Evolution of production and operations management essay sample

Business, Management

The Industrial Revolution began in the 1770s in England and spread to the rest of Europe and to North America during the nineteenth century. A number of innovations changed the face of production forever by substituting machine power for human power. Perhaps the most significant of these was the steam engine, made practical by James Watt around 1764, because it provided a source of power to operate machines in factories. The Spinning jenny (1770) and power loom (1785) revolutionized the textile industry. Supplies of coal and iron ore provided material for generating power and making machinery. The new machines, made of iron, were much stronger and more durable than the simple wooden machines they replaced. Two concepts assisted in mass production: division of labour and interchangeable parts.

DIVISION OF LABOUR, which Adam Smith wrote about in The Wealth of Nations (1776), means that an operation is divided up into a series of many small tasks and individual workers are assigned to one of those tasks. Unlike craft production, where each worker was responsible for doing many tasks and thus required skill, with division of labour the tasks were so narrow that virtually no skill was required.

INTERCHANGEABLE PARTS, is sometimes attributed to Eli Whitney, an American inventor who applied the concept to assembling muskets in the late 1700s. The basis for interchangeable parts is to standardize parts so that any part in a batch of parts would fit. This meant that parts did not have to be custom fitted, as they were in craft production. The standardized parts

could also be used for replacement parts. The result was a tremendous decrease in assembly time and cost.

Soon after their invention in Britain, the iron-making and steam engine technologies were imported into North America. In Canada, a few small mills began operating in the first half of the 1800s. By the second half of the 1800s, canals and railways were built, and timber was being exported.

The discovery of electricity by Edison in the late 1800s allowed replacement of electricity for steam as a power source, improving the efficiency and working environment of factories.

Despite the major changes that were taking place, management theory and practice had not progressed much from early days. What was needed was an enlightened and more systematic approach to management.

THE SCIENTIFIC MANAGEMENT ERA AND POM

The scientific management era brought widespread changes to the management of factories. The movement was spearheaded by the American efficiency engineer and inventor Frederick Taylor, who is often referred to as the father of scientific management. Taylor believed in a “ science of management” based on observation, measurement, analysis and improvement of work methods, and economic incentives. He studied work methods in great detail to identify the best method for doing each job. Taylor also believed that management should be responsible for planning, carefully selecting and training workers, finding the best way to perform each job,

achieving cooperation between management and workers, and separating management activities from work activities.

Taylor’s methods emphasized maximizing output. They were not always popular with workers, who sometimes thought the methods were used to unfairly increase output without a corresponding increase in compensation. Certainly some companies did abuse workers in their quest for efficiency. Eventually, the public outcry reached the halls of the U. S. Congress, and hearings were held on the matter. Taylor himself was called to testify in 1911, the same year in which his classic book The Principles of Scientific Management was published. The publicity from those hearings actually helped scientific management principles to achieve wide acceptance in industry.

A number of other pioneers also contributed heavily to this movement, including the following:

Frank Gilbreth was an industrial engineer who is often referred to as the father of motion study. He developed the principles of motion economy that could be applied to incredibly small portions of a task.

Lillian Gilbreth, a psychologist and the wife of Frank Gilbreth, worked with her husband, focusing on the human factor in work. (The Gilbreths were the subject of a classic 1950s film, Cheaper by the Dozen.) Many of her studies in the 1920s dealt with worker fatigue.

Henry Gantt recognized the value of nonmonetary rewards to motivate workers, and developed a widely used system for scheduling, called Gantt charts. Henry Ford, the great industrialist, employed scientific management techniques in his factories.

THE HUMAN RELATIONS ERA AND POM

Both Taylor and Ford expected workers to perform like robots. This paved the way for the human relations movement. Whereas the scientific management movement heavily emphasized the technical aspects of work design, the human relations movement emphasized the importance of the human element in job design. In the following decades, there was much emphasis on motivation. During the 1930s, Elton Mayo conducted studies at the Hawthorne division of Western Electric. His studies revealed that in addition to the physical and technical aspects of work, giving special attention to workers is critical for improving productivity. During the 1940s, Abraham Maslow developed motivational theories, which Frederick Hertzberg refined in the 1950s. Douglas McGregor added to this in the 1960s. In the 1970s, William Ouchi combined the Japanese approach, with such features as lifetime employment, employee problem solving, and consensus building, and the traditional Western approach that features short-term employment, specialists, and individual decision making and responsibility.

THE MANAGEMENT SCIENCE ERA AND POM

Management science had its beginnings during World War II under the labels operational research and operations research. Today the terms are used

interchangeably. During World War II mathematical analysis military data lead to new decisions that improved the effectiveness of the military effort. Soon after the war these analytical methods were applied to problems of government and industry, with promising results. Management science is concerned with the application of mathematical and statistical theory to business situations. It involves the use of models to describe and provide an understanding of a problem and its alternative solutions. The objective is to achieve the best, or optimum, solution. Management science is not a redirection in management but a change in the approach to solving management problems and an addition to the tools that are available for solving management problems.

CRAFT PRODUCTION TO LEAN PRODUCTION

In the earliest days of manufacturing, goods were produced using craft production: highly skilled workers using simple, flexible tools produced goods according to customer specifications. Goods were produced in small shops by craftsmen and their apprentices. Under that system, it was common for one person to be responsible for making a product, such as a horse-drawn wagon or a piece of furniture, from start to finish. Only simple tools were available; the machines that we use today had not been invented. Craft production had major shortcomings. Because products were made by skilled craftsmen who custom-fitted parts, production was slow and costly. And when parts failed, the replacements also had to be custom made, which was also slow and costly. Another shortcoming was that production costs did not decrease as volume increased; there were no economies of scale, which

would have provided a major incentive for companies to expand. Instead, many small companies emerged, each with its own set of standards.

Mass production Systems are systems where lower-skilled workers use specialized machinery to produce high volumes of standardized goods. Henry Ford introduced the mass production to the automotive industry, a system of production in which large volumes of standardized goods are produced by low-skilled or semiskilled workers using highly specialized, and often costly, equipment. Ford was able to do this by taking advantage of a number of important concepts. Perhaps the key concept that launched mass production was interchangeable parts. Ford accomplished this by standardizing the gauges used to measure parts during production and by using newly developed processes to produce uniform parts. A second concept used by Ford was the division of labour. Together, these concepts enabled Ford to tremendously increase the production rate at his factories using readily available inexpensive labour.

A number of Japanese manufacturers developed or refined management practices that increased the productivity of their operations and the quality of their products. This made them very competitive, sparking interest in their approaches by companies outside Japan. Lean production systems are so named because they use much less of certain resources than mass production systems use-less space, less inventory, and fewer workers-to produce a comparable amount of output. Lean production systems use a highly skilled workforce and flexible equipment. In effect, they incorporate advantages of both mass production (high volume, low unit cost) and craft

production (variety and flexibility). And quality is higher than in mass production. Lean production is a broad approach to just-in- time.

Table 1 – A comparison of craft, mass and lean production

THE SUMMARY

For over two centuries operations management has been recognized as an important factor in a country’s economic well being. Progressing through a series of names – manufacturing management, production management, and operations management-all of which describe the same general discipline, the evolution of the term reflects the evolution of modern operations management. The traditional view of manufacturing management began in the eighteenth century when Adam Smith recognized the economic benefits of specialization of labor. He recommended breaking jobs down into subtasks and reassigning workers to specialized tasks in which they would become highly skilled and efficient. In the early twentieth century, Frederick W. Taylor implemented Smith’s theories and crusaded for scientific management throughout the vast manufacturing complex of his day. Till about 1930, the traditional view prevailed, and many techniques we still use– today were developed.

Production management became the more widely accepted term from the 1930s through the 1950s. As Frederick Taylor’s-work became more widely known, managers developed techniques that focused on economic efficiency in manufacturing. Workers were “ put under a microscope” and studied in great detail to eliminate wasteful efforts and achieve greater efficiency. At

this same time, however, management also began discovering that workers have multiple needs, not just economic needs. Psychologists, sociologists, and other social scientists began to study people and human behavior in the work environment. In addition, economists, mathematicians, and computer scientists contributed newer, more sophisticated analytical approaches.

With the 1970s emerge two distinct changes in our views. The most obvious of these, reflected in the new name-operations management-was a shift in the service and manufacturing sectors of the economy. As the service sector became more prominent, the change from “ PRODUCTION” to “ OPERATIONS” emphasized the broadening of our field to service organizations. The second, more subtle change was the beginning of an emphasis on synthesis, rather than just analysis, in management practices. Spearheaded most notably by Wickham Skinner, American industry was awakened to its ignorance of the operations function as a vital weapon in the organization’s overall competitive strategy. Previously preoccupied with an intensive analytical orientation and an emphasis on marketing and finance, managers had failed to integrate operations activities coherently into the highest levels of strategy and policy. Today, the operations function is experiencing a renewed role as a vital strategic element. Consequently, organizational goals are better focused to meet consumers’ needs throughout the world.

Year

Concept

Tool

Originator

1910s

Principles of scientific management

Industrial psychology

Moving assembly line

Economic lot size

Formalized time-study and work-study concepts

Motion study

Activity scheduling chart

EOQ applied to

inventory control

Frederick W. Taylor (U S.)

Frank and Lillian Gilbreth (U. S.)

Henry Ford and Henry L. Gantt (U. S.)

F. W. Harris (U. S.)

1930s

Quality control

Hawthorne studies of worker motivation

Sampling inspection and statistical tables for quality control

Activity sampling for work analysis

Walter Shewhart, H. F. Dodge, and H. G. Roming (U. S.)

Elton Mayo (U. S.) and L. H. C. Tippett (England)

1940s

Multidisciplinary team approaches to complex system problems

Simplex method of linear programming

Operations research groups (England) and George B. Dantzig (U. S.)

1950-60s

Extensive development of operations research tools

Simulation, waiting-line theory, decision theory, mathematical programming, project

scheduling techniques of PERT and CPM

Many researchers in the U. S. and Western Europe

1970s

Widespread use of computers in business

Service quality and productivity

Shop scheduling, inventory control, forecasting. Project management, MRP

Mass production in the service sector

Led by computer manufacturers, in particular, IBM; Joseph Orlicky andOliver Wight were the major MRP innovators (U. S.)

McDonald’s restaurants

1980s

Manufacturing strategy paradigm

JIT, TQC, and factory automation

Synchronous manufacturing

Manufacturing as a competitive weapon

Kanban, poka-yokes, CIM, FMS, CAD/CAM, robots, etc.

Bottleneck analysis, OPT, theory of constraints

Harvard Business School faculty (U. S.)

Tai-Ichi Ohno of Toyota Motors (Japan), W. E. Deming and J. M. Juran (U. S.), and engineering disciplines (U. S., Germany, and Japan)

Eliyahu M. Goldratt (Israel)

1990s

Total quality management

Business process reengineering

Electronic enterprise

Supply chain management

Baldrige quality award, ISO 9000, quality function development, value and concurrent engineering continuous improvement paradigm

Radical change paradigm

Internet, World Wide Web

SAP/R3, client/server software

National Institute of Standards and Technology. American Society of Quality Control (U. S.), and International Organization for Standardization (Europe)

Michael Hammer and major consulting firms (U. S.)

U. S. government, Netscape Communication Corporation, and

Microsoft Corporation

SAP (Germany), Oracle (U. S.)

2000s

E-commerce

Internet, World Wide Web

Amazon, eBay, America Online, Yahoo!

REFERENCES

Chase, Jacobs, Aquilano, OPERATIONS MANAGEMENT – FOR COMPETITIVE ADVANTAGE WITH GLOBAL CASES, 11th Edition, New York : McGraw Hill, 2006.

William J. Stevenson, OPERATIONS MANAGEMENT, 7th Edition, New York : McGraw Hill, 2002.