

CATEGORY: 2.2	MANUFACTURING MANAGEMENT	FACTORY LAYOUT AND FLOW
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## INTRODUCTION

The layout of a factory is deciding where to locate the manufacturing resources. That is where to install the production facilities such as equipment, machines, stores and operators. Thus layout determines the basic shape and appearance of factory. It also determines the way the production flow. In other words it affects how material and parts flow through the factory. Relatively small changes in the position of a machine in a factory can affect the flow of materials. This in turn can affect costs and efficiency of manufacturing.

Layout design is one of the most critical tasks of production management. It affects the factory efficiency, quality and costs. If the layout is wrong, it can lead to confused flow patterns, inventories, long process times, inflexible operations and high cost. Many practical reasons make the task difficult. One of them is the physical size of the equipment and machines that need to be moved. Managers are reluctant to make frequent changes in the factory layout because it is expensive to carry out and can be disruptive to production. But at the same time there is pressure to design an effective layout that is right for the factory.

## LAYOUT DESIGN

Designing a factory layout, like any design activity, must start with an understanding of the objectives. It is important for people who are involved in the layout design to understand the manufacturing strategic objectives such as volume-variety characteristics. However, this is only the starting point of a multi-stage process that leads to the final physical layout of the factory.

*Steps:*

1. Consider **volume-variety characteristics** of the operation.
2. The next decision or consideration that needs to be made is the **process type**. Largely, this is influenced by the volume-variety characteristics of the operation.

Process types. i.e.:

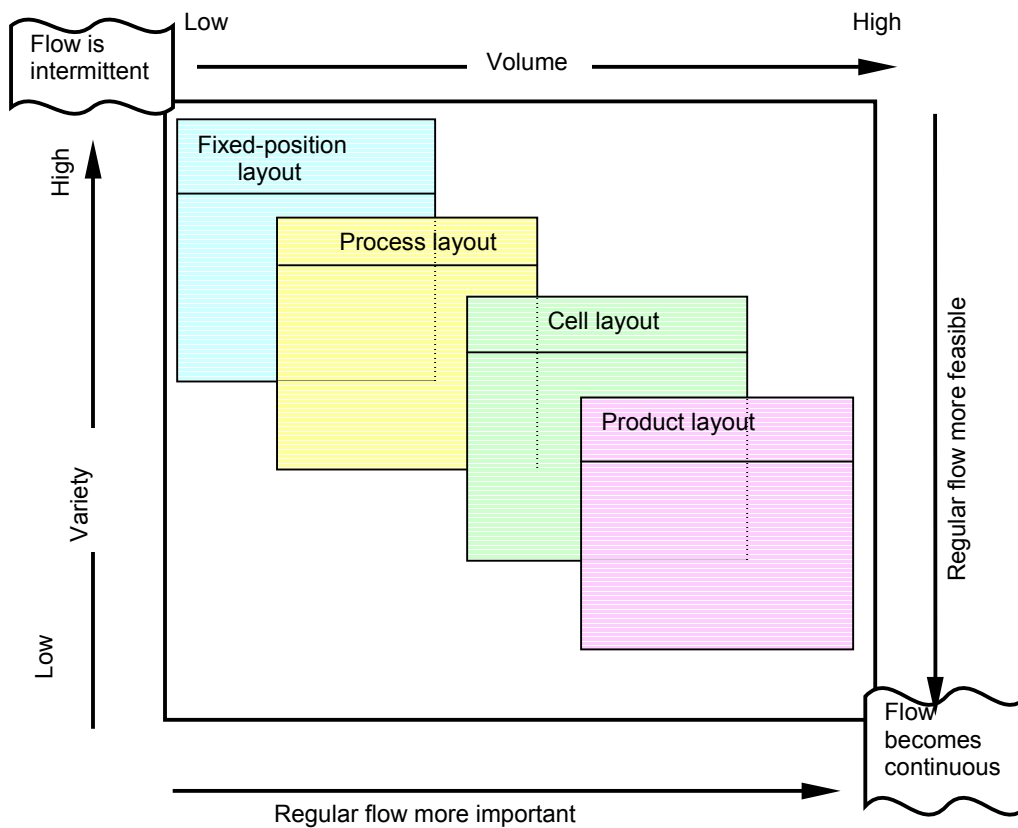
- Jobbing process
- Batch process
- Mass production process
- Continuous process

3. Select basic layout This is the general type of arrangement of the facilities or plant of the factory i.e.:

- Process layout
- Cell layout
- Product layout
- Mixed layout

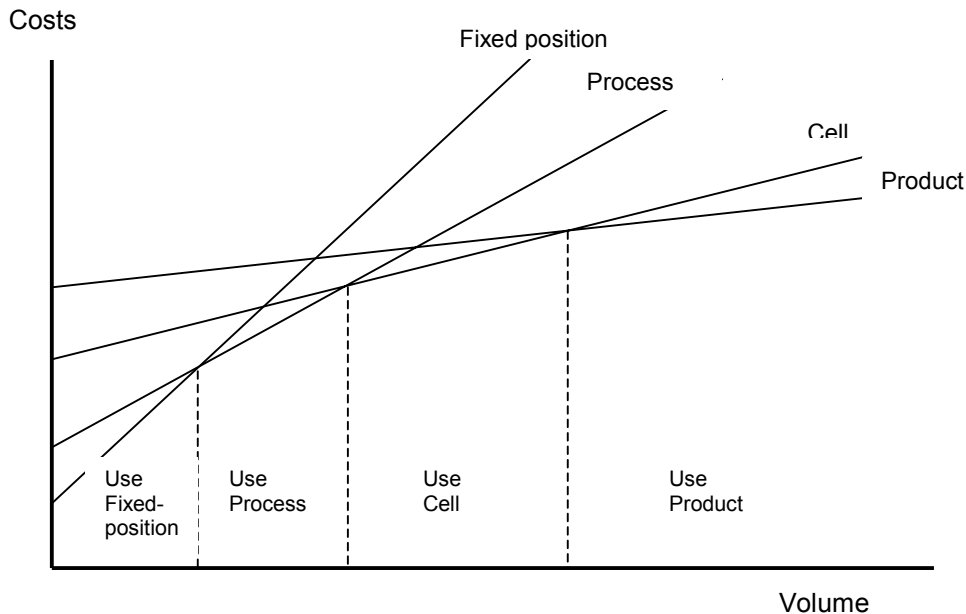
The decision as to which layout type to adopt will be influenced by the understanding of their advantages and disadvantages. The volume-Variety characteristics of the manufacturing operations would narrow the choice down to one or two options. This is demonstrated diagrammatically by the figure below.

**Fig. 1** The Volume-Variety process position of a manufacturing operation influences the factory layout



Cost implications of the various layout types are a significant factor. The total cost, fixed and variable will depend on the volume of products produced as shown in the figure below:

**Fig. 2 The basic layout types have different fixed and variable cost characteristics**



4. The final stage is to design the layout based on above considerations. This entails basically the detailed location of machines. However the following need to be considered:

- Cycle time
- Task-time variation considerations
- Balancing line
- Arrangement of stages

In addition to the operational objectives other important factors that need to be taken into account are: safety, accessibility, use of space and long-term flexibility.

## COMPUTER AIDED LAYOUT TOOLS

The complexity of the task of designing a factory layout, has led to the development of software tools that aid the design process. Some of these tools are based on heuristic procedures or rules of thumb. These tools do not search for optimal solution but try to find a good solution. Some other tools aid design using simulation. By simulating the real factory conditions they can derive at some optimal solution which can meet the set manufacturing objectives. Simulation allows the designer to experiment using models on a trial and error approach. This allows also the designer to understand the issues, problems and possible solutions. Problems that would have taken years to surface and be understood, can be simulated in very short time.

**INTERNET RESOURCES**

[www.manu-online.co.uk](http://www.manu-online.co.uk)

The website for the Manufacturing Institute. The Manufacturing Institute is an educational charity, focused on the research, expansion and dissemination of knowledge of best practice in manufacturing and is a partnership between the Northwest's leading manufacturing companies and universities.

<http://www.dti.gov.uk/mbp/>

DTI website, providing information on "Management Best Practice".

<http://www.apics.org/>

The website for the Educational Society for Resource Management. Organises training courses and supplies books on factory layout.

[www.twi.co.uk/j32k/search/](http://www.twi.co.uk/j32k/search/)

The website for the organisation TWI (The Welding Institute) displays information on computer aided layout design topics.