic Theory

- **Max Waber** had advocated the necessity of a formal organizational structure with set rules and regulations. Weber's concept is intended to **remove ambiguity, inefficiencies, and patronage.**

Limitations of Classical School of Thought

- Management principles are not universally applicable in today's complex business situation.
- Classical school of thought ignored organizational behaviour (leadership, motivation informal relation) only concentrated on productivity.

Neo Classical School of Thought

- This school of thought lays emphasis on human elements in an organization.
- **Max Parker Follett** recognized the **significance of human elements**, attributed greater significance to the **functioning of groups in workplace**.
- **Elton Mayo** father of Human Relations Approach, conducted the study to evaluate the **attitudes and psychological reactions of workers** in on the job situations.
- **Maslow's** focus was on **importance of human needs** driving force for **motivation**.
- **McGregor** has made assumption about people categorizing them as under
 - **Theory X** People are by nature **lazy**, have **little ambition**, **dislike work**, **avoid responsibility**.
 - **Theory Y** People are **more positive**, **innovative**, **creative** and **do not dislike work**. **Chris Argyris's** contributions are **maturity –immaturity theory**, **integration of individual and organizational goals**.

Modern Approaches

- These approaches are classified as
 - I. Quantitative School of thought.
 - II. System Theory Approach.
 - III. The Contingency Theory.

Quantitative School of Thought

- Different branches of quantitative approaches are **Management Science, Operations Management, MIS.**
- **Management science** approach or operations research approach is used in production, **scheduling human resource planning, inventory management** etc.
- **Operations management** is primarily concerned with **production management** and related management.
- **MIS** approach focuses on design and implementation of information system for management uses. It converts raw data into information inputs to be used by management for decision making.

System Theory Approach

- It considers organization as a whole because of **interdependent nature of activities** requiring organization to **interact with external environment** factors.

Contingency Theory Approach

- This Approach discards the concept of universality in management principles and **determines managerial decisions considering situational factors.**
- Contingency theory and System theory together are classified as **integrative school of management** thought because these two theories integrate the classical, behavioral and quantitative theories and uses only the best of each approach in a given situation.

APPLICATION & SCOPE OF INDUSTRIAL MANAGEMENT

- Initially the scope & application of industrial management was restricted to manufacturing industry. Later on it spread to non- manufacturing activities such as construction & transportation, farm and air- line operations and maintenance, public utilities govt. & military operations.
- In an industry besides the production, other departments utilizing industrial management concepts are Marketing, Finance, Purchasing, Industrial relations etc.

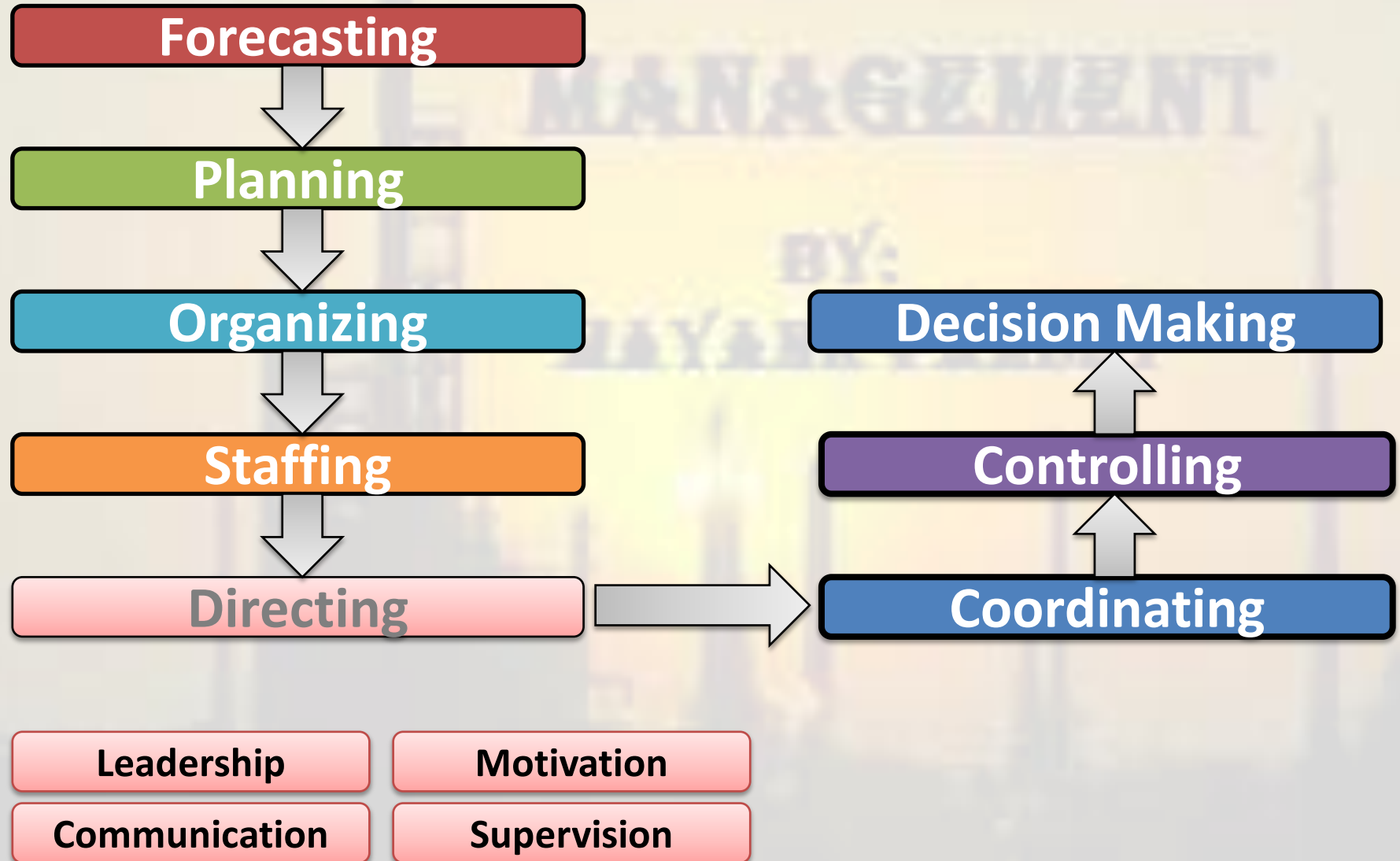
Major applications of Industrial Management



Scope of Industrial Management

Expertise Help	Help in all decision making and problem solving
	Help in design of production system
	Help in design, selection and implementation of new technology
Advise and Consultancy	Interpretation of data and information
	Review of data and information
	Productivity measurement and improvement
System Analysis	Identification of faults in the production system
	Job analysis of the system
Training and Motivation	Motivation practice of employee
	Work and motion study
	Training of workers in motion study
	Application of new technology
	Negotiation
Decision Making	Application of operation research in management
	Development and use of decision tools
	Use of MIS and Computers.

Process of Management/Management Functions



PRODUCTIVITY

Concept and Definition

- Productivity may be defined as the ratio between output and input.
- Output means the amount produced or the number of items produced and inputs are the various resources employed, e.g, land, building, equipment and machinery, materials, labours, etc.
- According to Peter Drucker, “Productivity means a balance between all factors of production that will give the maximum output with smallest efforts.
- ILO defines productivity as the ratio of aggregate output to aggregate input.

Factors Affecting Productivity

- **Factors affecting National Productivity**
 - *Human Resources*
 - *Technology and Capital Investment*
 - *Government Regulation*
- **Factors affecting Productivity in Manufacturing and Services Sectors**
 - *Product and System Design*
 - *Machinery and Equipment*
 - *Skill and Effectiveness of the Worker*
 - *Production Volume*

Measurement of Productivity

- The basic objectives of productivity measurement are:
 - To study performance of a system over time.
 - To have relative comparison of different systems for a given level; and
 - To compare the actual productivity of the system with its planned productivity.

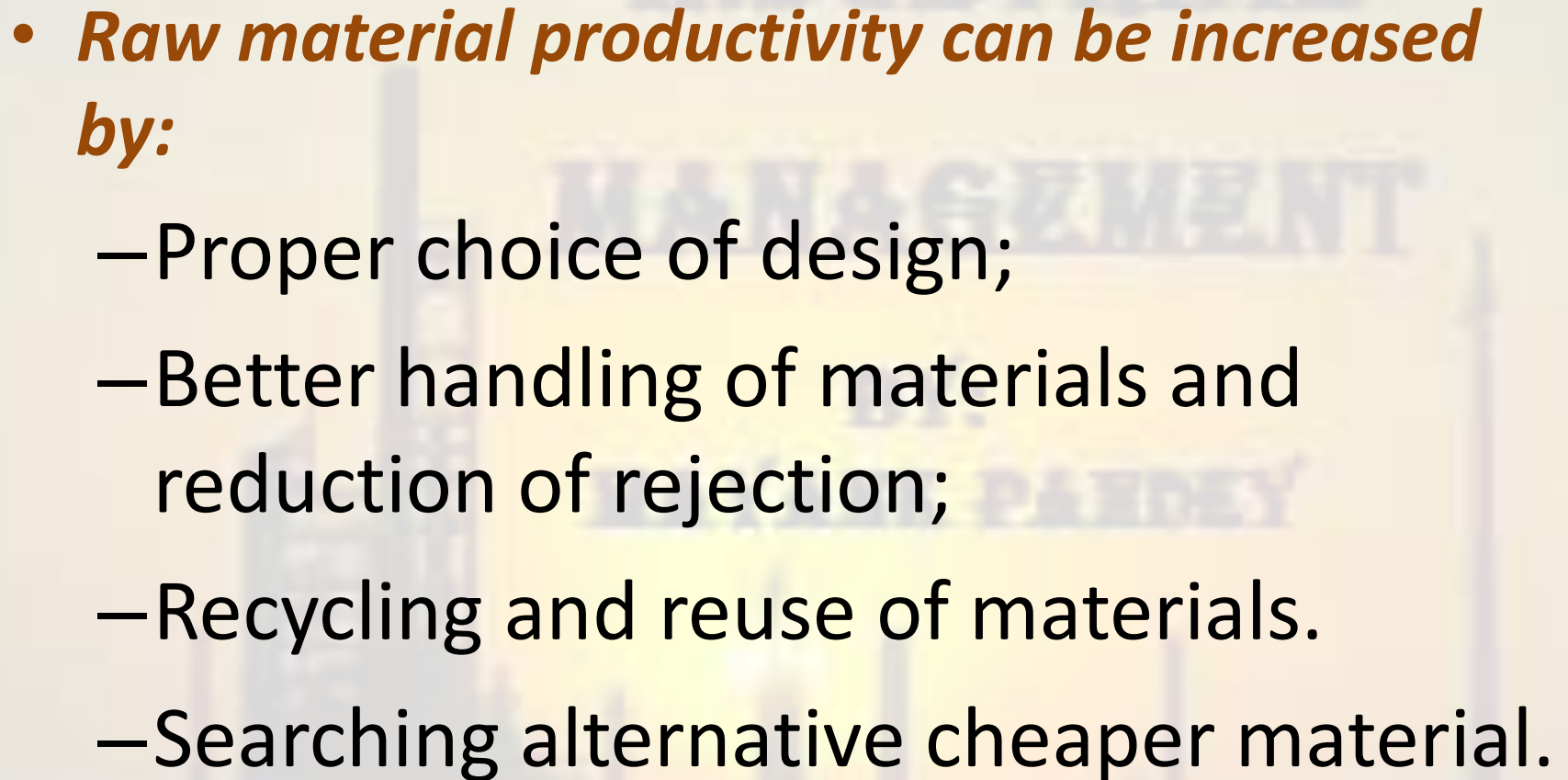
- The most common way is to express both outputs and the inputs in monetary terms.
- If the outputs and inputs for the period for which productivity is measure, are expressed in rupees, then
 - Aggregate output = Gross sales= G(say); and
 - Aggregate input= Cost= C (say)

$$\text{Thus Total Productivity } T_p = \frac{\text{Aggregate Output}}{\text{Aggregate Input}}$$

Kinds of Productivity Measurement

- 1. Land Productivity:** The productivity of land and building is said to have increased if the output of goods and services within that area is increased.
- 2. Material Productivity:** The productivity of the materials becomes key factor in economic production / operation.

$$\text{Material Productivity} = \frac{\text{Number of units produced}}{\text{Cost of material}}$$

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- *Raw material productivity can be increased by:*
 - Proper choice of design;
 - Better handling of materials and reduction of rejection;
 - Recycling and reuse of materials.
 - Searching alternative cheaper material.

3. Labour Productivity

- Output can be measured in total quantity produced and labour can be measured in total man hours required to produce that output.

$$\text{Labour productivity} = \frac{\text{Aggregate Output}}{\text{Amount of Labour}} \text{ or } \frac{\text{Number of units produced}}{\text{Man hours utilized}}$$

- Output and labour can also be measured in terms of their value in money value. Thus,

$$\text{Labour productivity} = \frac{\text{Total Revenue from Production}}{\text{Expenditure on Labour}}$$

- ***Labour productivity can be increased by:***
 - Providing training to use best method of production.
 - Constantly motivating the workers by providing financial and non-financial incentives
 - Keeping high morale of the employees.
 - Improving working condition on the plant.

Example: A worker was assembling 10 pieces of mobile sets per hour and the same worker, by improved methods of the work is able to produce 13 pieces of mobile sets. The productivity is improved by 30%.

4. Machine Productivity

- Output can be measured in total quantity produced and machine can be measured in total machine hours required to produce that output.

$$\text{Machine Productivity} = \frac{\text{Actual Output}}{\text{Actual Machine Hours Utilized}}$$

- ***Machine productivity can be improved by:***
 - Preventive maintenance;
 - Use of proper speed, feed, etc.
 - Using method study techniques(Using best method)
 - Use of skilled, properly trained workers.

5. Capital Productivity

Turn Over

Capital Productivity = -----

Actual Machine Hours Utilized

- ***Capital productivity can be improved by:***
 - Better utilization of capital resources like land, building machines etc.
 - Careful make or buy decision.
 - By using modern techniques of production, maintenance, flexible manufacturing system, proper plant layout etc.

Productivity Index

- Productivity index is used to compare the productivity during the current year with the productivity during the base year.
- Base year is any year which the company uses for comparative study.

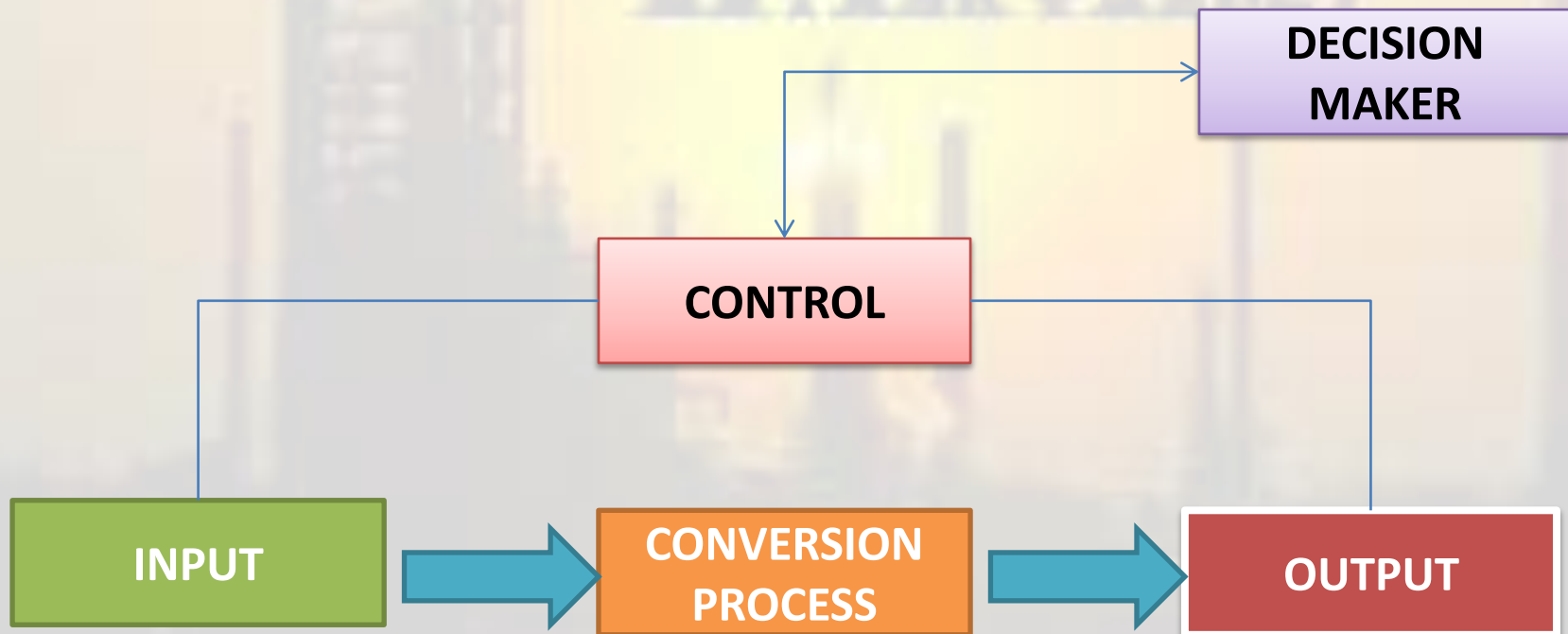
$$\text{Productivity Index} = \frac{\text{Productivity during the current year}}{\text{Productivity during the base year}}$$

Sources of Information for Productivity Index

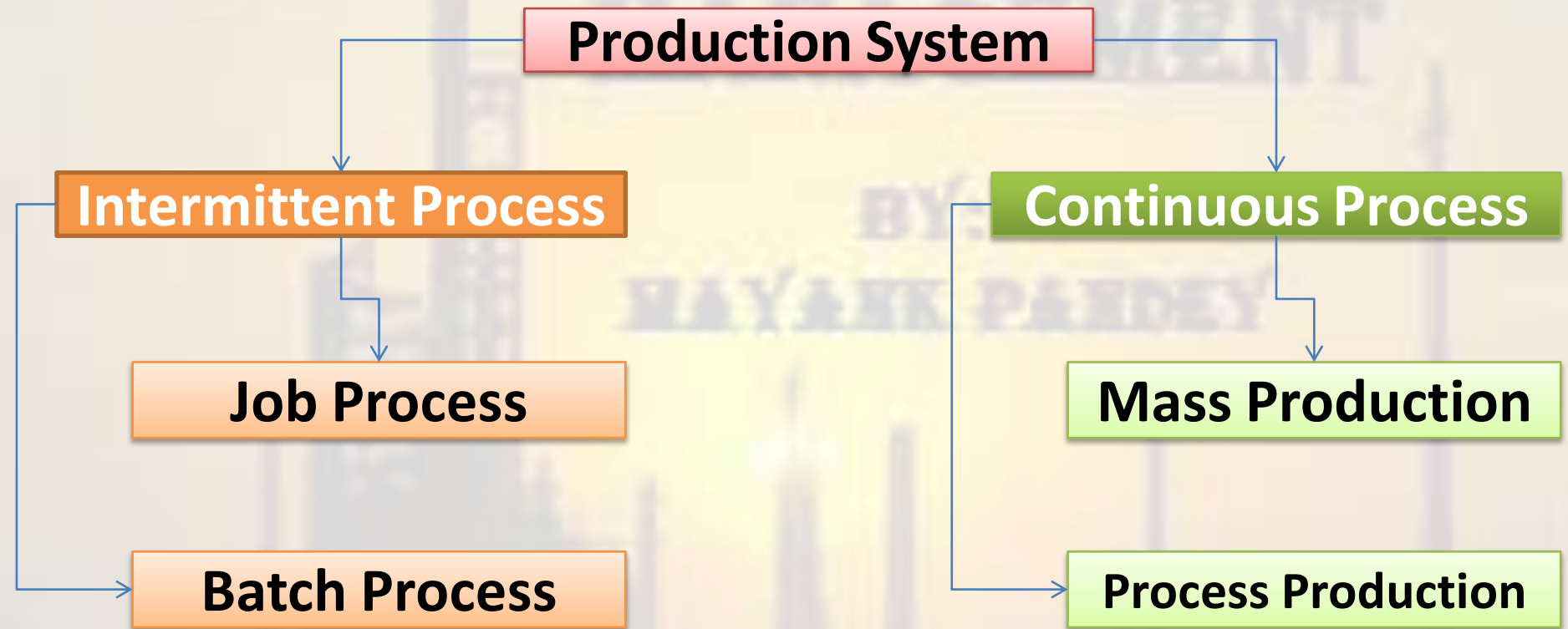
- There are three major sources:
 - Product Identification Information
 - Accounting Information
 - Work Measurement Information

TYPES OF PRODUCTION SYSTEM

- Production is the process by which goods and services are created. A typical production / manufacturing system is depicted in

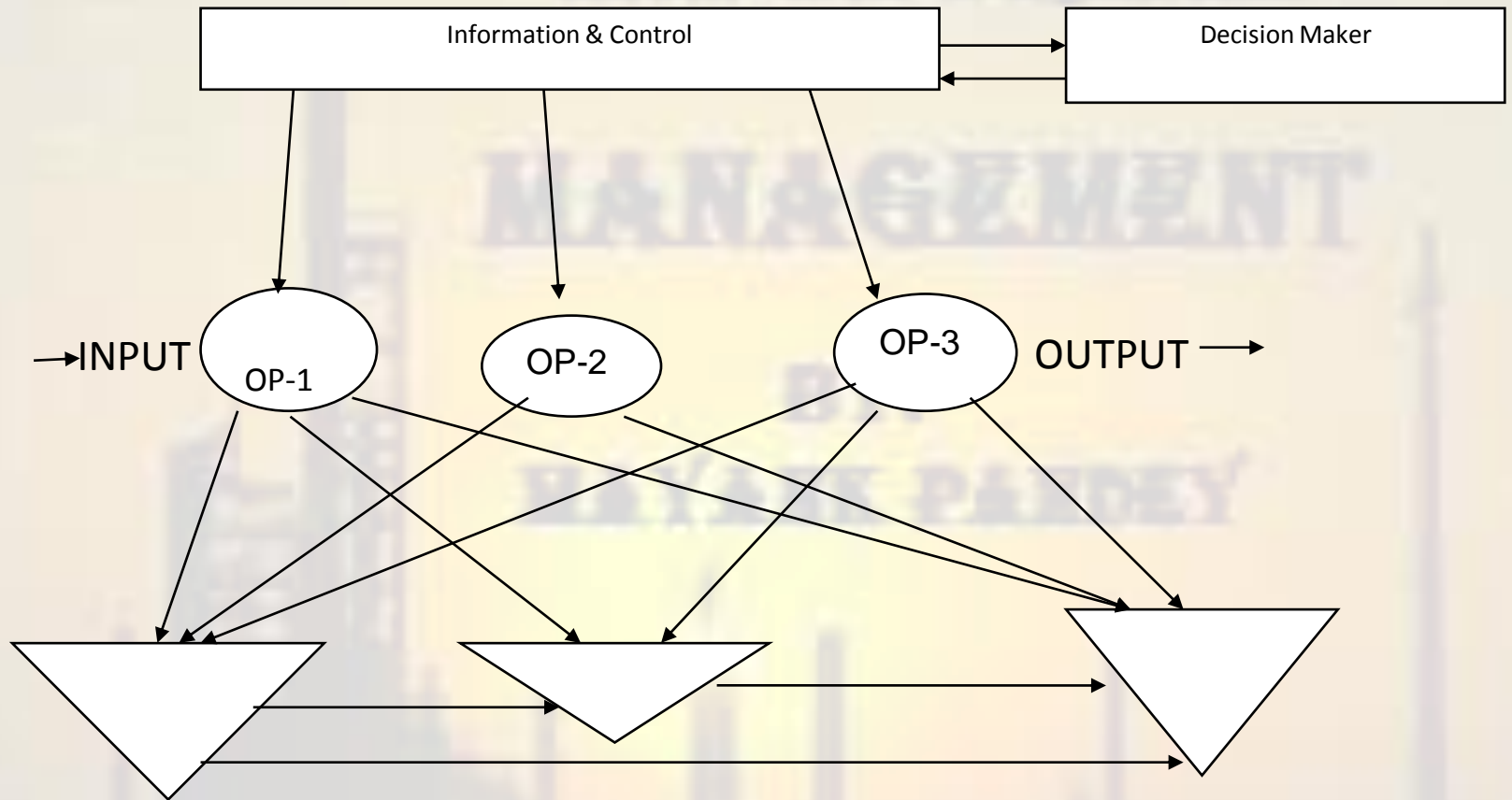


Classification of Manufacturing System



Intermittent System

- In this system, the goods are manufactured specially to fulfill orders made by customers rather than for stock.
- Here the flow of material is intermittent.
- Intermittent production systems are those where the production facilities are flexible enough to handle a wide variety of products and sizes.



Chief characteristics of intermittent system are:

1. Most products are produced in small quantities.
2. Machines and equipment are laid out by process.
3. Workloads are generally unbalanced.
4. Highly skilled operators are required for efficient use of machines and equipment.
5. In-process inventory is large.
6. Flexible to suit production varieties.

Job- Production or Project Type Production

- In this system the goods are produced to definite customer's orders.
- There is no assurance of continuous demand for specific items and the manufacturing depends on the receipt of orders from customers.

Job-order process is characterised by

1. Whole project is taken as a single operation.
2. Work is to be completed on each product before processing the next item.
3. Versatile and skilled labour is needed.
4. High capital investment.
5. Control operations are relatively simple.
6. High unit cost of production.

Batch-Production

- The items are processed in lots or batches unlike job-type system where one item is produced during each production run.
- In batch-type system new batch is undertaken for production only when the work on all items of a batch is complete.

It is characterized by

1. One can employ more specialized labour for each operation with comparatively low investment.
2. Organization and planning is more complicated in this system.
3. The irregularity in the increase of work added to the basic material.

Features of an intermittent System

1. Demand can be discontinuous.
2. All operational stages may not be balanced.
3. Elaborate sequencing and scheduling is required.
4. Needs high investment.
5. Planning, routing and scheduling changes with fresh orders.
6. Storage is necessary at each stage of production process.
7. Can adjust to new situation and specification.
8. Inspection is not in line with production.

Continuous System

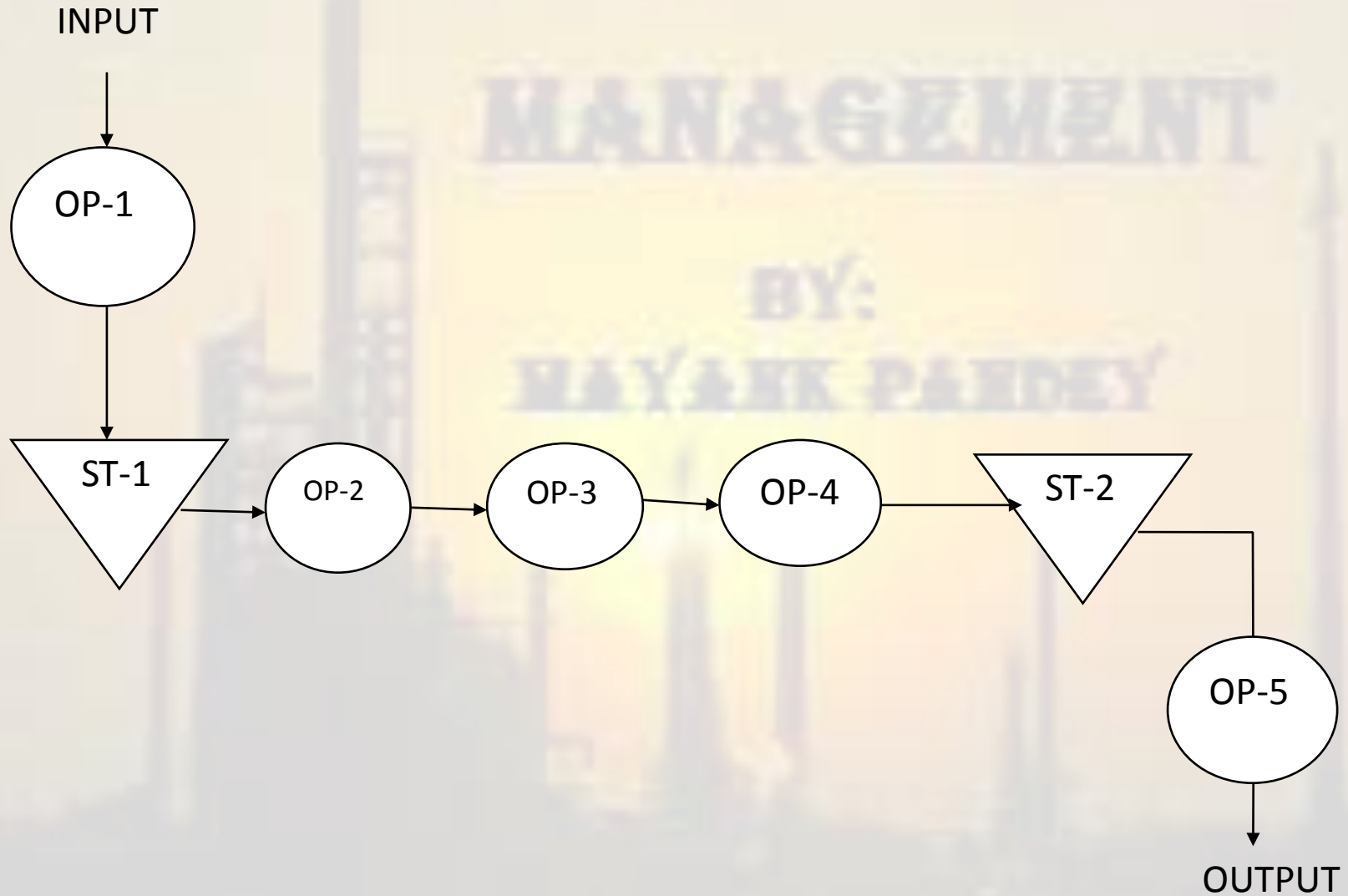
- In this system the items are produced for the stocks and not for specific orders.
- Here the inputs are standardized and a standard set of processes and sequence of processes can be adopted. In continuous manufacturing systems each production run manufactures in large lot

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Mass Production

1. Standardization is the fundamental characteristic of this system.
2. Here items are produced in large quantities and much emphasis is not given to consumers orders.
3. Uniform and uninterrupted flow of material is maintained through pre-determined sequence of operations.
4. Specialization and standardization also leads to economies in production

Process Production

This system is analogous to Mass production system with more stress on automation in production process.

1. The volume of production is very high.
2. Used for manufacturing those items whose demand is continuous and high e.g. petroleum products, particular brand of medicines, heavy chemicals industries, plastic industries etc.
3. Single raw material can be transformed into different kinds of product at different stages of the production process e.g. in processing of crude oil in refinery one gets kerosene, gasoline etc. at different stages of production.

Features of continuous type of Manufacturing Systems

1. There must be continuity of demand.
2. The product must be standardized.
3. Material should be per specifications and delivered in time.
4. All operational stages in the process must be balanced.
5. Work must conform to quality standards.
6. Appropriate plant and equipment must be provided.
7. Maintenance must be by anticipation and not by default.
8. Inspection must in line with production.

Advantages

1. Direct labour content is reduced.
2. High accuracy.
3. Work in progress is at a minimum.
4. Storage at different stages of operation not necessary.
5. Reduced material handling.
6. Control process simple.
7. Any weakness in the system is easily located.
8. Material requirements can be accurately planned.
9. Investment in material can be more rapidly translated into income from sales.

Differences between Intermittent and Continuous Process

Intermittent

- 1. Same product is not produced continuously.**
- 2. Items produced for order.**
- 3. Production process flexible.**
- 4. Equipment used for limited time.**
- 5. Wide range of products can be produced.**
- 6. Smaller scale of production.**
- 7. Planning and control operations complicated and tedious.**

Continuous

- 1. Same product produced continuously.**
- 2. Items produced for stock.**
- 3. Process not flexible.**
- 4. Regular use of equipment.**
- 5. Only particular type of product is produced.**
- 6. Large scale production.**
- 7. Planning and control operations simple and easy.**

1. More detailed and too many instructions are required for operations.
2. Capital investment may be low.
3. Per unit cost of production is high.
4. Less security of jobs.
5. Functional type of organization.
6. Requires staff of high technical skill and ability.
7. Control not in line of production.
8. Storage is required at each operation.
9. Change in location easy.
10. Product and the process not standardized.
11. Accuracy low.

1. Single set of instructions is sufficient for operations.
2. Capital investment is high.
3. Per unit cost of production is low.
4. More security of jobs.
5. Divisional type of organization.
6. Requires more managerial capability and better co-ordination.
7. Control in line of production.
8. Storage required only at limited locations.
9. Change in location difficult.
10. Product and process standardized.
11. Accuracy high.