THE USE OF THE SCORECARD IN THE MANAGEMENT OF PRODUCTION OPERATIONS.

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ABSTRACT

In order for production strategy to develop its role in the creative activity of value it is necessary to have the information that will facilitate decision making and to guide its performance.

The aim of this study is to present the basic ideas of how a Scorecard, adapted for use in production-operations should be. More specifically it will present the key factors and indicators which it should contain, these being different depending on the production strategy used and on whether the information is directed at upper management levels or at levels with fewer responsibilities.

Key words: scorecard, the production function, strategies

1.- INTRODUCTION

The transformation of the competitive environment in which the companies of the new millennium are going to carry out their activities is being determined by the globalisation of the economy and the progress made by new technologies.

Due to these circumstances, a series of shortcomings have come to light, with respect to the current systems of control and information, which, both from operative and strategic positions, lead to speculations as to the consequences that might derive from new business management concepts.

The Scorecard in particular should be considered as a necessary tool in information systems for Management, and a vital one for decision making processes.

Consequently, in an area such as Production Operations, considered to be a key activity in the creation and execution of business strategy, the scorecard can perform a fundamental role in the structuring and diffusion of necessary information. However its general structure and recommendations have to be adapted to the necessities of a particular function and this is the aim of this study. An attempt has been made to transfer the theories and recommendations which usually appear in production manuals to the information requirements of the scorecard. The structure of the present article is as follows: The first two sections are summaries: firstly, the underlying notions of the scorecard and secondly of production strategy. The fourth section consists of the proposal for the scorecard to be used in Production-Operations, according to the strategy used by each company. The conclusions drawn from the study are presented in the final section.
2.- THE SCORECARD

The concept of the scorecard derives from the French term "Tableau de bord", which would literally resemble a control board or panel of instruments. Its origin dates from the middle of the last century, although around 1948, the idea of the business scorecard first appeared in the United States. During the 1980’s this concept became much more doctrinal than practical, even though the environment was generally stable and decisions were made in a situation of very little risk. Today, the concept of the scorecard should consist of five fundamental aims:

• It should be a tool of assistance during the decision making process.
• It should be created, applied and interpreted in a simple and efficient way.
• It should contain both financial and non-financial indicators.
• It should be flexible to changes and progresses in the environment.
• It should generate motivation at all levels of responsibility.

It is important to point out the relationship which should exist between the scorecard and other management control tools, which constitute the bases of a great deal of useful information. The strategic plan and budgets, cost accounting and finance, incentive systems and performance evaluations etc., all favour the creation of a new management control concept, which is a fundamental element in the decision making process and which, consequently, facilitates the task of formalising the Scorecard.

The Scorecard should be based on a response that is consistent with way in which information from the surrounding environment is dealt with as well as that over which the organisation has no control. On the whole, the information should come from the different management control areas which should provide only the most relevant information. In this study we focus our attention on Production-Operations Management as a strategic area in the integrated management of organisations.

As López Viñegla (1998) points out, the scorecard should be oriented towards the reduction and summarising of concepts, it should be a tool which, together with new information technology, offers simple, synoptic, efficient information for decision making processes.

In addition, with the exception of the different classifications which are open to consideration, there needs to be a distinction between strategic and operative Scorecards. The former is mostly oriented to towards management levels with greater responsibility, marked by the strategy carried out in the company, and, most importantly, totally involved in the company’s global management. The operative Scorecard, on the other hand, using clear, user-friendly language needs to provide behaviour guidelines which the organisation must follow in order to carry out its operative plans. The information provided must be totally related to the company’s short term continuation variables.

Moreover, with regards to presentation and design, mention must be made to the increasing importance of new technologies, particularly electronic data transmission, as underlined in López Viñegla (1998), in which the use of these technologies applied to the Scorecard is suggested.

3.- PRODUCTION-OPERATIONS MANAGEMENT

According to Fernández Sánchez (1993) the area of Production-Operations should be considered as a valuable creative activity which should actively participate in the process of preparing the company’s strategy and putting it into practice.
The same author states that the relationship between company strategy and production strategy can take two directions. Traditionally, production strategy has been considered as a set of policies which, as well as backing up business strategy, helps to ensure that it is carried out. But it is also true that the role of production strategy is not necessarily limited to aiding the implementation of business strategy, but rather that it can be widened to include the attainment of competitive advantages, which would convert it into the source of inspiration for the business strategy itself.

As regards business strategy, Porter (1991) proposes three different types: leadership in costs, differentiation and concentration. Fernández Sánchez (1993) when considering possible production strategies, focuses on processes, products and Just In Time (JIT). Regardless of whether it is the business strategy that conditions the production strategy or if the opposite relationship occurs, the logical, coherent connection between the different types of business and production strategies would be the following:

- In cost leadership a focus on processes would be applied, given that its production objective is to achieve the greatest efficiency possible, that is to say, the minimisation of costs.
- In the case of a differentiation based on the offer of a product adapted to consumer needs, Just in Time would be applied. JIT can be characterised as satisfying the demands of the mass market by making a wide variety of products in small amounts, which makes it possible to serve clients who demand personalised products.
- In the case of a concentration strategy where the intention is for customers to perceive a certain exclusiveness, product focusing would be adapted. This is characterised by targeting a small number of customers based on one of the following three competitive criteria: the introduction of new products into the market, attention to market niches in the case of products in decline or when special products are to be commercialised. Efficiency is relegated to second place in product focusing, always behind quality, delivery time or flexibility.

4.- SCORECARD FOR THE AREA OF PRODUCTION-OPERATIONS

Given that the Scorecard is a control tool which, as well as other information, should supply the values set as objectives for the management of the company, it would be only natural to think that according to the business and production strategies used, the most important questions to be considered when establishing objectives and carrying out the final control of these will differ. It has thus been considered important that the Scorecard elements for the production function are different depending on the strategy that is to be implemented. Various factors have been considered in this particular case.

Firstly, the four objectives for the area of production-operations proposed by Schroeder (1992) have been considered as possible key factors which are: cost, quality, delivery time and flexibility.

Secondly, in the area of production-operations the policies considered to be the most suitable for carrying out the proposed objectives will be put into practise. However, to carry out the control function it is necessary to specify them in greater detail. This is the purpose of the indicators, considered not only as magnitudes related to objectives to be achieved, but also as a numerical expression of what is hoped will be achieved during the planning process. Thus, Schroeder’s (1992) recommendations are followed in as much as that the objectives should be expressed in quantitative terms which are both specific and can be measured.

Finally, considering that the scorecard is a useful tool at different Management levels leads to the proposal of its use at a strategic and tactical level. The concept underlying this
The implicit idea in the proposal of tactical indicators that is made in this study is that decisions taken by top management act as restrictions on middle management activities. Nevertheless it must be remembered that communication from low hierarchical positions to higher levels has to take place, especially through suggestions for improvement received by middle management and then passed on to top management. This participatory approach is very common in new management models and, throughout the work, we will be able to see all those situations in which, for the sake of greater clarity, reality has been simplified to the point of proposing situations which clearly contradict the recommendations on participation made by production strategy.

Table 1 shows the key factors and indicators, both strategic and tactical, which are proposed for the production-operation Scorecard. It should be mentioned that in the case of these indicators, only a certain number of examples have been given and this should not be taken to be an exhaustive list as each company should determine the most appropriate ones in keeping with its activities and characteristics.

The objective is to achieve cost reductions by process focusing. With regards to the level that should be set for the corresponding indicator, it is worth remembering Levitt’s (1977) comments as, according to his point of view: Ford was misunderstood, in that for him the reduction of costs was not an objective in itself. His intention was to achieve a cost that would allow him to sell his vehicles at a price which the customers were prepared to pay for them. This idea suggests that the indicator for top management has to be the mean total cost which produces profitability for the company when selling at the price that the customer is willing to pay. Nevertheless, this indicator, which, from the theoretical point of view makes complete economic sense, proves to be too abstract and general in practice. It would thus be necessary to discover which aspects influence the mean total cost, with the aim of establishing indicators that help attain the cost level proposed by top management. Fernández Sánchez (1993) points out that the best competitive weapon in these cases is large scale production, which requires a high capacity installation. A company which wishes to attain a reduced cost level presumably has installed the capacity, which from a strictly technical point of view, it has been recommended in order to achieve its purpose. But capacity by itself does not reduce costs, but rather this reduction occurs when this capacity is used to the full. In other words, it is assumed that a company that wishes to be a cost leader has the capacity which permits it to reduce costs to the desired level and what it
should then do its to check to what extent it is making use of this capacity. In this sense a very useful indicator for top management would be the value to be placed on the relation between the volume really produced in a period and the installed capacity$. From this point of view it is easier to find indicators which are sufficiently precise and adapted to middle management so that they can understand perfectly what is expected of them for each of the tasks they are assigned. Capacity is fully used when machinery is permanently operating. For this reason the tactical indicator proposed in Table 1 is the number of parts manufactured per hour in each section of the production function. In this indicator both the manufacturing time (a relevant datum if it is possible to work at different paces) and the amount of break times are shown.
Table 1.- Scorecard for the function of production-operations.

<table>
<thead>
<tr>
<th>PRODUCTION STRATEGY</th>
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<tbody>
<tr>
<td>COST LEADERSHIP</td>
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<tr>
<td>FOCUSING BY PROCESSES</td>
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<tr>
<td>FOCUSING BY PRODUCTS</td>
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<tr>
<td>MORE COHERENT BUSINESS STRATEGY</td>
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### KEY POINTS

**COST LEADERSHIP**
- Cost.
- a) Flexibility
  - b) Cost (elimination of waste).
- a) Quality.
  - b) Delivery time.

**JUST IN TIME**
- a) Quality.
  - b) Delivery time.

**FOCUSSING BY PRODUCTS**
- a) Quality.
  - b) Delivery time.

**CONCENTRATION (EXCLUSIVENESS)**
- NICHES
- SPECIAL PRODUCTS
- NEW PRODUCTS
- a) External quality: product features.
  - b) Product delivery time.
- Introduction time of new products.

### STRATEGIC INDICATORS

- Total mean cost Volume / Capacity.
- a) Variety of products: manufacturing sequence.
  - b) Zero stocks.
  - Zero breakdowns
  - Zero defects.
  - Zero delivery times
  - Zero bureaucracy
- a) Internal quality: guarantee costs.
  - b) Task preparation time.
- Proportion of staff, with professional training certificate or equivalent, with regards to total workforce.
- Machine tolerances.

### TACTICAL INDICATORS

- Number of parts manufactured per hour.
  - b) Stock levels: number of cards in circulation.
    - Number of production line stoppages
- a) Internal quality: guarantee costs.
  - b) Task preparation time.
- Proportion of staff, with professional training certificate or equivalent, with regards to total workforce.
- Machine tolerances.
Given that JIT is the production strategy which would correspond to a strategy of differentiation via the offer of products which are highly adapted to the consumer needs, the objective to achieve must be flexibility. Fernández Sánchez (1993) proposes two alternative ways of understanding flexibility: the ability to offer new products or the time taken to change production volume. Naturally, the type of flexibility which JIT intends to achieve is the former, but with the following nuance: it looks to offer a variety of products simultaneously and makes no reference to the introduction of new products which, in the long run will replace the current ones. With regards to this acceptation, a useful indicator for top management would be the number of different products offered to the market at the same time. Having said this, product focusing can also offer several different products by simply manufacturing large quantities of each one of them alternately. For this reason the proposed strategic indicator is not the final figure that indicates the variety produced but rather the manufacturing sequence, given that JIT strives for variety whilst producing small amounts. One of the mechanisms offered to increase flexibility, as understood by this production strategy, is the reduction of machine preparation time (Fernández Sánchez 1993 and Domínguez Machuca et al.,1995 b). Machine preparation is a task which would be given over to middle management so that the time taken to carry out this task could be taken as an indicator of tactical flexibility.

Furthermore, JIT is especially concerned about the elimination of waste in every area, which naturally implies a cost reduction. The indicators which, in this regard can be useful to top management are those put forward in the five zeros theory (zero stocks, zero breakdowns, zero delivery times, zero bureaucracy, zero defects) which, furthermore provides the numerical value which the indicators should take. Naturally, these are highly ambitious objectives which are gradually being brought into effect and which, in reality, aid in the evaluation of the policies undertaken, assessing whether or not they have led to an alignment with the proposed values. The implementation of the JIT system requires a productive process with certain characteristics which, according to Fernández Sánchez (1993) can be summed up according to the three following characteristics: the usage of general machinery, the hiring of multi-skilled workers and the distribution of the plant in a “U” shape. Middle management would therefore find itself with a production process already established by top management, together with the tactical indicators which result in an approximation to the goals proposed in the five zeros theory. Therefore, in the case of stocks, the indicator must reflect the stock level which will be tolerated, which in a JIT production strategy, can be indirectly measured by the number of kanban cards in circulation (Companys and Fonollosa, 1989). As regards the prevention of breakdowns, the JIT system proposes that all workers should be involved in the maintenance of the machines they work on, both from the preventative point of view and in the detection and correction of failures. As a result these jobs will have fulfilled their objective if they succeed in reducing (or eliminating) unexpected breakdowns which would result in the stoppage of the manufacturing line. As for defective products, the JIT system considers it necessary to inspect 100% of the units produced, for which task the quality control tools known as Jidoka have been developed. These tools consist of installing sensors to detect defects, which if they occur, stop production themselves, i.e. without human involvement. Consequently the JIT system defends the stopping of the production line when abnormal situations arise. This explains why the number of stoppages in the line occurring during a given period has been proposed as a tactical indicator. As far as the objectives of zero delivery times and zero bureaucracy are concerned, these do not imply the putting into practice of any measures, whose responsibility can be attributed, in principle, to middle management.

In the case of having opted for product focusing with the idea of catering for market niches or of offering special products, one of the objectives to pursue could be quality. According to Fernández Sánchez (1993) quality can be understood from an internal
perspective (complying with the technical specifications of the product) or external (customer satisfaction). It seems obvious that the questions of external quality are more suited to top management and that those of internal quality pertain more to lower management levels. For this reason the features of a product have been proposed as a strategic indicator whilst the number of defective products and the costs of meeting guarantees used by customers are suggested as tactical indicators.

Delivery time can also be used as an objective to distinguish one product from that of competitors and/or whether this is the variable which is most valued by a certain group of consumers. It is clear that the proposed indicator in this case is the delivery time, however, to understand more clearly what this indicator may reflect, on a strategic and tactical level, the distinction, referring to competence in time, made by Domínguez Machuca et al. (1995 a) is considered, namely the distinction between quick deliveries (the aim being maximum speed of delivery) and on-time deliveries (compliance with the date agreed to with the customer). When determining the value of the strategic indicator “product delivery time” one has to take into account the idea of quick delivery in order to offer times which are more attractive than those of competitors. Having said that, this must be accompanied by an analysis of the productive process so that the proposed time will be coherent with the characteristics of the production area. Once the delivery time has been established it is put to middle management as a tactical indicator informing them that this is the time they have been assigned to carry out their set tasks. This indicator will have been established in the production process analysis already mentioned and will permit the fulfilment of product delivery times. Thus establishing the tactical indicator in this way is more related to the idea of delivery on time.

The introduction of new products in a market is accompanied by a series of uncertainties such as how well they will be received or the final form they will have to take to satisfy consumer needs. This makes it advisable to apply, in the first stages of a product’s cycle, the concept of product focusing, the main objective of which should be flexibility, understood in either of the two forms identified by Fernández Sánchez (1993). For top management the indicator normally used in these cases has been proposed, i.e. the time it takes to introduce a new product into the market. For middle management, flexibility is reflected by the capacity of the resources it controls to produce the new products proposed by top management. It is often recognised that a skilled worker after being trained to perform a greater number of tasks is perfectly capable of carrying out those tasks required for the manufacture of a new product. For this reason the proportion of workers qualified to Professional Training level or with a similar qualification compared to the overall workforce in the section analysed is put forward as a measure of the level of qualification. Given that the characteristics of material resources are also important with a view to obtaining flexibility, machine tolerances (understood as the diversity of parts on which they can work or the diversity of tasks that they can perform) have been considered as a tactical indicator of the flexibility of material resources.

5.- CONCLUSIONS

The creation of value in a company is a strategic element of the first order, for that reason the role that the Scorecard plays in the different functions of the company becomes especially relevant in the production area. Thus, in industrial companies, within this critical area of business, there are key factors which can be underlined, such as: cost, quality, delivery times and flexibility, the choice of which may depend, as has been seen, on the type of production strategy that is selected.
6.- BIBLIOGRAPHY


1 With the Scorecard Concept we refer to a tool which makes it possible to carry out a balanced control of those indicators which require special supervision. At no time to we refer to the BSC (Balanced Scorecard) concept defended by Kaplan and Norton.

2 We recommend access to: http://cuadrodemando.unizar.es (guided model).

3 Any indicator which can show the productivity of the whole production function can be used.

4 It should be pointed out that the described focus is a simplification of JIT: whilst here it is believed that the decisions made by top management restrict middle management, if there is something that characterises JIT it is precisely its participatory dimension (Quality circles, proposal plans, etc) so that in reality top management bears in mind and evaluates all employee suggestions which lead to the attainment of the five zeros which, in addition are known by all the staff.

5 This separation is not so strict in the real plan because top level management, with the intention of offering the products that clients want, has to also establish the technical requirements, i.e. it must fix the parameters that will govern the activity of the sections that form the production function.

6 It is only natural for middle management, if it sees that there is a possibility of an improvement which reduces the time it has to devote to carrying out a task, to notify top management of this and for top management, after analysing the possible repercussions that this measure may have on the rest of the area or indeed on the company, to implement it in order to achieve its aim of reducing product delivery times.