



STRATEGIC ROLES OF PRODUCTION: CORRECT, CENTRIC, COMPROMISE AND BEYOND

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ABSTRACT

This paper aims to view production from a new angle, and tries to look beyond correct, centric and compromise, approaches which may no longer be sufficient for long-term competitive success. Four cases from different industries are described and used to illustrate and discuss the possibility of production playing new strategic roles. Backward, forward and lateral interactive supports are suggested to explicate how production can realize its new strategic roles. Finally, four new strategic roles of production are suggested. They are: innovation production, ramp-up production, primary production, and service production.

Key words: Production, Production Strategy, Production Roles.

Cite this Article: Nelson Vinotha Kumar Xavier P and T. Narayanan, Strategic Roles of Production: Correct, Centric, Compromise and Beyond, International Journal of Civil Engineering and Technology, 8(8), 2017, pp. 870–879.

<http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=8&IType=8>

1. INTRODUCTION

Currently, production is viewed as a simple process of transforming materials into products mostly. Trying to propose ideas to make production work more efficiently and/or effectively, most studies take their outset in offering customers what they want at the lowest possible cost (Riis *et al.*, 2007). However, this view no longer suffices as the environment of production has faced significant changes in the past decade. In fact, the most notable challenges for production are increased levels of complexity and uncertainty coming from increased globalization, of markets and operations, the diversified demands of customers, drastic reductions in product lifecycles, and production and Information & communication technology progress. In a word, the knowledge base for production has become more complex and this process is likely to

continue. Therefore, it is quite important to change our perspectives on production, from a resource-based to knowledge-based view; from linearity to complexity; from individual to system competition; and from mono-discipline to trans-discipline (European Commission, 2004).

Production strategy is not just about aligning operations to current competitive priorities but also about selecting and creating the operating capabilities a company will need in the future (Hayes and Pisano, 1994). When production starts to play a somewhat different role, as sketched above, this opens for a discussion of current thinking and practices approaching production from the (traditional) most correct, centric and compromise perspectives (Teece et al. 1997).

Thus, this paper will focus on the changes in the strategic roles of production that are initiated by the challenges mentioned above. It begins with a brief review of the literature on strategic roles of production. By pointing out shortcomings in existing research, the main questions of this paper are formulated, and the research method employed to research these questions described. Then, four detailed cases are introduced and analyzed to provide the basis of four new strategic roles discussed next. The paper is concluded with a summary of the findings and directions for future research.

LITERATURE REVIEW

The notion of production strategy as a separate but related functional component of a business unit strategy was first put forward by Skinner in his two papers (1969), (1974). Currently, the dominant view is that research on production strategy consist of two categories—content research and process research. According to Adam and Swamidass (1992), content research addresses the decision scope of production strategy, which includes two core elements. The first element is a statement of "what the production function must accomplish", or the "production task" (Skinner, 1978), which refers to critical competitive capabilities, e.g. quality, cost/efficiency, delivery/responsiveness, flexibility, innovation and customer service. The second element of a production strategy is defined by the pattern of production choices that a company makes (Hayes and Wheelwright, 1984; Hayes et al., 1988; Hill, 1989), namely structural or "bricks and mortar" decisions about facilities, technology, vertical integration, and capacity and major decisions about the production infrastructure, such as organization, quality management, work force policies, and information systems architecture. In process studies of production strategy, there are also two mainstream theories (Rafael and Dilts, 1997), production strategy as a top-down (directed, intended) and as a bottom-up (emergent) process, respectively.

In the literature about strategic roles of production, the role of production is "defined" as the strategic contribution of production to the competitive strength of a company. Hill (1983) proposes various concepts and ideas and gives practical examples of how to develop the strategic role of production. Many authors in this line of research regard the positioning of production in its wider environment as a question of correct and centric. Hill (1985) defines the production task in terms of the capabilities that are critical to meeting customer demands. This means that production plays two key roles: qualifying for, and winning orders in, the market place. Within the perspective of correct and centric the strategic role of production can also be described by its location and contribution to the value chain of a company, following the ideas of Porter (1985).

Based on empirical findings, Wheelwright & Hayes (1985) identified four different roles (stages) of production: internally neutral, externally neutral, internally supportive, and externally supportive, which they saw as a maturity model of strategic production, proposing that production companies make a choice as to how they compete (Child, 1972). Gilgeous (2001) provides some evidence for the characteristics of strategic production effectiveness, to

provide an empirical validation of the strategic role of production and to make the structure of the four-stage frame work explicit.

Voss (1995) introduced three paradigms of production strategy, respectively: competing through production; strategic choices in production; and best practice. In the first paradigm Voss included order winners, key success factors, capability, generic production strategies and shared vision. In the second paradigm he included contingency approaches, internal and external consistency, choice of process, process and infrastructure and focus. In the best practice paradigm, Voss included world-class production, benchmarking, process re-engineering, TQM, learning from the Japanese and continuous improvement. In his 2006 revisited the paradigms and stressed that there is a need for adding more dimensions to the strategic role of production, following the increased distribution of production and increased complexity (Voss 2006).

Most researchers regard production “simply” as a process of transforming materials into products and propose ideas to make production work more efficiently and/or effectively. Production strategy, then, concerns the question of how to pursue specific competitive priorities efficiently and effectively according to changes in corporate strategy and the internal and external environment. In the centric and correct perspective dominating this approach, the emphasis is on offering customers what they want (Riis *et al.*, 2007). However, it is less clear how much freedom production should have to develop competences that go beyond immediate requirements (Hayes and Pisano, 1994), but ever more authors advocate the idea that production competencies and their development may also create competitive advantage for the company (Hayes et al. 2005). Then, production strategy is not just about aligning operations to current competitive priorities but also about selecting and creating the operating capabilities a company will need in the future (Hayes and Pisano, 1994). In effect, the role of the production function starts to change. Rather than simply carrying out their assigned mission, they also have the authority to redefine that mission (Hayes and Pisano, 1996). This opens for a discussion of current thinking and practices of production related to the traditional most correct, compromise and role perceptions. Moreover, it may change our paradigm of production based on physical resources to production based on knowledge.

Johansen & Riis (2005) propose another way of characterizing the strategic role of production based on the thesis that an industrial company can occupy a number of different positions in the supply chain. In view of the close interaction between the various functions of an industrial company it is difficult to identify a strategic role that production plays alone. Based on a survey including approximately 1,800 Asian companies, they identify five different roles. *Full scale production* is carried out exclusively by production, whereas the following four roles are supporting one or more functions, such as *ramp-up* (sales and product development), *prototype production* (product development, sales and sourcing), *benchmarking* (sourcing), and *laboratory production* (product development). However, these authors do not account for how they arrived at these five roles, nor do they provide empirical support for their findings or analyze the five strategic roles in detail.

Following the above discussions, the objective of this paper is to replicate, and elaborate on, the work of Johansen and Riis (2005), discuss and, possibly, modify and/or add to the strategic roles for production these authors identified, and provide more detailed insight into the (modified, new) roles.

RESEARCH METHODOLOGY

Our objective calls for explorative in-depth research, for which, at this stage of theory development, case studies are the most suitable methodology (Yin, 1994). In the next section, four case stories from four different industries are introduced. Open interviews and document study were the main methods used to perform the case studies.

CASE STUDIES

Manufacturer A is an OEM supplier of textiles, which has few but very important customers. Due to a strong price competition in the market for incontinence products, Manufacturer A has recently come to recognize the importance of customers' demands. Production is not longer viewed as the dominant activity, but as a means for realizing customers' needs and obtaining better customer satisfaction. This change of production role has called for a greater understanding of which needs production should fulfill, as well as how these needs are satisfied for Manufacturer A. The result of these considerations is that most high-cost production was moved to factories in Bangalore, Mumbai and Kolkata, where financial advantages can be picked up. However, on the other hand, central, that is, knowledge and competence intensive production tasks remained at company headquarters in New Delhi. The starting point is to combine production competence with product development, so that prototype production and process development are handled at headquarters, where there are two different production halls. One production hall is reserved for the R&D department, and has two primary functions: prototype production and laboratory. Here product developers have privileges to test new ideas and to produce and improve prototypes. They enjoy enough freedom to experiment with new products and new technologies. This freedom combines with a wish of testing and experimenting, which makes products of Manufacturer A so attractive, and thus, its market position so strong. The other production hall handles the running-in of prototypes from the first hall. Here pilot series are made by new products, and are documented with the help of process flow and work-instructions.

Manufacturer B focuses on developing and production unique, customer-specific components and total solutions in the area of plastic and metal technologies. Being an OEM supplier and facing strong competition from factories in North India, it is under constant pressures to renew its product portfolio and production procedures, and price pressure increased, too. Manufacturer B used to be competitive, on flexibility and change-over ability, not on price, and needed to develop the capability to combine rapid adaptation to changing demands of customers with the efficiency of mass production, so as to provide specific, high quality and low price solutions to customers. The actual strength of its current production system is the combination of ramp-up production and mass production, that is, the combination of flexibility and efficiency. Although ramp-up production brings complexity to the production system, it also makes it possible for Manufacturer B to maintain production in South India and offer low prices simultaneously. To some extent, production of Manufacturer B could be viewed as a textbook example, which points out that production in South India could also be competitive, as customers demand not only "cheap" products.

Manufacturer C is the one of largest kitchen companies in India. The operational objective of the case company is to deliver a large range of products to customers in order to satisfy their special demands. There are some clear demands for production, including low cost, high delivery reliability and constantly high quality, combined with the flexibility to produce and deliver kitchens with different configurations and made from different types of wood. Manufacturer C has well-developed, mature products and production processes, from component production to assembly of whole kitchens. Its production system is made up by three departments: component department, special department and assembly department. As their names point out, the component department produces standard components, the special department produces customer-specific components and the assembly department integrates components to make up the whole kitchens. The component department produces according to forecast, while the other two departments produce to customer order.

Manufacturer D is one of the subsidiaries of a big energy company, which merged with another company to create the largest manufacturer of Transformers in the whole India in 2004, delivering approx.500per year. Mainly due to political and logistic issues, Manufacturer D follows a strategy that it only holds 10%-12% of its production in own plant while the rest is outsourced to local suppliers. Its, consequently small scale, production system involves all the equipment and processes needed to produce transformers. This in-house production, which could be viewed the mini version of the production operations of Manufacturer D’s partners, acts as a benchmark for those partners. Manufacturer D selects proper suppliers and then helps them to improve their performance. In order to support the knowledge transfer to its suppliers and help them improving their performance, Manufacturer D mainly relies on documents and a “supervisor corps”. Documents can be used as producing the body are not considered a core-competency and can be classified as low-tech production. Moreover, all the operations related to body production are standard. Thus, it is possible for the suppliers to produce according to standard operating procedures. However, still, different kinds of problems may occur during the various production phases. To tackle that, Manufacturer D utilizes the “supervisor corps”. The corps consists of experienced craftsmen who visit the production sites and assist the external suppliers based on their expertise from the benchmarking production in Own plant. Thus, the supervisors are responsible for solving problems faced by the external suppliers, while they also bring back production knowledge to the Engineering and Production departments in own plant from their problem solving experiences.

FINDINGS

We summarize the case stories with respect to their strategic roles of production from four aspects: (1) the objectives, (2) the competitive priorities pursued (quality, cost/efficiency, delivery/responsiveness, flexibility and innovation), (3) key resources (access to low cost production input factors; proximity to market; use of local technological resources) according to Ferdows (1997), and (4) inter-relationships with other functions, as shown in Table 1.

Table 1 Characteristics of Four Strategic roles of Production

Cases	Objectives	Competitive Priorities	Key Resources	Inter-Relationships with Other Functions
Manufacturer A	Developing and testing new processes, new products and production equipment, even new technical/administrative systems	Innovation	Technological Resources	Mainly R&D and marketing, while external research centers, universities and customers could be involved
Manufacturer B	Establishing a production system to keep pace with increasing demands from technologies or markets as quickly as possible	Flexibility and Delivery	Proximity to R&D Centers or Markets	Mainly between R&D and production and between marketing/sales and production
Manufacturer C	Taking part in the company’s continuous development and profit making, and being able to live up to quality, price and on-time delivery	Quality, price and on-time delivery	Access to Low Cost Production Input Factors (Sometimes Proximity to Markets)	Mainly focusing on production itself, but also working, more or less, as a caller to get help from other functions

Cases	Objectives	Competitive Priorities	Key Resources	Inter-Relationships with Other Functions
Manufacturer D	Getting information of a certain production flow, which could be used as a benchmark, to help making some strategic decisions	Flexibility	Technological Resources	Mainly between production and outsourcing or procurement

DISCUSSION – NEW DIFFERENT ROLES FOR PRODUCTION

Viewed from a material flow perspective, production is the last function before products come out and are delivered to the market place. Before production, different sorts of information, knowledge and materials from different functions come together, and during production, they are transferred into specifications of production processes and used to support finished goods production. After completion of the actual production process, production could be viewed as the starting point of the delivery process. To some extent, production is arguably at the center of the entire operations of industrial companies, as a “processor” that collects all sorts of information, knowledge and materials from different functions, processes them and transfers them in the form of final products to the market place.

Besides its traditional role, the possibility exists for production to play additional roles through **interactive support**, which means production cooperates with specific functions, serves specific objectives and gives adequate support to these activities, as shown in Manufacturer A, B, C and D. Generally, because production is viewed as the center of the entire operations of industrial companies, it is natural that there could be three types of interactive support, namely **backward interactive support** (upstream), **forward interactive support** (downstream) and **lateral interactive support**.

Backward interactive support means that production takes part in activities, e.g. innovation and product development. Many studies refer to this area as, for example, integrated product development or concurrent engineering. Forward interactive support means that production takes part in activities after completion of the (physical) product, including distribution and after-sales service.

FOUR NEW STRATEGIC ROLES OF PRODUCTION

Following this line of thinking, the cases suggest four different strategic roles for the production function:

- **Innovation Production**, which takes part in R&D activities and works with R&D (maybe also with marketing) to realize innovations. In this role, the production function is home to the development and test of new technologies, products and/or management systems (Manufacturer A).
- **Ramp-up Production**, which mainly works with marketing (maybe also with R&D). It aims to establish a production system capable to keep pace with increasing demands for a new product or in a new market. At the same time, it also embraces possibilities of a temporary set-up for the establishment and running-in of an assembly system based on new technologies (e.g. Manufacturer B).
- **Primary Production**, the traditional role, which aims to produce as efficiently and effectively as possible. Production capacity keeps pace with the demand for the company’s products. Pursuing priorities as to quality, price and on-time delivery is one of the most important tasks in this role. Most OM studies take this role as their starting point (e.g. Manufacturer C).

- **Service Production**, which could be viewed as the aggregate of many different possible roles that production could play, and aims to serve specific context dependent objectives. Benchmarking production can be classified into this role (e.g. Manufacturer D).

The first two roles – innovation and ramp-up production – involve backward interactive support as they take part in some activities before traditional production. With regard to the third role, it just concentrates on production itself and does not provide forward or backward interactive-support. Benchmarking production provides lateral interactive support, to parallel systems essentially producing the same components or products, but may also interact with upstream and downstream processes. We suspect benchmarking is just one form of many actually providing services to other functions or production systems, inside or outside the company – hence the term service production.

Our observations are limited to four cases, in which we did not see any forward interactive support. However, it does not mean that this mode is not important. Furthermore, there may still be other strategic roles – further research is needed to investigate this.

The four strategic roles of production differ from the classification of Johansen and Riis (2005)¹⁴ as follows:

- In practice, laboratory production and prototype production are always interdependent and they have the same objective—product development. Moreover, according to our observations, they are in the same place in most of situations. Therefore, we combine them into a new role—innovation production.
- Actually, comparing with other roles, full-scale production plays a traditional role, which focuses on the primary objective of production – producing more efficiently and effectively and it is the only role carried out exclusively by production while other roles normally cooperate with other functions to realize supportive objectives. In order to describe these comparisons more clearly, we use primary production to replace full-scale production.
- We extend the conception of benchmark production to service production. Benchmarking production is one role, in which production services for the sourcing (purchasing) function to get relevant information about suppliers and also provides services to those suppliers. But production may still have possibilities to service for other objectives. That is why we propose the label service production as the aggregate of possible roles that production could play.

Furthermore, it is obvious that the four strategic roles are not necessarily entirely separated from each other. On the contrary, they can be related along two dimensions: time and place.

Firstly, viewed from the time dimension, the four strategic roles seem to represent the typical product life cycle. Innovation production is relevant during the development phase of new products. Ramp-up production is used during the introduction and growth phase. Certainly, primary production satisfies the maturity phase. Service production could be useful in many phases, depending on service provided and the internal or external customer(s) of that service. Secondly, along with the trend of globalization, it is more and more normal for industrial companies to have several plants spread geographically. And to some extent, the strategic role of plants could be decided by production roles. Individual plants could be characterized by the production role(s) they play and they could be viewed as locating specific production roles in specific places and giving specific forms of support, depending on their role. This suggestion provides a starting point for discussing the role of plants in networks.

VIEWING PRODUCTION AS A SUPPORT ACTIVITY

Primary production is the only role that could be viewed as the traditional one, which mainly focuses on production itself to support producing efficiently and effectively. Without denying the significance of primary production, it seems that the contributions that production makes to competitive advantage in cooperation with other functions will become more important in the

future (Riis et al., 2007)¹⁷. According to Porter (1985)¹⁵, production has always been treated as one of the primary activities in industrial value chains. But according to the analysis presented above, this point may need to be revised. On the one hand, there is still room for production to play its traditional primary role. On the other hand, however, the other three roles seem to be better characterized as support functions. Innovation production supports the development and test of new processes, new products and production equipment, even new technical/administrative systems; ramp-up production supports the introduction and growing demand for new products and/or from new markets; and benchmarking production parallels production systems and informs the (out) sourcing function.

With the competitive environment changing continuously and ever faster, it is predictable that the indirect strategic roles of production (innovation, ramp-up, and service production) will become increasingly important in the future, which points to the need to focus attention on developing competencies in managing the interplay between production and other functions, such as sales, product development, sourcing, distribution and after-sales service. As the indirect strategic roles come into focus and operations take place globally, new competencies are called for. Traditionally, emphasis has been placed on knowledge and know-how about production processes; and this represents an important challenge for key processes. But increasingly the capability to manage the complex interplay between many actors involved in a value chain will become important. The strategic roles of production imply companies need to develop competencies in this area (Riis et al., 2007)¹⁷, but it is unclear as yet exactly what these competencies involve.

CONCLUSION AND SCOPE FOR FUTURE RESEARCH

This paper argues that production should no longer be viewed as a simple process of transforming materials into products as efficiently and effectively as possible. Viewed as the center of the entire operations of industrial companies, the possibility emerges for production to play different and equally important role. Through backward, forward and lateral interactive support, production could take part in other relevant activities before or after production and support operations of other (parallel) functions. Thus, besides traditional role – primary production, this paper introduces three other strategic roles: innovation production, ramp-up production and service production.

It is predictable that the discussion of these new strategic roles of production will become more and more important. Firstly, the globalization means that it is more and more normal for companies to have new product development in one place, ramp-up production elsewhere, and full capacity production in a third location. Obviously, in different phases, production could have different effects, that is, play different roles. Secondly, in different situations, production needs input from or provides input to and, thus, has to cooperate with different functions to realize its own role. In order to know more about how production works with different functions in different phases and how production acts as a platform to support different activities, the four strategic roles of production are valuable to be researched. Thirdly, following the cooperation with different functions, the knowledge used and created may differ from phase to phase. In order to make this knowledge aspect clearer and easier to be researched, it is, again, valuable to focus on four roles of production.

This paper tries to view production from a new angle, going beyond correct, centric and compromise. The findings provide the basis for future research, mainly focusing on three parts. Firstly, the paper is based on four case studies. Further research is needed to refine and, possibly extend the findings. In practice more roles may be found. And, then, our understanding of each of the roles is rather limited. Second, from a life cycle perspective, it is necessary to focus on knowledge transfer between the different strategic roles. Finally, globalization leads to,

amongst others, the development of dispersed plant and supply networks. The interaction between the strategic roles in such networks is a third important area for further research.

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