SISTEM MODELING

Materi 8

Manufacturing System

A Systems View of Manufacturing

- Manufacturing can be viewed either as a transformation process or as a system.
- **As a Transformation Process:** A narrow definition of manufacturing is that it a process of transformation where raw material are converted into products.
- **As a System:** Manufacturing is not limited to materials transformation performed in a factory. Rather, it is a complex system comprising of several elements.

Flow of Materials, Information and Cost

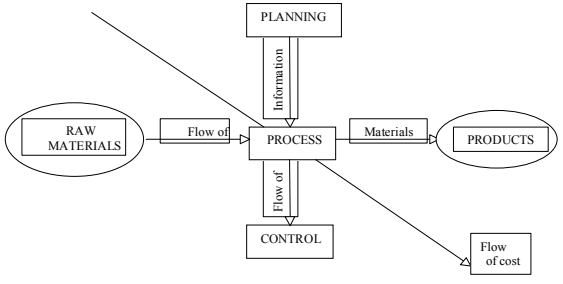


Figure 2.3: Flow of Material, Information and Costs (Hitomi, 1996)

A Systems View of Manufacturing

- This involves an internal environment and an external environment.
- The inputs are from the external environment and involve several variables.
- The outputs are to the external environment and also involve several variables.

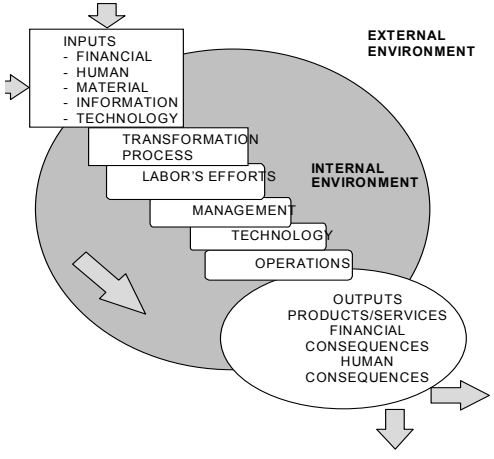


Figure 2.2: Systems View of Manufacturing (Murthy, 1995a)

A Systems View of Manufacturing

- Can be viewed from three different Aspects:
- **Technical:** Dealing with engineering, science and technology issues.
- **Commercial:** Dealing with financial, marketing, legal issues
- **Management:** Dealing with planning, operations and other related issues such as information. And also organisational issues dealing with human related issues.

MANUFACTURING: DIFFERENT PERSPECTIVES

- It can also be viewed from three different perspectives:
  - Firm level,
  - Industry level and
  - Regional or global level.

Firm Level

- Manufacturing at the firm level involves several variables which can be broadly grouped into the following three categories:
  - Technical
  - Commercial
  - Management

Technical

- The technical side has been discussed before and involves various issues related to the science, engineering and technology aspects of manufacturing.

Commercial

- The commercial side deals with issues such as costs, sales, revenue and profits. Each of these involves many variables.
- For example, the costs can be investment costs, unit manufacturing costs, cost of rework and so on. The basic bottom line for a firm is that it must make reasonable profit for its investment.

Management

- Deal with managing the various activities at strategic and operational levels taking into account the many different legal and socio-political aspects and various constraints.
- Another very important issue relates to the organizational side that deals with the human related issues – organisational structure, communication and flow of information, skill base of the workforce and so on.

National Level

- In the national level, a manufacturing firm is influenced by factors such as market competition and government policies.
- Obviously, the market competition is not only determined by manufactured goods within the nation but also affected by imported manufactured goods.

National Level

- Some of the government policies that affect the manufacturing enterprise are indicated below.
- Industry or Technology development policies,
- Taxation policies,
- Environmental policies.
- Trade policies – export and import subsidies, protection
- Financial investment

Regional and Global Levels

- Manufacturing at the regional and global levels deals with the following factors :
- Fierce competition
- Open market - free trade
- Trade organisation - regional partnerships

A THREE LEVEL MODEL OF MANUFACTURING

- Manufacturing is a complex system involving several elements. It can be viewed as a three level system (Level 1 - 3)
- Note that Level 1 is nested within Level 2, in turn, is nested within Level 3. We briefly discuss the elements at each of these levels.

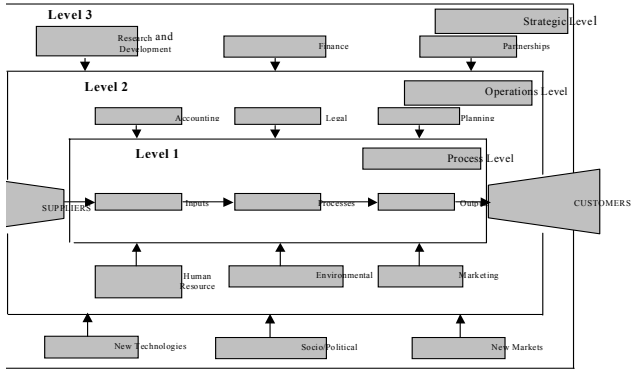


Figure 2.9: Three Level Model of Manufacturing (Murthy, 1995b)

Level 1

- This level corresponds to the shop floor level and has three key elements - Inputs, Process and Outputs.

Level 2

- This level includes Level 1 as well as six new elements. The focus of this level is management of business at the operations level and the six new elements with a range of operational issues.

Level 3

- This level includes the Levels 1 and 2 and six new elements. Here, the management focus is long term and strategic.
- This is important, as survival of businesses in the fiercely competitive global market requires long term strategies. The six new elements deal with a range of long term issues.