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By Grant W. Lawless

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Grant Lawless is a project lead for SEMCOR, a division of Titan Systems Corporation, which specializes in supporting Government acquisition agencies. Mr. Lawless is completing a Master's of Science in Administration in Information Resource Management from Central Michigan University. His undergraduate degree is a Bachelor's of Science in Industrial Technology concentrating in Manufacturing Engineering from the University of Wisconsin-Stout. Mr. Lawless is a NAIT Certified Senior Industrial Technologist (CSIT), a Certified Cost Estimator/Certified Cost Analyst (CCE/CCA) by the Society of Cost Estimating and Analysis (SCEA), and a member of Society of Manufacturing Engineers (SME).

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Global Competition

The world of manufacturing has reached a turning point because of the influence and impact of Information Technology (IT). Some refer to it as the "New Manufacturing Era" (Panchak - *Conquering a World of Change*, 1998). Manufacturers must compete in the global market to be successful today. This trend is going to continue. Manufacturing executives see their role more broadly as creators of value and wealth.

The manufacturing industry is changing to make profits for the company, employees, and the stockholders. After a decade of downsizing and restructuring, most American businesses have cut about all the costs they can (Cohan, 1997). Managers have come to the conclusion that long-term health will depend on growth achieved through competition.

The **Key is innovation** – companies who excel in innovation can achieve remarkable growth and profits.

Changing Environments

The **Old-manufacturing environment** consisted of producing a product on an assembly line for customers within the United States. The focus was to build as much as possible in order to achieve economies of scale to lower costs (Verespej, 1998). Worker-manager

relationships were simple that is managers gave the orders and workers did the work. In not a too distant past, workers were given full time status of 40 hrs/week with overtime possible, were given benefits (e.g., vacation, holidays, medical insurance, etc.), cost of living adjustments, and even retirement. Workers expected lifetime job security and got it.

Assembly line manufacturing was prevalent. Goods were produced as they headed down the assembly line, as in automobile production. Workers were generally unskilled and performed repetitive tasks.

The **New-manufacturing environment** consists of combining technological advances with strategic management insight to reach a company's goals and potential.

One must look at the fundamental changes in the workforce. Technology is leading Management to a decentralized/flatter organizational structure (Laudon, 2000). Middle management has been reduced and workers have been empowered to resolve issues themselves. Managers now identify needed skills and provide workers with the resources to solve problems rather than give orders. This is the era of the Integrated Product Team (IPT). People working in groups with a project leader that may become a team member of another in the future. Workers in a manufacturing plant manage the production process and decide the most efficient way to get the job done. Suppliers are part of the manufacturing process. Employees, managers, suppliers, and customers work as a team. Alliances are unfolding. Cus-

tomers and suppliers are working side by side in the same office or manufacturing plant; also, temporary employees are given as much responsibilities as full-time employees.

People are more skilled today than in the past. Nearly two-thirds of the workplace jobs that will be created in the coming years will require education beyond high school and be tied to the use of Information Technology (IT) (Verespej, 1998).

Management is aware that reducing costs is a benefit of IT. Company's goals are to automate tasks where appropriate. Companies can control their inventory and production. Chrysler has used IT to implement Just-In-Time (JIT) manufacturing and lean production to reduce costs (Lucas, 1997). Boeing also claims to have reduced costs as well as improve quality. The new Boeing 777 airliner was the first "paperless airplane" designed using sophisticated computer-aided design programs (Lucas, 1997).

Companies have to move quickly to compete because with information technology it takes only days to gain or lose a competitive advantage.

Technology

Manufacturing information systems today support the production/operation functions of companies. Production/operation functions include the activities concerned with planning and control of the processes used in producing goods and services. Computers are at the root of these processes. Computer-based manufacturing information systems use several major techniques to support Computer-

Integrated Manufacturing (CIM). Computer-Integrated Manufacturing is an overall process that stresses the goals of computer use for factory automation and must include the following (O'Brien, 1997):

- Simplify/reengineer production processes, product designs, and factory automation.
- Automate production processes and the business functions with computers and robots.
- Integrate all production and support process using computers and the telecommunications network.

Engineers use Computer-Aided Engineering (CAE) and Computer-Aided Design (CAD) systems to help design products. Product designs can be modeled, analyzed, and designed/drafted using graphical software in 2-dimensional or 3-dimensional views. These types of systems are frequently responsible for determining standards for product quality (i.e., quality assurance). Additionally, a bill of materials can be a final product of the design process. Furthermore, Research and Development (R&D) time has been greatly reduced over a laborious non-computerized process.

To improve manufacturing processes, Manufacturing Engineers (MEs) use computerized systems such as Computer-Aided Process Planning (CAPP). Computers are also used to identify and plan the material requirements needed to produce a product. This is referred to as Material Requirements Planning (MRP). Integrating MRP with production schedules and shop floor control functions is referred to as Manufacturing Resource Planning (MRPII). To aid in the manufacturing of products, Computer-Aided Manufacturing (CAM) is employed. Computers and robotics are used to fabricate assemble and package products. Monitoring and controlling the production process in a factory (shop floor control) is accomplished by directly controlling a physical process (process control), a machine tool (machine control/numerical control), or a machine with humanistic capabilities (robots).

Artificial Intelligence (AI) may some day have a large impact on the manufacturing sector (Miller, 1985). AI enables information integration for decision making from conceptual design, engineering, planning, scheduling, fabrication, testing, shipping, and customer service (Meyer, 1987). Other AI topics include: Expert Systems, Artificial Vision, Natural Voice Recognition, and Voice Recognition.

Benefits of CIM systems include:

- Increased efficiency through work simplification and automation.
- Improved utilization of production facilities.
- Reduced investment in production inventories using Just-In-Time practices.
- Improved customer service.

These are just some of the ways information technology is and will be used in the manufacturing process. With the introduction of the Internet and the World Wide Web, companies have access to a global market place. The Telecommunications industry is providing a way to access this technology. The manufacturing industry will now use IT to enhance their competitive edge and more effectively compete in the global market.

Strategic Management Perspective

Strategies for the New Manufacturing era are not new. The value of teams, partnerships, and alliances, and an empowered workforce have been around during the last 25 years (Panchak - *Conquering a World of Change*, 1998). Best practices and learning from successful companies will be the way of the future for companies to get ahead.

The New Manufacturing era represents a complete overhaul of management and strategy. The drivers forcing this new definition are **globalization** and **information technology**. This has been compared to the Industrial Revolution (Panchak - *Conquering a World of Change*, 1998)! The traditional definition of manufacturing was to make something from raw

materials by hand or by machinery. The new definition recognizes knowledge and ideas as the new raw materials. The basis of New Manufacturing is Intangible assets – organizational knowledge, ability to innovate, and value added services – rather than tangible assets such as factories and equipment. CEL's Rosenthal defines it as, "the supplier's supplier to the customer's customer." It incorporates every function of a company, producing tangible goods from research and development to customer delivery and even products returning to the company for recycling or disposal.

Peter F. Drucker, who is known as the "father of management" (Ye, 1998) has done numerous research in the subject areas of society, economics, politics, and management. The manufacturing sector is the driver of the economy. "Statistical Quality Control is changing the social organization of the factory (Panchak-*The Future of Manufacturing*, 1998). He also compares traditional manufacturing in the United States to farming in 1950s. His definition of the New Manufacturing is:

An era in manufacturing history during which manufacturing companies rethought and remade virtually every aspect of the way they were organized, managed, and operated; characterized by increased, intense global competition; rapid advances in and adoption of information technology; increased focus on value creation for the shareholder and the customer; and a heightened state of uncertainty (Panchak - *Conquering a World of Change*, 1998).

The New Manufacturing era is full of opportunities for companies that become innovative in the fast-changing global marketplace.

Predictions

- Manufacturing companies will reach a limit on downsizing and will increase their capital investments focusing on IT. Returns on investments speak for themselves,

when companies realize that it “takes money” to “make money”.

- Successful companies will be transparent or integrated together via the World Wide Web to the extent that their customers will think they are one company. This is much like the homebuilder who gets the credit for the house he builds, but don't forget he relied on his contractors (e.g., plumbers, electricians, etc.) to deliver a high-quality finished product.
- Many manufacturing companies will not be able to compete in this environment and therefore, end up going out of business. They must think outside the box. IT is just starting and it's growth potential hasn't been realized yet!

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