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Introductory Chapter: Background and Current Trends in Operations Management

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1. Introduction

Operations management (OM) may be considered to be a multidisciplinary field that focuses on effectively managing an organization's processes for the production and distribution of specific products and services. It applies both qualitative and quantitative concepts and techniques to increase process efficiency and effectiveness, reduce costs, assure high-quality output, and improve organizational flexibility to changing demands.

While some authors trace the roots of OM to much earlier periods (e.g., [1]), operations management began to truly define itself during the industrial revolution of the late 1800s and particularly the early 1900s. Taylor [2] developed efforts in standardization and specialization, with a focus on workers, their tasks, and how to effectively manage them. This leads to the formalization of such OM sub-disciplines such as product design, production scheduling, inventory control, capacity planning, and quality management. Throughout much of the twentieth century, operations management had such a manufacturing orientation that it was referred to as factory management and later production management.

In 1973, Bell [3] postulated that the economy would soon provide more value and employment from the service industry than from the manufacturing industry. Reflecting this transformation, the service industry in the United States currently accounts for approximately 80% of this country's gross domestic product [4]. As the economy transitioned, the tools and techniques of traditional production management were quickly adapted for service industry applications. In recognition of this shift, within 5 years of Bell's book, the field was already beginning to be referred to as production and operations management (e.g. [5, 6]).

Continued adaptation and expansion of the OM perspective occurred as attention further shifted toward analysis of the supply chain. Originally, the supply chain only referred to the flow of materials from outside sources to the internal company user. This was extended to

include the flow of materials, information, and services from raw material suppliers, through factories and warehouses, to the end customers. As factory-centric and service-centric improvements were progressively made, and associated gains in efficiency and effectiveness obtained, greater opportunities for improvement were viewed as existing in this expanded supply chain context. The idea of supply chain management (SCM), that is, the effective planning, organizing, and coordinating of a supply chain's activities, began to emerge. Articles discussing this approach began to appear in the literature during the mid-1990s (e.g., [7]). This trend continues to this day, emphasizing its continued prominence as an area of research and investigation [8, 9]. The assimilation of supply chain management completed the integrated and comprehensive view of business processes in the production of goods and services, thus forming the present concept of operations management [1].

2. Current status and trends

As observed by Gunasekaran and Ngai [4], "the management of operations in both manufacturing and service organizations has evolved tremendously over the years." The authors further note four trends that have emerged and will continue to affect the field of operations management [4]:

- "The market has become global, thereby compelling enterprise operations to keep up."
- "Consciousness toward the environment."
- "The application of information technologies ...in managing operations has altered the landscape of operations management."
- "Manufacturing has become more of a service industry, indicating significant service OM, including project management."

These trends are not mutually exclusive but interweave with each other in varying degrees.

3. The global economy

Operations management has had to evolve to address the global economy and its expanding manufacturing and service competitiveness. One early impact of globalism was the response to Japanese competitiveness in productivity and quality during the 1980s, with the subsequent widespread adoption of Japanese production techniques, such as total quality management (TQM) and just-in-time (JIT) scheduling [1].

The importance and influence of emerging economies on the world's economy has been well documented [10]. The era of global capitalism is considered to have begun with the collapse of the Soviet Union and the commitment of China to implement capitalism. As the

market became increasingly global, it required companies to transition toward international operations, joint ventures, and further outsourcing. Supply chain management then became critical due to this worldwide sourcing of products. Both smaller and developed economies will continue to face challenges derived from the competition of emerging economies, not only in manufacturing, “but also in the development of innovative products and services” [4].

4. Sustainability

Interest in sustainability and the relevance of operations management to it have increased over the past decade. OM research and practice has begun to respond to demands to address this issue of sustainability. These efforts include product design with consideration of design for the environment (DFE) concepts; process improvement incorporating lean operations; and logistics including recycling and the use of closed-loop systems [11]. Walker et al. [11] further note the initial focus on resource productivity, that is, the need to reduce resource consumption and utilize resources more efficiently. This included an emphasis on green products and processes and reduction of CO₂ emissions and other wastes.

The literature has indicated a recent shift in emphasis from standalone sustainability to more cross-functional considerations, such as sustainable supply chains. This also includes a deeper and broader investigation of social and humanitarian concerns.

5. Information technology and quantitative methods

Over the past 20 years, information technology/information systems (IT/IS) has transformed the operations and functions of companies. The advancement of IT/IS created a vehicle for enterprise-wide integration. As a result, conventional OM functions (e.g., production planning and control, and logistics) have had to adapt and incorporate the internet, enterprise resource planning (ERP), third-party logistics (3PL), knowledge management, radio frequency identification (RFID), and customer relationship management (CRM). ERP has become an integral part of global supply chain management. It would be almost impossible to achieve a well-integrated supply chain without the application of an effective ERP system and the internet [12]. Currently, companies’ efforts are focused on developing an RFID-based supply chain to deliver further improvements in business visibility and customer service [4].

Underlying many of these IT applications are the enhanced use of quantitative methods. These quantitative methods may include such analytical approaches as decision theory, heuristics, operations research/management, science-based mathematical models, simulation, and statistical/probabilistic methods. Gunasekaran and Ngai [4] outline a number of quantitative methods that could be used to model and analyze future operation management functions based on these current and emerging trends.

6. Changes in the manufacturing and service industries

The respective profiles of the manufacturing and service industries have changed due to these influences of globalism, IT/IS, and environmental concerns. Companies have been further compelled to compete based on an array of performance criteria, such as price, quality, flexibility, dependability, and responsiveness. Thus, they have had to develop the following operational techniques and strategies: (e.g., [13]):

- Lean manufacturing is a system-based methodology for the reduction and elimination of waste in all its forms [14]. These lean concepts have been extended to service operations and delivery.
- Agile manufacturing as a key component of operational flexibility [12]: This may include the use of reconfigurable manufacturing systems, which are designed for rapid change in structure and components to respond to sudden market changes
- Business process reengineering (BPR) infers a basic restructuring of essential business functions and processes to optimize the workflow and productivity in an organization [15]. This optimization is measured in terms of performance indicators, including cost reduction, and increases in revenue and profitability, which are then mapped with the processes to which they apply.
- Supply chain management is increasingly treated more as a strategic and cross-functional activity in the context of a global operating environment [13]. This includes the development of build-to-order supply chains and other configurations that support a greater level of flexibility and customer responsiveness.
- Systems engineering entails a logical sequence of events which converts a set of requirements into a complete system description that fulfills the objective in an optimum manner [16]. It provides a framework to integrate these progressively more complex techniques.
- Project management has long been considered to be an OM topic [13]. As manufacturing has shifted from mass production to mass customization, the capability of project management to address unique aspects “has regained its importance in global enterprise environments and operations” [4].

7. Summary

Over time, the field of operations management has grown in depth, breadth, and importance. It incorporates both engineering and behavioral concepts, and utilizes quantitative analysis techniques (now often fielded via an IT/IS platform), for systematic management decision-making. Research in OM continues to evolve in terms of topics, themes, motivations, and methodologies. This book examines some of these recent advances.

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