

Computers in Manufacturing Enterprises

Lecture 2: July 27, 2015

By,
Vandana Srivastava

Assignment 1

In your opinion, what is the status of Indian Manufacturing Industry and why? Write 1-1.5 page article.

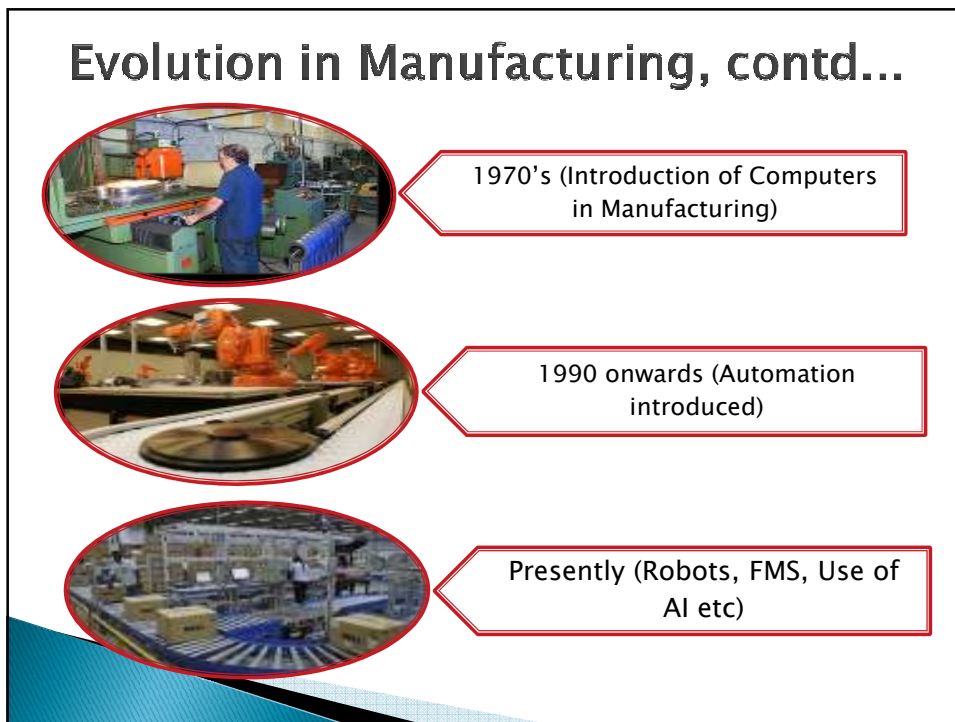
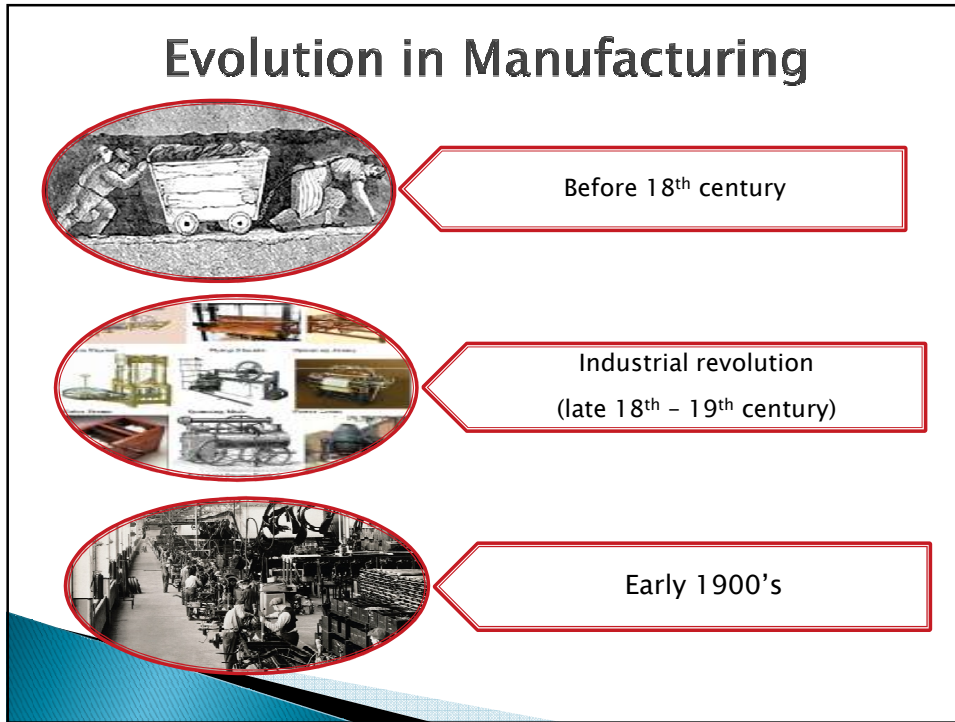
Due Date: August 2, 2015

▶ **Guidelines:**

- The article should be original in efforts and research.
- References should be properly documented. Citations are preferred.

▶ **Article**

- abstract / background at the beginning
- article should be supported by statistics / data.

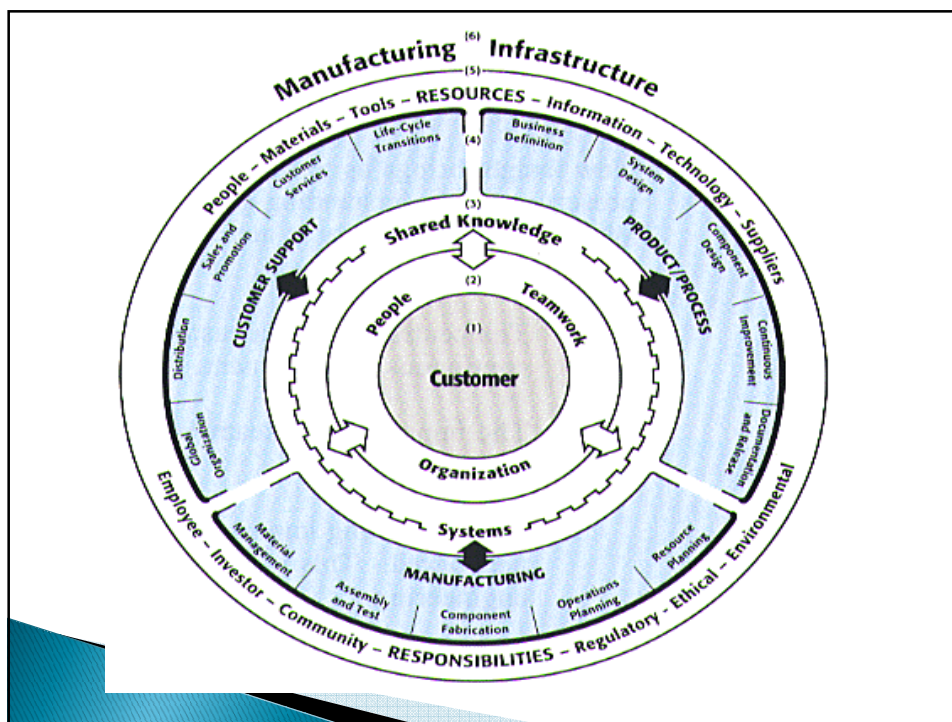


Introduction

- ▶ Manufacturing Enterprises
 - not simply a company that makes things
 - Computer and Automated Systems Association of the Society of Manufacturing Engineers (CASA/SME) definition,

a manufacturing enterprise includes six key, interconnected factors. These factors are parts of CASA/SME's Manufacturing Enterprise Wheel.

www.engr.sjsu.edu/~sbates/images/mfg/SME_Mfg_Ent_Wheel.doc



Manufacturing Enterprise – 1

Six key, interconnected factors of ME:

- ▶ Customer
- ▶ People and Teamwork
- ▶ Shared Knowledge and Systems
- ▶ Processes
- ▶ Resources and Responsibilities
- ▶ Infrastructure

www.engr.sjsu.edu/~sbates/images/mfg/SME_Mfg_Ent_Wheel.doc

Manufacturing Enterprise – 2

- ▶ **Customers**
 - hub of the wheel
 - their orders and demands drive the manufacturing operation
- ▶ **People and Teamwork**
 - includes metrics, rewards, quality circles and any worker-driven or worker-fulfilling process
- ▶ **Shared Knowledge and Systems**
 - manual or computerized processes for research, analysis, innovation, decision making and control
 - Centralized software applications like Oracle and SAP, and a company's computer network, are key elements
- ▶ **Processes**
 - include product definition, production, and customer support

www.engr.sjsu.edu/~sbates/images/mfg/SME_Mfg_Ent_Wheel.doc

Manufacturing Enterprise – 3

▶ Resources and Responsibilities

- resources as input, and responsibilities as output
- involves investments and capital (input), plus regulatory, ethical and environmental responsibilities (output)

▶ Infrastructure

- involves both the self-contained company and its interrelationships with customers and suppliers

www.engr.sjsu.edu/~sbates/images/mfg/SME_Mfg_Ent_Wheel.doc

Evolving Manufacturing Environment

Discuss the paper:

(<http://escholarship.org/uc/item/36d27692#page-1>)

MANUFACTURING — ITS EVOLUTION AND FUTURE

M. Eugene Merchant, Senior Consultant, TechSolve

David A. Dornfeld and Paul K. Wright

Department of Mechanical Engineering,
University of California, Berkeley, California

Publication Date:

05-01-2005

Manufacturing – Its Evolution and Future

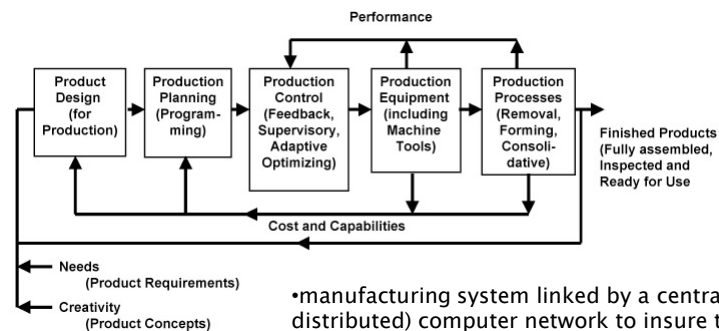
- ▶ highlights events of manufacturing's evolution and changes that took place over a period of 60 years
- ▶ offers some observations on key developments and activities
- ▶ discusses how manufacturing is evolving to accommodate the current and expected trends in manufacturing technology
- ▶ three specific software environments relative to developments in the design-to-manufacturing cycle are described

Manufacturing – Its Evolution and Future

- ▶ Earliest form (1760 – 1840)
 - Industrial Revolution– going from hand production to machines, small companies, good communication and collaboration
- ▶ Expansion of companies -> departmentalization
- ▶ “bits and pieces” approach to manufacturing
- ▶ In the 1950's–
 - digital computer and associated technology and its initial application to manufacturing became turning point

Manufacturing – Its Evolution and Future

INITIAL CONCEPT OF THE COMPUTER INTEGRATED MANUFACTURING SYSTEM
1969



- manufacturing system linked by a central (and distributed) computer network to insure that design to manufacturing specs takes care of performance/quality, cost, productivity

- stress on the importance of production and the creativity

Manufacturing – Its Evolution and Future

▶ New Technology Evolves (1970 onwards)

- introduction of concept of the Computer Integrated Manufacturing (CIM) System
- integrated former “bits and pieces”, allowed flexible automation

▶ Non-productive time issues and lean manufacturing

- study by Merchant showed that the actual time a part spent on a machine tool was only 5% of the available time
- Most of the other 95% was “waiting and moving.”
- removing nonessential tasks from the machine, to be performed in parallel off the machine, -> tremendous improvement in machine utilization
- example of this is the “single minute exchange of dies” or SMED that allowed die changes in large automotive presses to occur in one minute or less compared to traditional die change times of 8 hours

Manufacturing – Its Evolution and Future

▶ Combined processes to reduce non-productive time

- Integration of various machining processes into one machine tool (e.g. turning, milling, drilling, grinding, deburring) Six side machining
- process designs further optimized regarding productivity by:
 - Parallel processing:* 2 or more processes are utilized independently on a single machine (e.g. 4 axes turning)
 - Hybrid processes:* 2 or more processes are coupled to achieve a specific workpiece alteration, also called assisted machining (e.g. laser aided turning)
 - Integrated processes:* New processes based on 2 or more conventional processes (e.g. grind hardening)

Manufacturing – Its Evolution and Future

▶ Utilization of human resources (HR)

effective methodologies which have already emerged include:

- empower individuals with the full authority and knowledge necessary to carry out their responsibilities
- managerial and operational teams to carry out the functions required to realize products
- communicate and cooperate teams / departments

Manufacturing – Its Evolution and Future

- ▶ **Nature of Future Manufacturing Enterprise**
 - achieve good integration of equipment, people, and operations
 - integrate engineering technology and human resource utilization→ both technology and people perform at full potential
- ▶ **“Digital Factory”**
 - new trend that semiconductor, automobile and other manufacturing industries are following
 - aims for digital verification of product design, production and assembly before the foundations for the actual factory are laid

Manufacturing – Its Evolution and Future

- ▶ **“Digital Factory”**
 - guiding principles: standardization, data integration, work flow management and automation of planning
 - usually reside on a platform of any CAD software already in use in the factory

Manufacturing – Its Evolution and Future

▶ Summary

- today's evolving global enterprises -> human-centered self-reliant systems(people, machines, software elements, etc.) would communicate and cooperate globally as fully as though in same room together
- integration of manufacturing processes

Example

- ▶ <https://www.youtube.com/watch?v=DAtcNxApQI8>
(The Evolution of Lean Manufacturing)

Next Class!

- ▶ Thursday: July 30, 2015 at 5:00 pm
- ▶ Discussion on the paper:
“The Changing Role of Information Technology in Manufacturing”
(<http://www.cpe.ku.ac.th/~yuen/mis/r3042.pdf>)
- ▶ Case Study: Find a manufacturing company where the use of computers / technology had significantly improved its production performance. (10 marks: 5 min presentation; 5-7 slides)
 - Background of the company
 - Past performance of the company
 - Technology implemented
 - Performance enhancement achieved
- ▶ article is due on August 2, 2015
- ▶ no labs / Quiz this week