Artigo 07

Implementing manufacturing strategy through strategic production planning

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Implementing manufacturing strategy through strategic production planning

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Introduction

This paper identifies the need for a formal mechanism aiming to integrate operational decisions both horizontally, between different functional areas, and vertically, within the manufacturing function. It outlines some of the desired characteristics of a potential method to fulfil the aforementioned need and proposes that the integration should be done under the domain of the production planning process. Partial results of a running field research on the theme among Brazilian manufacturing companies are presented.

The need for an integration mechanism

Many relevant authors in the recent literature on business strategy (Hill, 1995; Slack *et al.*, 1995; Stonebraker and Leong, 1995) suggest hierarchical approaches for the strategic management process, aiming to create and sustain competitive advantage. Frequently such an approach establishes three levels of strategy – corporate strategy, business strategy and functional strategies – each of them driven and constrained by the immediate upper level. Strategies of different businesses in an organisation should be coherent and possibly synergetic in order that the corporate objectives are accomplished. Similarly, the various functional strategies – among them the operations strategy – should also be coherent, integrated, self-supporting and synergetic in order that competitive power is created and sustained in the business.

Coherence among the different functional strategies should be guaranteed during the formulation process. Corrêa and Gianesi (1993) outline a process of manufacturing strategy formulation in turbulent environments, based on contingency models and scenarios which aims, among other objectives, to achieve coherence among functional strategies. Hayes *et al.* (1988) propose the development and maintenance of a consistent manufacturing decision pattern, since most decisions, be they strategic, tactical or operational, have impact on the strategic performance of the organisation. It appears to be plausible that this idea can be extended to other (non-manufacturing) functional areas. It is therefore necessary to ensure that intra-functional consistency between the functional strategy, the decision areas[1] policies and the many individual decisions. The "pattern" of the individual decisions taken as a whole represent the actual realised strategy. They have, therefore, crucial importance for the achieved performance of the function, the business and the corporation. The

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coherence between the functional strategies (here called "high horizontal coherence") and the coherence between the several decision levels within each and every function (here called "vertical coherence") should ensure the coherence between functional operational decisions (here called "low horizontal coherence") – Figure 1 illustrates this point. However, ensuring "high horizontal" coherence and "vertical" coherence is by no means an easy task for several reasons:

- Functional strategy formulation processes which aim to ensure "high horizontal" consistency (such as the one proposed by Prochno and Corrêa, 1995) often assume some hypotheses which are difficult to guarantee without an extremely diligent management. Among others, top management and functional management commitment to the process and a thorough understanding, by the functional managers, of the strategic implications of their functional decisions.
- Turbulent environments, such as the Brazilian industrial world, require frequent re-planning and therefore process-like approaches (Whittington, 1993) seem to be the most appropriate. Brazilian companies cannot afford to wait, say, six months to review their strategies, requiring that the strategic replanning process be triggered by relevant events (events which significantly affect any company function). The problem is that the aforementioned turbulence also affects functional operational decisions, some of them requiring sudden route changes. These changes can cause the presupposed coherence achieved

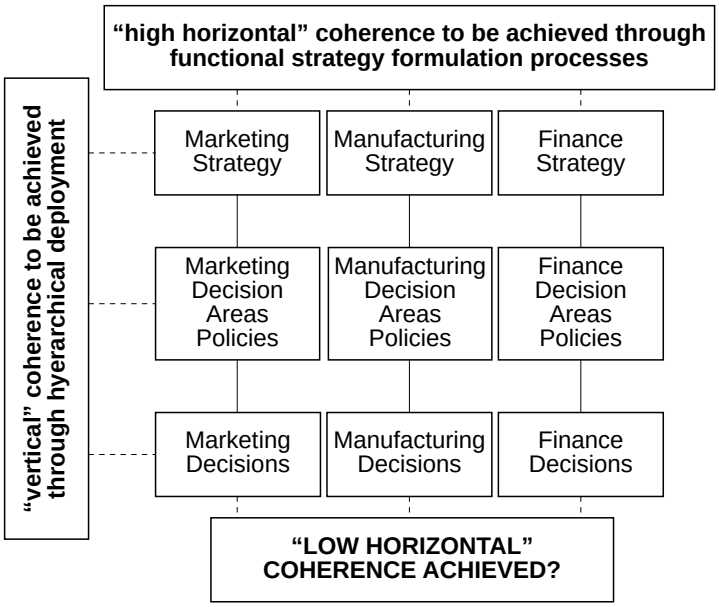

Figure 1.
The need for coherence between operational decisions of several functions within the company

at the functional strategic level ("high horizontal") to be eroded day-by-day, unless the various functions systematically communicate in order to be able to adjust their decisions to regain the continually lost coherence ("low horizontal") between their functional decisions.

- The functional strategy formulation is not easy and although there are several proposed methods (e.g. Hayes and Wheelwright, 1984; Hill, 1995) there is not one best for any circumstance.
- Managers of several functions have their own objectives and personal agendas, which interfere, to a certain extent, with the objectives set by the functional strategies.
- The need to have a consistent decision pattern within each function has been highlighted by several authors (e.g. Hayes and Wheelwright, 1984), however the literature has been more prolific in prescribing what to do (objective) than prescribing how to do it (process). As a consequence, methods for the deployment of strategic objectives into lower level objectives which actually drive functional decision making at different levels is neither a simple task nor consensual in the literature.
- Decision-makers at different levels within any function also have their own personal objectives and agendas, which interfere with the deployed objectives, which were derived from functional strategies.

With all these difficulties one cannot expect 100 per cent coherence neither between functional strategies nor between different levels of decision making within each function. If we imagine a numerical exercise in which we suppose 85 per cent coherence between each decision level, it will result in only 44 per cent coherence between operational decisions of two different functional areas, as illustrated by Figure 2.

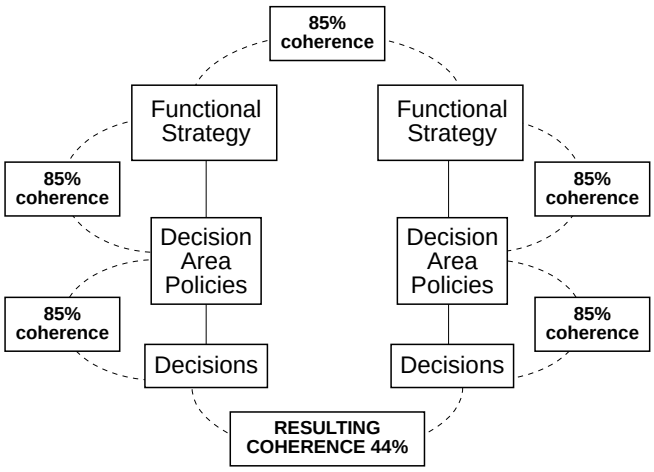

Figure 2.
Coherence between functional strategies (high horizontal) and coherence between decision levels of each functional area (vertical) alone do not guarantee the coherence between operational decisions of different functions (low horizontal)

One of the practical results is conflicting decisions which eventually jeopardise the company performance and therefore competitive power. Some examples of conflicting decisions are illustrated below and were drawn from the exploratory phase of the field study in Brazil:

- sales promotion, done by the marketing function, of products which have not yet been issued by the engineering function;
- when issued by the engineering function some products have components with long lead times not considered appropriately, thus causing even more lateness in delivering the products to the market place;
- decision by the manufacturing function of building up raw material inventory without enough provision of working capital, which had been used by finance as capital investment;
- sales effort, based on out-of-balance product mix with regard to manufacturing capacity, causing the manufacturing function to work with some machines under-utilised and simultaneous late deliveries;
- price discounts and customer credit policies aiming to increase sales, decided by the marketing function in isolation, jeopardising total margins and without the necessary provision of working capital;
- new product being developed by engineering and research and development which will use equipment being discontinued by manufacturing;
- manufacturing decision of making investment in more productive equipment requiring long set-up times, while marketing intensify the variety of new products launched, requiring flexible machinery;
- new markets developed by marketing efforts requiring extra production volume which may be constrained by parts suppliers whose limits were not considered at the time.

In search of an integration mechanism for the operational decision making

Besides ensuring coherence between operational decisions, such mechanisms should favour other aspects:

- *Coherence along time*: each functional area makes decisions at a certain point in time and plans to make other decisions in the future. It is necessary that the decisions made by different functions are both coherent in the present and in the future; this way it is necessary that there is coherence between the planning processes of the functions.
- *Proactivity*: each functional area should assume a proactive role, actively contributing to the achievement of competitiveness and not only reacting to requirements from other functions.

- *Breaking down organisational barriers*: the nature of the functional organisation (still present in most Brazilian organisations, despite the recent trend of "re-engineering" them), hierarchical and bureaucratic, makes it difficult for the operational decisions of different functions to be coherent and at the same time favours the rising of non-synergetic functional objectives, or, even worse, conflicting functional objectives, which either contribute little or do not contribute at all to the business and corporate objectives. It is necessary to favour a culture of integration, breaking down functional barriers, causing most decision making to be multi-functional.

The search for coherence between decisions of different functions requires a negotiating process between different functional areas. Corrêa and Gianesi (1992) suggest that, in terms of functional strategy development in turbulent environments, the negotiation focus should be a set of performance criteria established between the negotiating functions in an internal customer-internal supplier structure. This negotiating process should be triggered by relevant events, or in the unlikely absence of relevant events, after pre-determined time periods called replanning periods. In the case of operational decisions, the focus of the negotiating process should be on:

- being an integrator by nature, involving different functions within the company;
- being agile, including frequent revisions or replanning which will make it possible that the decision coherence is adequately monitored and adjusted; and,
- having relevant impact on the competitive performance of the company.

One of the business processes which potentially fulfils these characteristics is the logistics process, or in more conventional terminology, the production planning and control process. It is an integrating function by nature because the decisions what, how many and when to produce have profound impact, for instance, on the marketing function (they define what will be available to offer to the market), depend on the finance function support in terms of financial resources availability, let alone the evident impact on the manufacturing function. It is an agile process in the sense that it requires frequent replanning, monthly, weekly or even daily, depending on the planning level and on the business nature. The impact of the production planning and control decisions can be assessed considering the performance criteria below:

- *Cost*: the production planning decisions define how resources such as labour and equipment are to be utilised (implying certain levels of excess capacity, overtime, hiring and firing and subcontracts), in addition to the definition of inventory levels.
- *Delivery speed*: the definition of finished goods and work in process inventory levels can have a strong impact on the company's ability to

deliver goods promptly. The definition of strategic levels of excess capacity can also have a major impact on delivery speed.

- *Delivery reliability*: besides the definition of safety stock levels, which affect the system reliability, the production planning decisions also affect other determinants of reliability. Slack (1993) suggests five main actions to increase production systems reliability – planning the future, controlling resource utilisation, close monitoring of operations progress, increasing the flexibility of resources and developing internal suppliers as well as external suppliers. The production planning and control process directly affects the first three actions.
- *Flexibility*: considering the five types of flexibility proposed by Corrêa (1994) – product, mix, volume, delivery and robustness flexibility – the production planning decisions cause a major effect on at least the last four.

We will call the production planning and control process, when it is specifically structured to correspond to the aforementioned requirements of cross-functional integration "strategic production planning".

In summary, this process should integrate the functions of manufacturing, marketing, finance and engineering, both at policy definition and decision area levels (see Figure 3). With the extended aim of acting as one of the mechanisms to implement manufacturing and other functional area strategies, according to the previous analysis, the process should also ensure:

- the continuous revision of functional strategies aiming to cope with the turbulent environment and at the same time the continuous assessment of the coherence between functional strategies;
- a thorough understanding, by the functional managers, of the strategic implications of their functional decisions;
- a proactive role of every functional area involved;
- the coherence between time phased decisions;

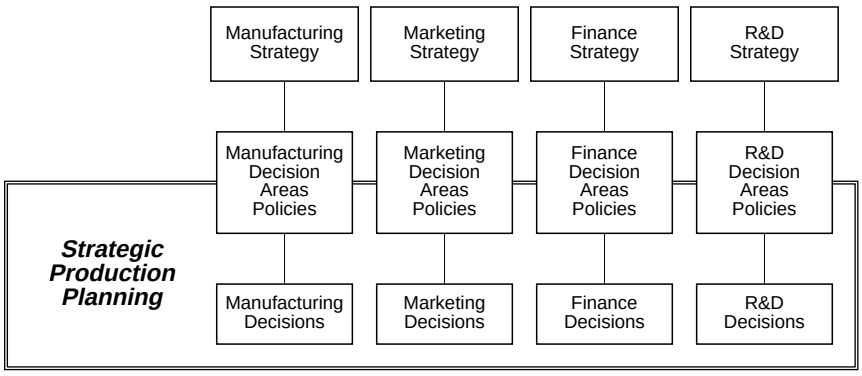

Figure 3.
Strategic production planning integrating functions within a company

- the coherence between different level decisions within the manufacturing function;
- the breakdown of important organisational barriers and, above all;
- the focus on the prioritised strategic competitive criteria, including an effective performance measurement system that favours this focus rather than disseminating conflict between functional efforts.

Towards the "strategic production planning"

According to several authors (Corrêa and Gianesi, 1993; Slack, 1991; Volmann *et al.*, 1992), when considering three of the main approaches to production planning and control – MRP II, JIT and OPT (based on the theory of constraints) – the most suitable to deal with medium to long term planning levels is MRP II, regardless of the type of production process. MRP II systems seem to be adequate to higher planning levels (as well as purchase scheduling), even in low variety high volume production, including the cases of simple routings and product structures.

The hierarchical approach of MRP II systems, when well implemented, seems to allow for proper links between short-term decisions and medium to long term decisions. This hierarchy has the potential to ensure the important "vertical" coherence of decisions that we addressed earlier. The starting point of the hierarchical planning process is the aggregate production planning, or simply, production planning (PP), which is usually MRP II highest planning level.

Some authors, e.g. Ling and Goddard (1988) and Volmann *et al.* (1992), advocate the benefits of the formal implementation of this planning level, also called game planning, and sales and operations planning, the principal characteristics of which, according to the authors, are summarised below.

Production planning (PP) is the liaison element between manufacturing and top management. It is aggregate, i.e. it deals with production, sales and inventory levels of product families, considering monthly or quarterly periods. It thus allows top management to have a broader view of manufacturing operations, establishing global goals to be sought by the more detailed planning levels. It is also the linking element between manufacturing and other functional areas of the organisation, as far as the plan, stated in terms of units to produce, is translated into the proper language of each functional area (e.g. units to the sales function, pounds to the marketing and finance functions, required resources to manufacturing and engineering functions). It therefore establishes the channel for vertical (business planning – PP – MRP II) and horizontal (between functions) communication, and constitutes a regular and systematic process in which the general manager meets the functional area managers in order to update plans, focusing on what is to be produced in the next 12 months or so. As a result, the process builds a teamwork culture among functional managers, thus allowing the mutual understanding of the capabilities, competencies and constraints of each other's area, ensuring in the

end, realistic and coherent functional plans. The planning horizon must be long enough to allow everyone to provide the required resources to the intended production, ensuring the MRP II logic of the "rolling horizon" as time goes by.

This is also the adequate planning level for top management to consider the trade-offs between possibly conflicting objectives of different functional areas. The resulting plan establishes clear objectives for each area: manufacturing must meet the production plan; finance must provide the resources considered in the budget; sales and marketing must achieve the sales plan. The objectives defined this way will therefore be coherent and integrated into the corporate objectives, providing performance measures for assessing each area.

A reason for the still weak dissemination of this process among companies is that its absence does not prevent operational decision making, it just does not ensure coherence. Volmann *et al.* (1992) argue that the lack of the systematic production planning process is the reason behind high inventory levels, poor service level, excess capacity, long lead times, "fire fighting" practice and failure to react appropriately to new opportunities. Ling and Goddard (1988) point out the opportunity to be able to manage properly, for example, changes in production volume, entries on new markets and introduction of new products, as one of its main benefits. Figure 4 schematically illustrates the point.

The production planning process, as described in the literature and summarised above, does not provide by itself all (but just some) of the desired characteristics of what we called strategic production planning. Particularly, the literature does not mention explicitly the following aspects:

- a proactive role of every functional area involved; and
- the focus on the prioritised strategic competitive criteria, including an effective performance measurement system that favours this focus rather than disseminating conflict between functional efforts.

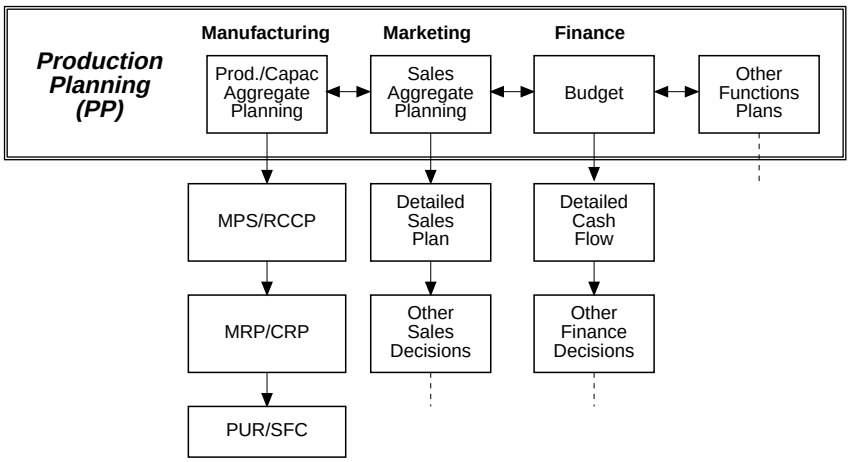

Figure 4.
The production planning (PP) or sales and operations planning (S&OP)

Field research – objectives, methodology, partial results and discussion

In order to investigate the efficacy of this process in attaining the proposed benefits and the possible main obstacles to its implementation, research work is being carried out among selected organisations in Brazil. The objective of the research is twofold.

First, it intends to identify possible difficulties and pitfalls in implementing the process of sales and operations planning, as described in the literature. Systematic empirical observation of sales and operations planning implementation is scarce in the international literature and Brazilian cases have not been reported and analysed so far. The idea is that before investigating empirical observations of the strategic production planning process, it should be verified whether the conventional sales and operations planning process can be implemented as described in the literature.

Second, it intends to identify difficulties in pursuing the additional characteristics of the process that correspond to the strategic production planning process, as proposed in this paper.

It is quite usual to hear statements like "it's impossible to plan in the long term" or "six months is long term in Brazil" from Brazilian managers. As a result, formal long-term production planning processes are not common practice and, if ever found, they are not well integrated into more detailed planning levels.

The number of software packages on offer supporting MRP II philosophy has increased in Brazil, mainly since the late 1980s. This encouraged several companies to implement MRP II, thus adopting its typical hierarchical planning approach. As a result of the way MRP II entered the organisations (via software acquisition, with great emphasis on software aspects, rather than on a new way of doing things), some of the modules (or MRP II planning functions) not supported by the software packages were not automatically incorporated into the planning culture, in most of the cases. The production planning (PP) or sales and operations planning (S&OP) are good examples. Therefore it is not well understood and its potential benefits are not well known by most managers. Not many implementation experiences have been identified and these are normally not more than one- or two-years-old, thus still beginning the learning process.

In order to accomplish the objectives of the research, a series of case studies has been carried on a sample of Brazilian companies. The sample was not random but chosen aiming to provide polar examples (Pettigrew, 1988) of companies that have undertaken formal initiatives of implementing sales and operations planning. Semi-structured questionnaires have been applied to the sample through interviews with the individuals primarily responsible for the implementation process. Companies of the sample are briefly described below.

Companies researched

Company A is the Brazilian branch of a large US producer of housekeeping consumer products and has executed the sales and operations planning process

for more than five years. This branch is considered a large operation. Company B is the Brazilian branch of a large US producer of a great variety of consumer and industrial products, ranging from overhead projectors to straps and office material. This branch is considered a medium-sized operation and was recently awarded a special prize for its sales and operations planning implementation by the head office. It has been carrying out the process for more than two years. Company C is the Brazilian chemical division of a large French chemical, textile and pharmaceutical company. This division is regarded as a medium-sized operation and has been doing sales and operations planning for more than three years. Company D is the Brazilian branch of a large US chemical company. This branch is considered to be a medium-sized operation and has been doing sales and operations planning for more than two years. Company E is a small branch in Brazil of a large US chemical company and is now implementing sales and operations planning. Company F is a large Brazilian food company and is implementing sales and operations planning.

Partial results and discussion

Most of the companies researched are using explicitly or implicitly (through material supplied from consultants) the framework of Ling and Goddard (1988) for implementing sales and operations planning and are not concerned with all the characteristics proposed for the strategic production planning process. This can be partially explained by the analysis of the expressed objectives of the process or the drivers for implementing sales and operations planning. Most of the firms were primarily seeking a higher degree of inter-functional integration in order to diminish or eliminate the problems derived from the lack of coherence between operational decisions, some of them already exemplified earlier in this paper. One company was implementing sales and operations planning as an attempt to extend the planning horizon in order to provide a better vision of the future to its suppliers, which are companies from the same organisation. Although the set of objectives of the process were in most cases extended after the educational phase of the implementation, due to a better understanding of the potential benefits, none of the companies was explicitly concerned about using the process as a tool for manufacturing strategy implementation. In fact, this is not a potential benefit that can be found in the literature, at least the literature most commonly used to educate the managers about the conceptual framework of the process. It is interesting to note that when incited to think about this potential benefit, most managers agreed that it would be useful to pursue also the goal of attaining, through the sales and operations planning process, a coherent pattern of operational decisions that might support the strategic direction of the company, or in other words, that might focus on the prioritised competitive criteria. However, many considered this a refinement of the process, as they improve the practice during the learning process.

These findings confirm the tremendous importance (normally emphasised in the literature) of conceptual education in defining the set of objectives that the

company will pursue during the design and implementation of the S&OP process, which in turn will define the possible benefits that might be attained, as expressed by Figure 5. Although this might need further empirical evidence, it seems to be appropriate to stress the concept of the strategic production planning during formal education, so as to facilitate its effective implementation. In this sense, further development of the literature on the theme will contribute substantially.

The main benefit so far achieved by sales and operations planning implementation is the higher level of co-ordination between functions in the internal supply chain: purchasing, production, sales, distribution. The level of coherence between the functional decisions was so poor in most of the companies researched that the simple fact of systematically putting people together to talk could solve critical problems. Breaking organisational barriers is the main benefit but also the main obstacle to the implementation of the strategic production planning process. Without top management effective commitment and change management techniques it is virtually impossible to get functions like manufacturing and marketing closer. Some of the companies researched seemed to be more advanced in their relations with suppliers, even on the second tier, than they are internally. Some of the case studies allow modelling the participation of the top management in the process, as illustrated by Figure 6.

In the beginning of the learning process, the role of the top management is twofold: first of all, to act as an arbitrator resolving conflicts between different functional areas, at a stage of the process when the middle management still lacks the ability to work as a team and the organisational barriers still remain. Second and most important, to disseminate the teamwork culture and properly educate the middle management to break the barriers. This has been achieved through better understanding of other functional areas' needs and constraints,

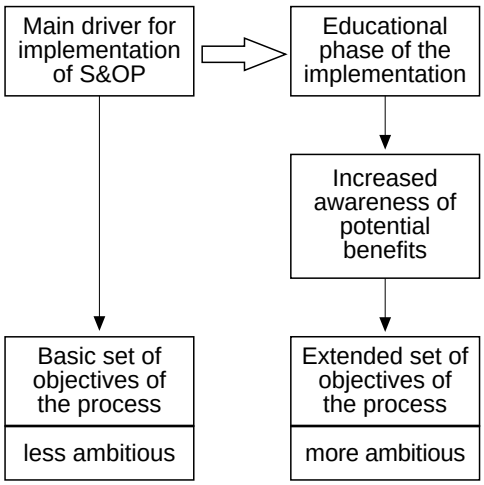

Figure 5.
The impact of the educational phase of the implementation in defining the objectives of the planning process

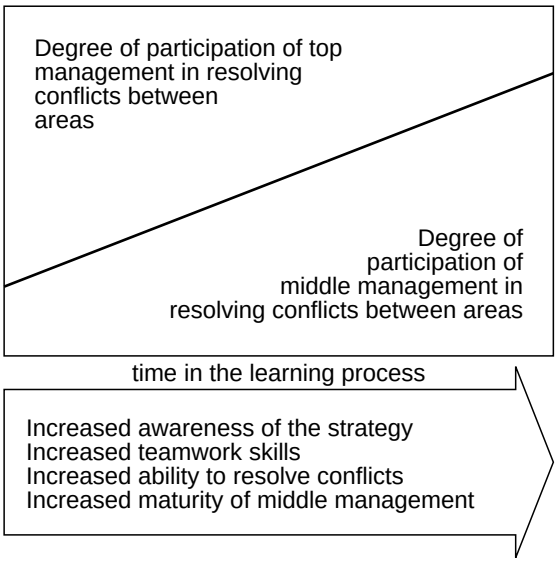

Figure 6.
The necessary degree of participation of the top management in resolving conflicts between areas decreases as the maturity of the middle management increases

as well as through properly designed performance measurement systems that focus on the group rather than individual performance. The expectation is, that as time goes by, the first role of top management will be taken by middle management, as their awareness of the strategy and the teamwork capability increases. This process could be identified in several companies researched.

Most of the researched companies are still planning with a horizon of not more than four or five months because they do not consider their forecasts reliable in the long term. As a consequence, the planning horizon is not greater than the minimum needed to react to what is forecasted. This implies a reactive rather than a proactive approach to the planning process. Besides, it is difficult to ensure coherence between time-phased decisions. Planning formally and systematically in the long term and ensuring vertical coherence with more detailed planning levels do not seem to be part of the Brazilian business culture.

All of the managers interviewed agree that they are gaining substantial benefits from the process and do not consider ceasing the implementation.

Conclusions

The elements discussed in this paper allow us to conclude that the sales and operations planning process is an adequate starting point to build a mechanism that aims to ensure coherence between operational decisions of different functional areas, which is necessary for a successful strategy implementation. As proposed by the literature, this process helps to achieve vertical coherence between decisions within the manufacturing function, as well as horizontal coherence between functions, at least considering medium to long term

decisions. Based on the research carried out so far, it was possible to find some empirical evidence of these capabilities.

There seems also to be evidence that the process can facilitate horizontal communication, thus potentially contributing to the horizontal coherence at lower decision levels. This point still needs further evidence, for so far it is based on the perception of the managers interviewed, due to the current stage of most companies in the learning process, rather than on hard data.

From the eight discussed characteristics of the strategic production planning, as defined in this paper, evidence could be found that four of them have already been attained, though partially, by the process of sales and operations planning in the companies studied:

(1) integration of the functions of manufacturing, marketing, finance and engineering, both at policy definition and decision area levels;

(2) the coherence between time-phased decisions;

(3) the coherence between different level decisions within the manufacturing function;

(4) the breakdown of important organisational barriers.

The other four, however, have not been attained nor even explicitly sought by the companies researched:

(1) the continuous revision of functional strategies aiming to cope with the turbulent environment and at the same time the continuous assessment of the coherence between functional strategies;

(2) a thorough understanding, by the functional managers, of the strategic implications of their functional decisions;

(3) a proactive role of every functional area involved;

(4) the focus on the prioritised strategic competitive criteria, including an effective performance measurement system that favours this focus rather than disseminating conflict between functional efforts.

The lack of these important characteristics can jeopardise the process ability to provide competitive power to the company; however, they seem not to be part of the set of objectives pursued by managers when designing and implementing the process.

It seems to be the case that managers are not aware of the potential benefits of the strategic production planning, as defined here. As discussed above, the reviewed literature about the production planning (or sales and operations planning) process does not mention explicitly the concern with the proactive roles of the different functional areas, or the necessary focus on the competitive priorities. Maybe this is the most important desired contribution of this piece of work: to suggest that practitioners and academics direct more efforts towards developing design and implementation models of sales and operations planning that can facilitate manufacturing strategy implementation.

Note

1. A functional strategy can be characterised as a consistent pattern of a large number of individual decisions, which affect a certain funtional area performance. Given the complexity and amount of decisions of most areas within a company, it is convenient to divide these decisions into "strategic decision areas", which characterise "families" of similar problems, about which managers have concern.

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