UNIT – II

COMPONENTS OF CIM

- CIM as concept and technology
- CASA / SME model
- Fundamentals of computer communication
- Types of communication
- Computer networking
- Network topology
- OSI model

CIM

- Term Coined by James Harrington in 1973
- ***CIM is the integration of total manufacturing enterprise through the use of integrated system and data communication mixed with new managerial philosophies which results in the improvement of personnel or organizational efficiencies.*** (by CASA – Computer and Automation System Association of Society of Mechanical Engineers).
- Integrate existing computer technologies in order to control and manage the entire business.
- Computerization of design, manufacturing, distribution and business functions into one coherent system.
- Providing computer assistance, control and high level integrated automation at all levels of manufacturing industries by linking islands of automation into a distributed process system.

CAPABILITIES OF CIM

- Responsiveness to rapid changes in market demand and product modification.
- Better use of materials, machinery and personnel.
- Better control of production and management of the total manufacturing operation.
- Manufacturing high quality product at low cost

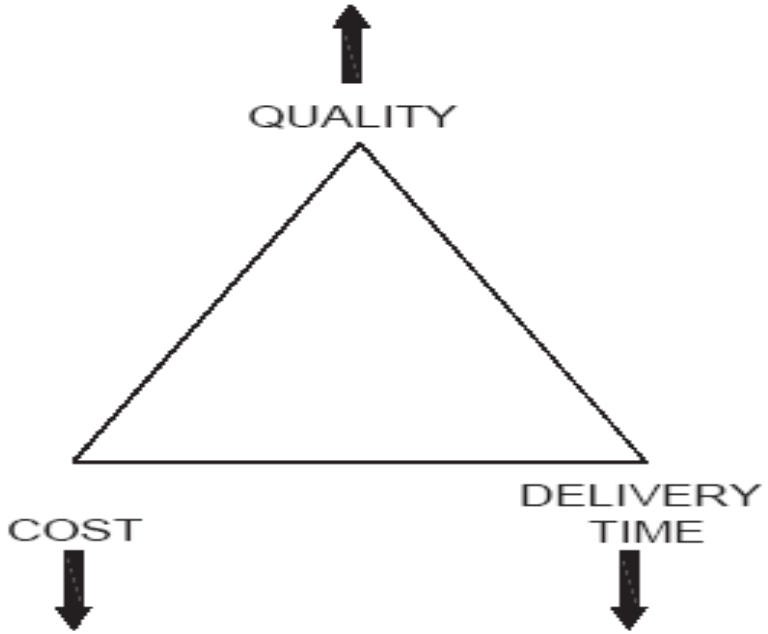
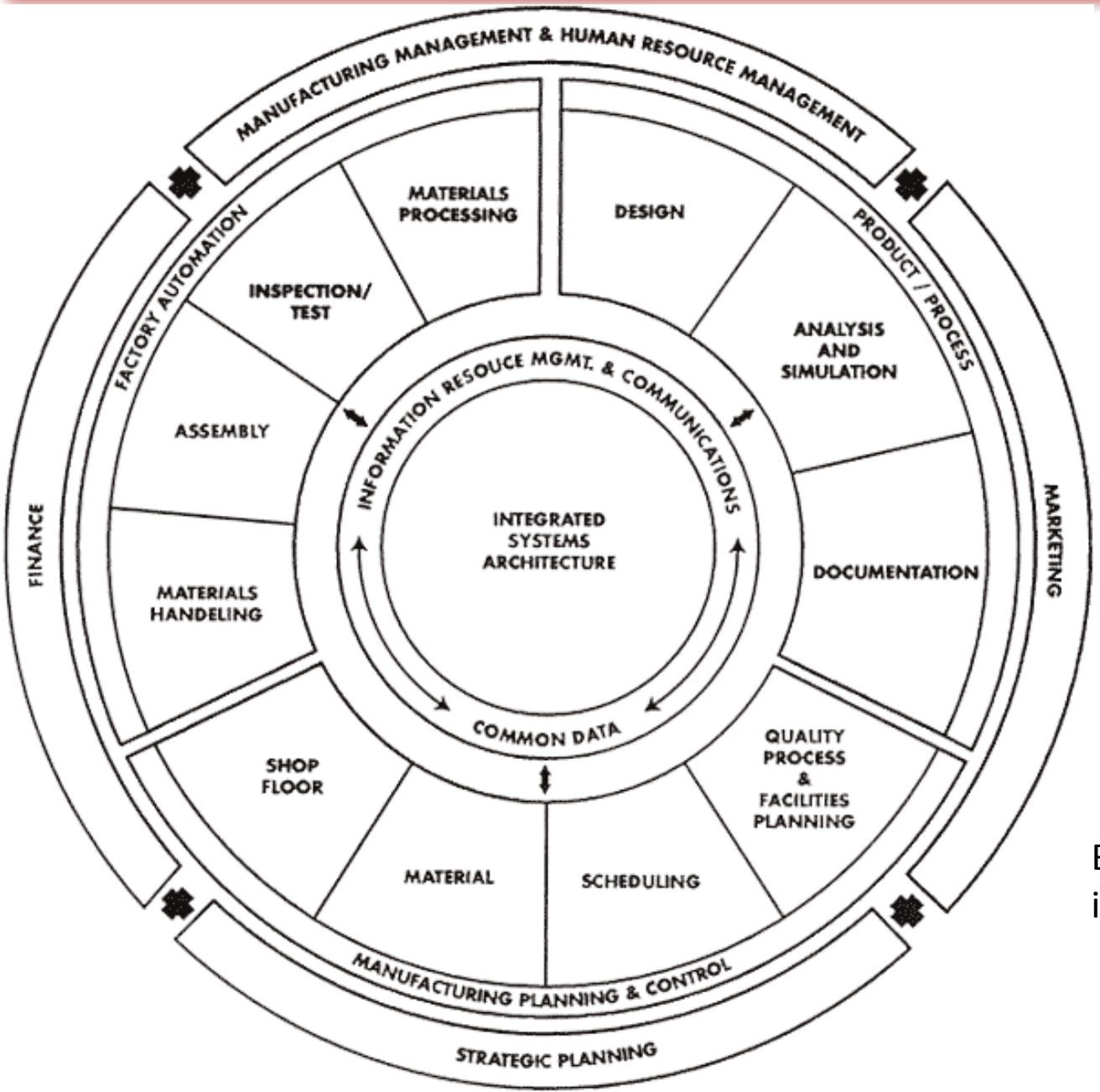


Fig.1.1 Challenges in Manufacturing

CASA/SME'S CIM WHEEL



By CASA/SME in 1980s

- CIM wheel captures the concept of total integration of all industrial functions.

CIM – A concept or Technology

A concept - For top management, a blue print for success.

A Technology – for middle management and line managers, a physical realization of resources that are more capable and flexible.

EVOLUTION OF CIM

- 1909 – Ford's concept of production line
- 1923 – Automatic transfer machine in Morris engine factory
- 1952 – Generation of punched paper tape
- 1954 – first NC milling machine in Parson corporation of USA by MIT
- 1959 – 1st application of computer control at Texaco Refinery of USA
- 1970s – CAD, CAM, GT, Flexible automation & DNC developed.
- 1980s – FMS & CIM became popular

FACTORS LEAD TO CIM

- Development of NC, CNC & DNC.
- Advent & cost effective computers.
- Manufacturing challenges
  - Global competition
  - High labor cost
  - Demand for quality products
  - Flexibility to meet orders
  - Lower product cost
- Capability – to – cost attractiveness of microcomputers

ACTIVITIES OF CIM

- Evaluating and developing different product strategies
- Market analysis and forecasting.
- Analyzing product / market characteristics & generates concept of possible manufacturing system (FMS & FMC).
- Designing and Analyzing components for machining, inspection, assembly and other processes.
- Evaluating and determining batch sizes, manufacturing capacity, scheduling and control strategies.
- Analysis and feedback for manufacturing processes.
- Analysis of system disturbances and economic factors.

REASONS FOR IMPLEMENTING CIM

- To meet competitive pressures

  Reduces lead time, inventory, material & cost.

  Increased quality, responsiveness to computers.

  Links logical, organizational and manufacturing activities.

- To coordinate and organize data

  Functional, product, operational & performance data

- To eliminate paper and cost associated with its use
- To automate communication within factory and increase speed
- To facilitate simultaneous engineering

  Concurrent engineering – restructuring product development activity by cross functional team

OBJECTIVES OF CIM

- More productive and efficient processes.
- Increase product reliability.
- Decrease cost of production and maintenance
- Reduce number of hazardous jobs.
- Increase involvement of educated and able humans in manufacturing and design.

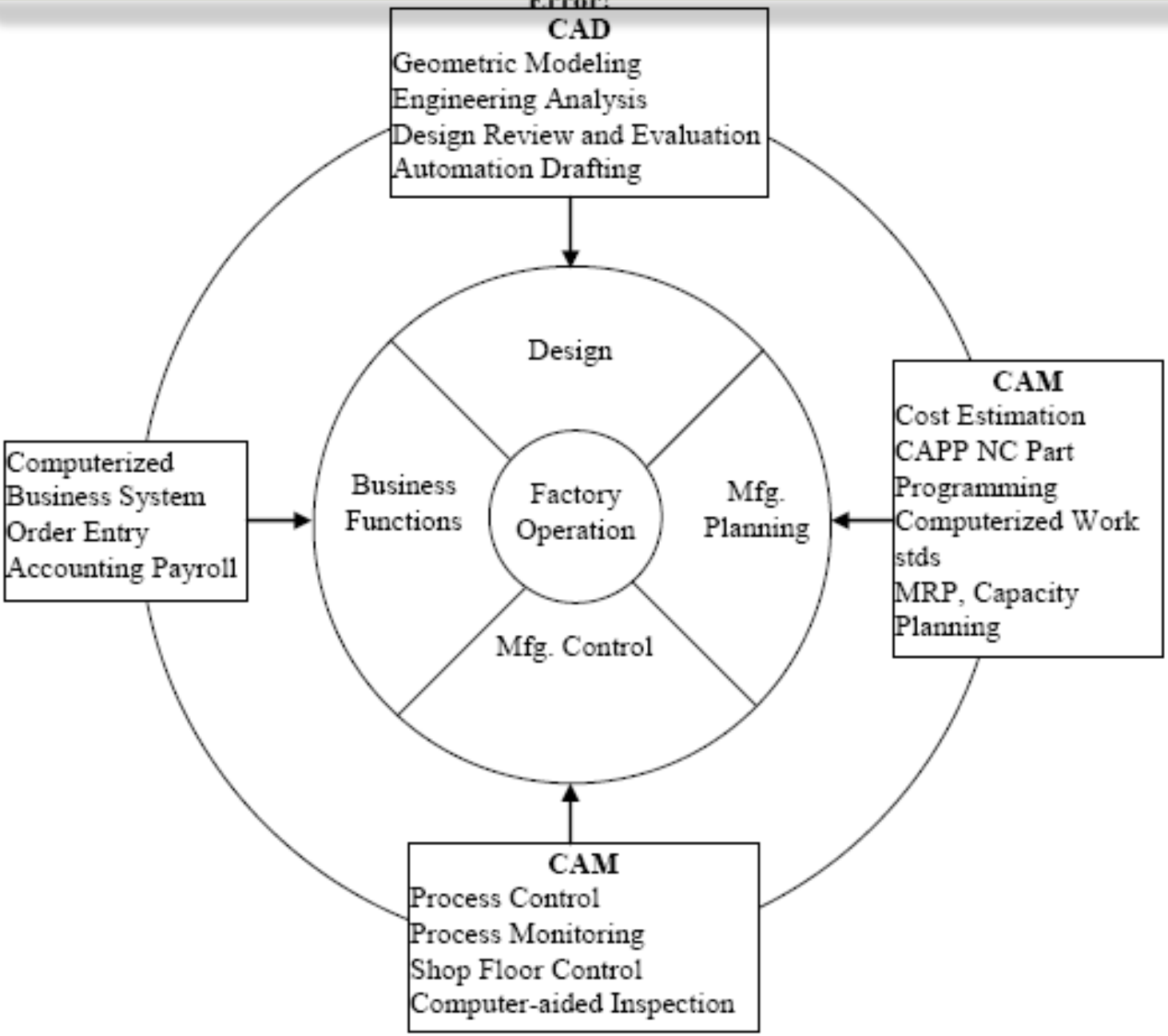
CIM-I Vs CIM-II

CIM-I	CIM-II
1. Computer Interfaced Manufacturing	Computer Integrated Manufacturing
2. Interfacing existing system	Integration of total manufacturing enterprises
3. Fourth generation computers	Fifth generation computers

ELEMENTS OF CIM

- Computerized integration of all aspects of design, planning, manufacturing, distribution and management.
- Includes all engineering functions of CAD/CAM and also business functions.
- Product and process design, production planning and control and production processes replaced by CAD/CAM, CAPP and automated material handling system and computerized business systems.
- Completely automated factory with no human interface and factory of the future.
- To transform ideas into a high quality products in the minimum cost and minimum time.
- CIM technologies tied together using a network and integrated databases.

COMPUTERIZED ELEMENTS OF CIM



SUBSYSTEMS OF CIM

i. Product design
ii. Manufacturing planning
iii. Manufacturing control
iv. Business planning and support

these subsystems are designed, developed and applied such that the output of system act as input for the another.

They are subdivided into two

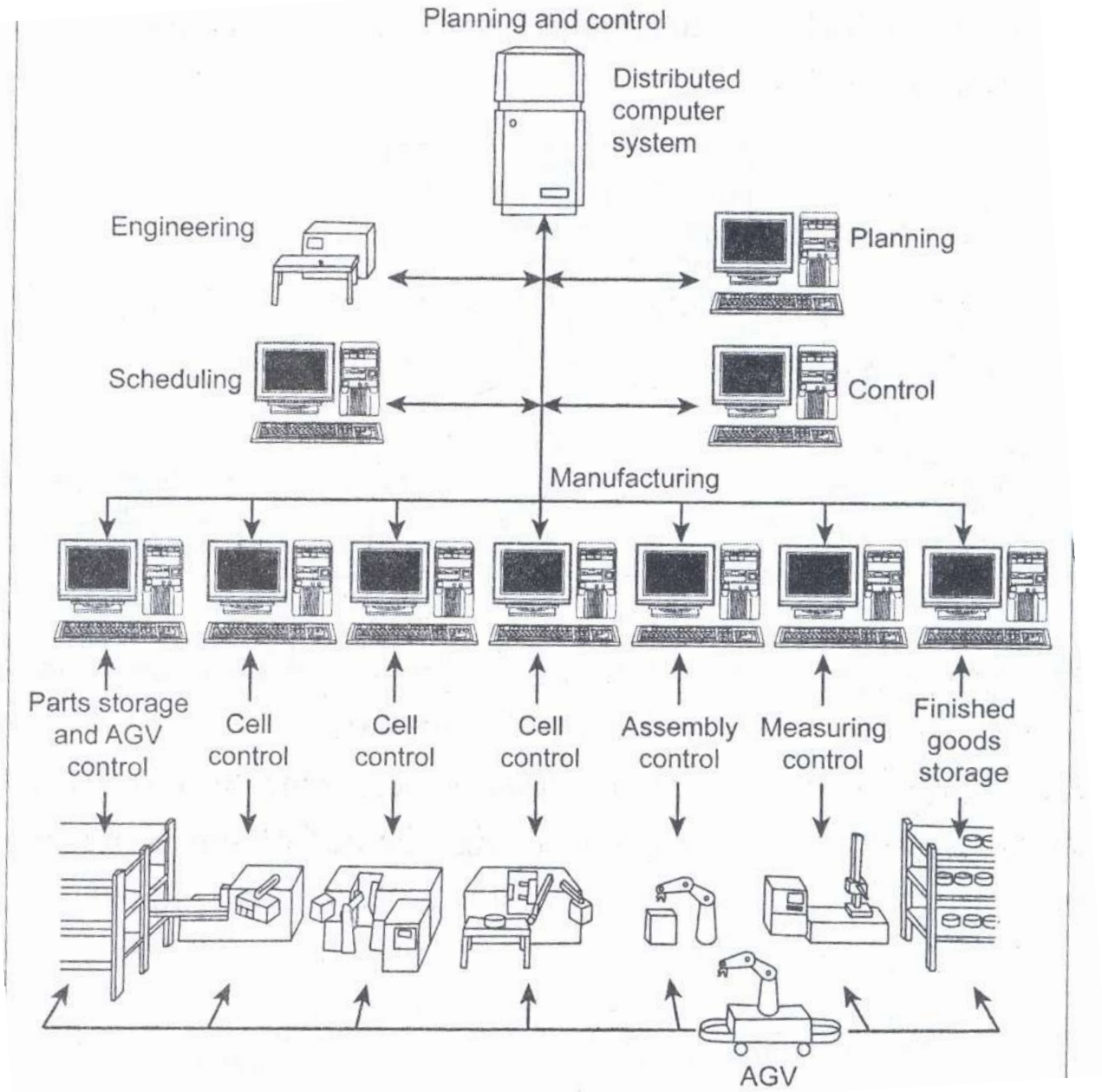
Business planning function – forecasting, scheduling, MRP, invoicing & accounting.

Business execution function – Production and process control, material handling, testing and inspection.

• Effectiveness depends on integrated communication system.

•All the production activities are incorporated in an integrated system to assist, augment and automate the operation.

SCHEMATIC ILLUSTRATION OF CIM



ISLANDS OF AUTOMATION

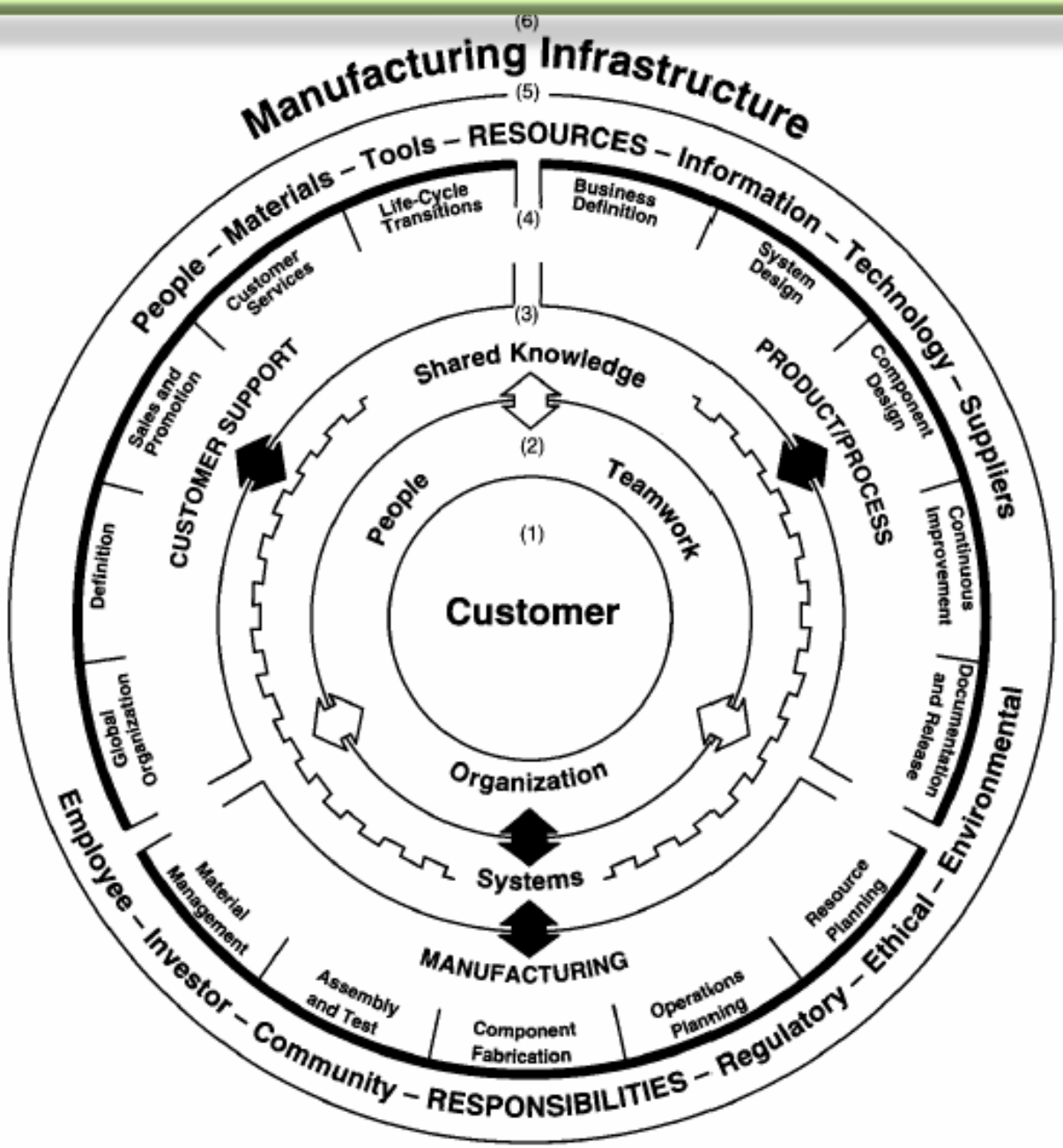
- Represents the various technologies that facilitate manufacturing automation in isolation, without having integration.
- Integrated Islands of automation– CIM.

local Global

Various Islands of Automation:

- CAD
- CAM
- CNC
- FMS
- Robotics
- AMHS
- GT
- CAPP
- MRP-II
- Computer control system

SME NEW MANUFACTURING ENTERPRISE WHEEL



By CASA/SME in 1990s

COMPONENTS OF CIM HARDWARE

1. Manufacturing equipments
   - Workstations
   - Cells
   - DNC
   - FMS
   - Work, tool handling & storage devices
   - Sensors
   - SFC data collection devices
2. Computer related hardwares
   - Computers, controllers, printers, plotters, Modems, Cables, Connectors,
   - Workstation terminals
   - CAD/CAM systems
3. Office equipment
4. Communication hardware
   - Remote batch terminals, Front end processors,
   - Transmitters, Acoustic couplers
   - Multiplexers, Concentrators

BENEFITS OF CIM

- Creates truly interactive system
- Accurate data transferability
- Faster responses to data changes
- Increased flexibility towards new products
- Improved quality and accuracy
- Control of data flow
- Reduction of lead time
- Streamlined manufacturing flow form order to delivery
- Easier training and re-training facilities

TANGIBLE BENEFITS	INTANGIBLE BENEFITS
1. Improved quality, Schedule performance 2. Increased Profit, productivity, machine utilization, factory capacity 3. Shorter time to market, flow time, vendor lead time, customer lead time, 4. Reduced inventory level, scrap and rework 5. Decreased work-in-process inventory, direct labor	1. Improved customer service, competitiveness 2. Greater flexibility, responsiveness 3. Safer working environment 4. Higher employee morale 5. More opportunities for upgrading skills

By Teichloz & Orr