

Linking product–process matrices for manufacturing and industrial service operations

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Abstract

Firms using industrial goods as a resource in their own operations need support and services to maintain the efficient use of these resources. The prevailing trend is to integrate goods and services in a product package. We take the supplier's view on the task of providing industrial services, i.e. the supply of after-sales services, including tangibles such as spare parts and consumables, related to industrial goods. We study the relationship between goods manufacturing and industrial services, aiming at an integrated approach for manufacturing and service operations decisions on process choice. In this paper, we specifically explore the linkage between goods manufacturing and service operations product–process matrices. Product, market demand and process characteristics can develop differently for industrial services relative to the manufactured good, wherefore it is important to analyse volume, variety and process issues for both manufacturing and service operations, respectively, in order to create a match between product and process characteristics. We derive a framework for process choice in joint manufacturing and after-sales service operations, and illustrate with an industrial case study.

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1. Introduction

For suppliers of industrial goods, the related after-sales services provided to customers often make up a substantial proportion of the supplying company's profit. These companies, including the case company initiating this research, operate in a business-to-business environment, and supply various machineries that are used in their customers' operations. After-sales activities contribute strongly to the bottom line of the companies, and being the

original equipment manufacturer has traditionally kept competition from other suppliers low. As after-sales volumes and competition increases, as well as customer requirements, new and improved ways to strategically manage these industrial after-sales services are in demand.

There is a trend towards the integration of goods and services into a single customer offering, implying that production means the creation of a combined goods and services product. Thus a product can be a service, a good, or most likely, a combination of both. In the light of companies becoming suppliers of such value-creating offerings, there is a need to investigate the link between the processes of supplying services as well as the

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underlying goods. The physical properties of the industrial service products are in many cases (more or less) identical to those of the new products. This means that the machines and tools used to manufacture the goods can be the same for both, which implies a possibility for making a process choice by which both types of products are supplied in the same process.

In a spectrum of different kinds of services, we here focus on industrial after-sales services, such as spare parts, consumables, support, upgrades and education, related to the maintenance of industrial goods. We study the relationship between these industrial after-sales services and manufacturing, aiming at an integrated approach for manufacturing and service operations management; this is in contrast to other recent work (Amini et al., 2005) where industrial after-sales services are treated decoupled from the original manufacturing process. We investigate if guidelines can be established for a concurrent design of manufacturing and service processes, taking into account the demand characteristics of goods and its related industrial services. Special attention is paid to the situation where the industrial good can be serviced in a process similar to that of new goods manufacturing, cf. the case of gas turbines (Johansson and Olhager, 2004). The choice of process for new goods manufacturing is often based on product and market characteristics as depicted by the product–process matrix by Hayes and Wheelwright (1979a, b, 1984), and similar approaches have been developed for service operations. However, no attempts have been made in the literature to link manufacturing and service operations decisions on process choice.

Exploring specifically the linkage between product–process matrices for goods manufacturing and service operations, the objective is to develop a decision support tool for practitioners working in an environment where the processes for both new goods and after-sales services are or can be related to each other. In the business-to-business industries considered here, the industrial after-sales service operations are largely separated organisationally from the new product operations. However, as the importance of the industrial service activities is growing, there is an interest in improving the process through which the after-sales service products are supplied. There are some well-established managerial tools for process choice for new products, and even for industrial services there are

tools available, although not yet as well known or proven. These tools provide a means for selecting an appropriate process for new products and service products, respectively. A next step would be to investigate the opportunity to link these two processes, i.e. to find instances when it can be beneficial to co-ordinate the goods and service processes, which is the objective of this research. The experience is that as industrial service has gotten more and more important, the process through which it is being supplied may no longer be adequate. Larger volumes and competition from third party suppliers of after-sales services put pressure on the companies to improve manufacturing operations for new goods as well as for industrial services. We hope to contribute to the understanding of integrated decision-making on process choice for manufacturing and industrial service operations.

First, we provide an overview of the product–process matrix originally developed for manufacturing operations. Then, we review the literature on product–process type matrices for services, and specifically consider an industrial service adapted matrix. Next, we combine these application areas into an integrated approach for process choice for manufacturing and service, and, through a case, discuss the positioning relationships between goods manufacturing and the related industrial services.

2. Product–process matrix for manufacturing operations

The research area of manufacturing strategy is evolving, calling for a stronger focus on the manufacturing aspect of companies, and claiming that by strategically managing the manufacturing function it can become a competitive weapon. Hayes and Wheelwright (1979a, b, 1984) link different production processes to the product life cycle stages, targeting goods manufacturing operations; see Fig. 1. This framework is one of the most widely recognised concepts in the manufacturing strategy arena, and has been frequently commented upon; see e.g. Spencer and Cox (1995), Safizadeh et al. (1996), McDermott et al. (1997) and Ahmad and Schroeder (2002).

In the product–process matrix, the market and product characteristics (along the x -axis) consist of the product volume and variety mix. Product volume increases from left to right, whereas mix decreases. Thus, at the left a manufacturing system

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