AN OPERATIONS MODEL TO SUPPORT MANUFACTURING LOGISTICS PROCESSES IN THE SUPPLY CHAIN

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Abstract: This paper presents an Operations Model, including a Control Model, developed to support reengineering of manufacturing logistic processes. The reengineering process is supported by a methodology. The Operations Model concept was first designed to support the enterprise perspective, and this paper explains the expansion of the model and methodology to supply chains. The methodology has been developed through several case studies and supports the realisation of Supply Chain Control dashboards and studio.

Key words: Manufacturing Logistics, Operations Model, Control Model, Reengineering

1. INTRODUCTION AND METHODOLOGY

In today's global economy operational excellence is required for manufacturing companies. Competitiveness can only be obtained and maintained if operations management is developed in order to support market requirements and customer needs. It becomes essential to develop innovative demand oriented business models which is adapted to the products and manufacturing processes in the company, and to provide for a holistic supply chain orientation towards suppliers and customers. ICT is an enabler leading to increased competition between companies, and at the same time being an instrument which supports companies in gaining competitive advantages. The ICT-based operational processes must be constantly reviewed and changed paving the way for new control concepts to

Please use the following format when citing this chapter:
Ola Strandhagen, Jan, Dreyer, Heidi, 2006, in International Federation for Information Processing (IFIP), Volume 207, Knowledge Enterprise: Intelligent Strategies In Product Design, Manufacturing, and Management, eds. K. Wang, Kovacs G., Wozny M., Fang M., (Boston: Springer), pp. 393-398.

be applied. Implementation of new control concepts are best supported by a set of enterprise models that represent the operations processes and resources involved. These models should be unified along the supply chain, allowing a process view rather that a functional view of the operation. The model supporting the reengineering process and the Operations Model itself must be neutral and hence generic to the actual control principles both in the as-is and to-be state of the operation. Also the models applied in the reengineering process should support the actual operation itself, allowing online decisions support functionality.

The aim of this paper is to describe the Operations Model and its applicability for supply chains. The research issues addressed is what the key characteristics of a supply chain Operations Model are, and what the main elements of a model supporting the reengineering process are.

The research strategy followed is a combination of a theoretical discussion, exploratory research and empirical data use. The empirical data is collected from a number of cases. The case study approach is preferred due to the need for a deep and extensive study about thoughts and reflections of operations models in supply chains [11][6]. The data sets are analyzed through traditional quantitative and qualitative approaches as statistical processing and textual interpretations of field notes.

2. OPERATION MANAGEMENT

A traditional definition of operations management is *"the design, operation, and improvement of the systems that create and deliver the firm's primary products and services"* [4]. In this paper we adopt this definition but broaden it to focus on and include the supply chain system.

2.1 Extended enterprise – supply chain

Today one of the most significant competitive enablers is innovative supply chain systems based on collaborative models between companies which see the needs of coordinating the supply, production and delivery processes. Supply chain management, which is *"a set of approaches utilised to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produces and distributed at the right quantities, to the right locations, and the right time, in order to minimize system wide cost while satisfying service level requirements"*, is both a management philosophy and a strategy for active operation and integration of the company's market and supply relations [10]. Here active operation means

that the company together with suppliers and customers forms holistic operation supply chain system between them.

Collaboration in the supply chain has a wide range of forms with one common goal: to gain information and to create a transparent, visible demand pattern that paces the entire supply chain [8]. Information and visibility is considered as *"The Holy Grail"* leading to higher predictability and insight into the demand situation which is an essential element in an Operations Model. Several studies have identified the problems caused by a lack of information and to what extent competitive advantages can be gained from a seamless supply chain [7][9][5].

2.2 Modelling and operations model

Enterprise models are used for a range of purposes and can differ from some coarse sketches to detailed numerical models. This paper focuses on the conceptual type of models, which usually are developed to make sense of aspects of an enterprise and communicate with other actors. Such models are normally descriptive, visual, and built on high level modelling entities.

Reengineering an enterprise requires a clear understanding and definition of customer requirements and the operation's capabilities [1]. To gain this understanding requires the collection of data from the enterprise's information systems, interviews with key personnel, examination of documents etc. This data is then used to create a textual and visual description of the Operations Model.

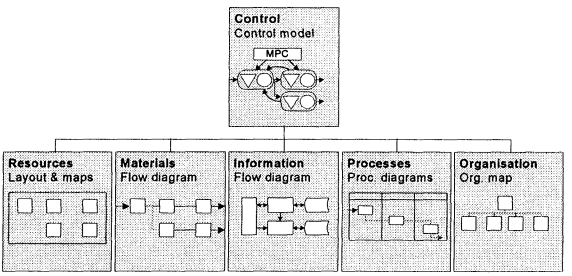

Figure 1. The operations model set.

A Control Model is a representation of how operations are organized and controlled in manufacturing [12][3][2]. A Control Model is normally developed by the following building blocks: customer order decoupling point, control principles and methods, main operations processes and the related information's flows and ICT systems. The Control Model is the key model in the comprehensive Operations Model. The Operations Model

proposes six views that should be modeled as shown in Figure 1.

3. THE SUPPLY CHAIN OPERATIONS MODEL

A simplified example of a Control Model for the manufacturing enterprise HÅG is shown in Figure 2. This model is the result of a reengineering process to improve the logistics performance of the enterprise.

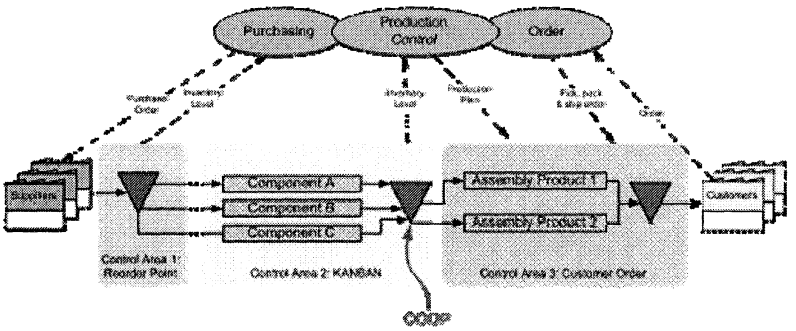

Figure 2. Control Model for Manufacturing Enterprise.

The focus in this model is on control of the internal processes of the enterprise. To expand from an enterprise view to a supply chain view the supply chain Operations Model has been developed to include the aspects given in Table 1.

Table 1. The expanded supply chain view

Resources	Processes	Material	Information	Organisation	Control
Suppliers Transporters Wholesalers Customers	Forecasts Order Call offs Procurements Wholesalers control	Demand pattern between actors Distribution principles	Informations flow between actors ICT systems of actors	Roles of different actors Contract principles	CODP placing (several in VC) Control principles Control areas combining actors KPI measure in customer-supplier relations
DATA SET (documentation)					

The expanded supply chain view is applied in a reengineering process to create an Operations Model for a pharmaceutical supply chain. The TO-BE supply chain Operations Model is based on the concepts of automatic replenishment and it resulted in the following Operations Model in Figure 3. Again the reengineering process methodology explained in section 4 was used. The figure shows a holistic view of the production, distribution and demand system in the pharmaceutical supply chain. In the AUTOMED project such a model is developed between a global manufacturer, a

Norwegian wholesaler, and a Norwegian pharmacy retail chain in order to allow automated replenishment of pharmaceuticals based on point-of-sale-data (POS-data). The essential elements in this model are the continuously replenishment of the pharmacies based on POS-data, the placing of the customer order decoupling point (CODP) and that the control process is integrated and coordinated in and between the companies.

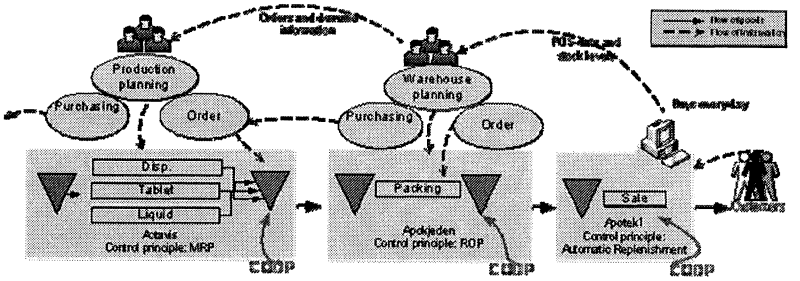

Figure 3. Supply chain operations model for AUTOMED.

4. THE REENGINEERING PROCESS

Process reengineering requires an in-depth understanding of the enterprise's current manufacturing logistics processes. The Enterprise Reengineering Methodology organises the reengineering process in six steps; see Figure 4. The purpose of the process is to create an Operations Model that describes the AS-IS and TO-BE logistics processes. The process purpose and preliminary problem hypothesis are defined in the initial stage. These guide the choice of methods for the mapping and analysis stages.

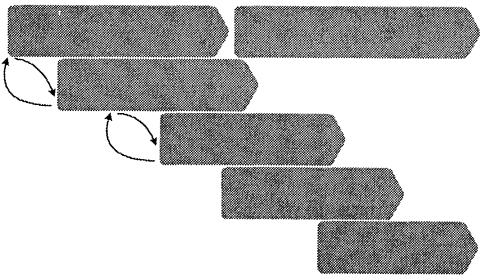

Figure 4. Enterprise Reengineering Methodology.

Mapping consists of creating a description of the AS-IS Operations Model and identifying potential improvement areas. Subsequently a selection of general and specific analyses is performed on chosen aspects of

the enterprise's operations. This should identify the key characteristics of the supply chain, and based on the findings, the TO-BE Operations Model and solution elements are designed, and implemented in the enterprise.

5. CONCLUSION

This paper has presented an Operations Model, including a Control Model, developed to support reengineering of manufacturing logistic processes. The reengineering process is supported by a methodology. The Model and Methodology has been applied in reengineering of more than twenty manufacturing enterprises. The Model has now been expanded into a Supply Chain view, based on the same Reengineering Methodology, and has been applied to several cases. Further research is focused on developing concepts and solutions for Supply Chain Dashboards and Supply Chain Control Studios based on the Operations Model.

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