SYSTEMS
AND INDUSTRIAL ENGINEERING SERIES

E-Enabled Operations Management

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Preface

Although the theory of operations management has been presented in many textbooks published over the last two decades, the subject of e-enabled operations management is rather short on literature which is easily accessible to students. When they want to gain some understanding of what it is all about, students are obliged to search journals and select papers from a large number of books. Even then they will find it difficult to arrive at a uniform view of the matter.

The objective of this book is to expound the subject at an "intermediate" level. By "intermediate", it is not assumed that students are specialists in mathematics and statistics, but it is supposed they have a working knowledge of calculus, algebra, probability and statistics.

The approach to operations management described in this book is unusual with respect to what is found in standard textbooks. Information and communication technologies (ICTs) impact the ways firms are organized and managed, and, as a result, change the practical means used to conduct business operations.

The features of this book are threefold.

– *system approach to business modeling*

Business activities, controlling functions and associated information systems are described within a coherent analytical system framework enabling a clear understanding of the various current control and costing concepts. Operations costing is not usually included in textbooks as part of

operations management, but it should be. Cost targeting has become an integral part of good practice of business management.

– *validity of models*

Apparently simple models are analyzed in detail. Students must be completely aware of the assumptions made when models are formulated and of their conditions of validity. Applying a model automatically implies that assumptions of a particular type are taken for granted.

– *logistics, procurement and quality management*

These three business functions are critical key success factors for managing e-enabled supply chains from suppliers to customers. That is why their main tools are introduced in this book.

Jean-Pierre BRIFFAUT
May 2015

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Modeling of Business Structures

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System Approach to Business Operations and Information Engineering

1.1. System approach to conduct business operations

1.1.1. *General considerations*

The system approach is instrumental in tackling complexity in the managerial as well as technical worlds. The system concept is a modeling tool based on interacting entities. Its purpose is to understand complex structures by (de)composing them into entities having specific functions and interacting with each other.

The "composition" approach is implemented when designing a real or virtual object. The "decomposition" approach is implemented when analyzing some existing part of the world.

In both approaches, systems are constructed with a view to identifying certain function capabilities perceived by the users to be desirable. Examples of function-based systems include: defending the country, transmitting messages, transporting people and goods, manufacturing goods, exchanging products and services, etc.

In general, users are known not to be able to articulate all their requirements and expectations. Therefore, at the planning stage, there always exists a considerable uncertainty about many aspects of the system to be built, or, in other words, the system behavior. That explains why prototypes

have to be built for checking whether the users' requirements are adequately fulfilled.

Systems do not exist in isolation. Each operates within a definite environment. But the ways a system interacts with its environment may prove to be of a wide variety. In other words, how and when some types of interaction take place have to be ascribed to uncertain or random events. As a result in certain circumstances, the system behavior can run out of control. These circumstances refer to events or sequences of events which have not been taken into account at the design stage of the system.

1.1.2. System description

Describing a system implies:

– describing its constituent entities as attributes;

– describing the inter-entity relationships;

– describing the relationships between entities and the environment.

Each entity can be a system in itself.

When a business unit is described as a system, the purpose is to control its business operations. Three entities have to be identified, i.e. the controlled system, the controlling system and the information system (IS). The controlled system, often called the transformation system, because it converts inputs into outputs, is modeled generally as a process. The relationships between these three entities are shown in Figure 1.1.

It is noteworthy to elaborate on Figure 1.1 for understanding the features of the system approach to business description. What is meant by direct and indirect control? Direct control refers to the direct action on the controlled process to maintain or change its state. Indirect control resorts to some entity external to the system for influencing the state of the controlled process by means of inputs.

Let us take an example to explain how the messages exchanged between the entities involved are articulated and how their contents trigger decisions. The controlled process is assumed to be a manufacturing process made of

storage and production activities. A message coming from the market place (environment data) is captured and processed by the IS. The message content says that a market slump is forecast. It is directed to the production scheduler in an appropriate format (control data). As a consequence, the scheduler decides to reduce the production level by releasing orders to the manufacturing shops (direct control) on the basis of inventory levels (process data) and to send orders to suppliers to decrease the number of deliveries (indirect control).

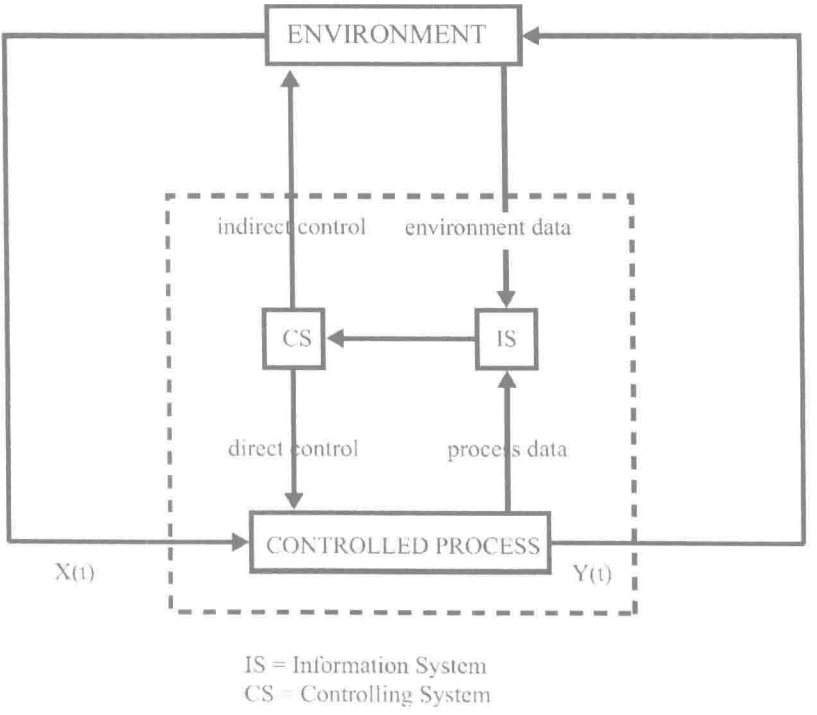

Figure 1.1. *Relationships between the various entities of a business unit within the framework of a system approach*

Describing any business organization as a system means:

– identifying and modeling the system to be controlled (WHAT);