Artigo 11

The development of manufacturing strategy in a turbulent environment

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The development of manufacturing strategy in a turbulent environment

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Introduction

The number of "case studies" reported in the manufacturing strategy process literature does not match the increased importance of the theme. Moreover, the authors in the field generally prescribe what to do but do not always delve into details on how to do it. There are, however, some authors whose work can help in the difficult task of developing a manufacturing strategy in real situations. Two examples are the worksheets developed by Platts and Gregory[1], which are interesting tools for helping define the priorities for manufacturing, and the importance-performance matrix proposed by Slack[2], which is both simple to use and effective in giving managers a clear idea of what performance aspect needs urgent action in manufacturing. However, some important aspects of the manufacturing strategy development process still lack proper operationalization methods. The proactivity of the manufacturing function is an example. Proactivity, particularly in turbulent environments, is not something that can simply give companies an edge. It is sometimes the only way to survive. In fact, manufacturing proactivity is prescribed by a number of authors (Hayes and Wheelwright[3] is the most eloquent example) but few of them actually prescribe how the function should be organized and managed to achieve it.

Breaking functional barriers is a second example. In turbulent environments, where change is not an exception but the rule, inter-functional communication becomes essential in order to allow for rapid responses to frequent and sudden changes. The authors in the literature generally agree that for an effective manufacturing strategy to be put into practice it is necessary that functional barriers are broken down. Much of the re-engineering discussion gravitates around this aspect. However, few authors in the field of manufacturing strategy deal specifically with methods to operationalize ways to break down or at least reduce the negative effects of the inter-functional barriers.

The case and propositions described here aim to contribute to manufacturing strategy process research by reporting one experience of a manufacturing strategy development in a turbulent business environment, specifically addressing aspects such as manufacturing proactivity and inter-functional

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integration, drawing some conclusions that may help other companies which operate under similar conditions.

Literature review

A number of authors in the literature [1,2,4,5] agree that one important aim of manufacturing strategy is to support the organization's business strategy in its pursuit of competitive advantage.

According to most of the authors, the manufacturing strategy development should follow a top-down approach. Skinner[6], Fine and Hax[5], Platts and Gregory[1], Slack[2] and, to a certain extent, Hill[4] suggest hierarchical models in which the corporate strategy drives the business strategy. This in turn drives the strategies of manufacturing and other functional areas within the business unit. In fact, the manufacturing strategy formulation process has not received as much attention as the manufacturing strategy contents – objectives and decision areas – in the literature[7]. Among the pioneers in the field, Hill[4] seems to have been one of the few who actually delved into a more detailed discussion on it, proposing a specific framework to guide the development process on a step-by-step basis. Rather, the authors in the field tend to focus their work primarily on the manufacturing strategy objectives and decision areas. This approach, according to Leong *et al.*[7], seems to consider some sort of implicit process, which depends on breaking manufacturing down into a number of decision areas and making the goals of manufacturing explicit in terms of a number of performance criteria. The steps of identifying these criteria, prioritizing them and relating the decision areas to them would form the implicit process. Hayes and Wheelwright[3], for instance, although describing four stages along a "continuum" which represents the evolution of manufacturing's strategic role, where the key aspect of evolution is the increasing, more proactive involvement of manufacturing in the firm's strategic needs, do not describe how a company should go about reaching the more advanced stages.

A number of authors (e.g. [1,8]) who have specifically addressed the manufacturing strategy formulation process seem to prefer an approach which can be called the "audit approach". They have not given up the "break down approach" but they have merged it with the idea of auditing. The audit procedure aims at guiding the user through a logical process of identifying objectives, measuring current performance, determining the effect of current practices and identifying where changes are required. It helps the user prioritize actions but does not change the basic top-down approach.

The models found in the current literature: the inadequacy for the Brazilian and other similarly turbulent environments

Change is a central concept in managing organizations in Brazil

Recent research work developed by Professor A. Fleury, from the University of São Paulo, Brazil, identified a tendency among a number of multinational companies of sending executives over to their Brazilian branches in order to be

trained in managing under very unfavourable conditions. Brazil has been considered a training "lab" for uncertainty and unfavourable conditions. In fact, in recent years, the turbulent industrial/economic environment makes long-term planning a difficult task for most companies operating in Brazil. The high and unstable levels of inflation (which, being 40 per cent per month in February 1994, dropped to around 2 per cent per month after October 1994; however, the country is still aprehensive with regard to the robustness of the measures which made it drop so drastically), the constantly changing government industrial policies (take the example of the import tax for cars: 250 per cent in January 1993, 20 per cent in January 1994, 32 per cent in January 1994, 70 per cent in April 1995, all changed by the government at short notice), high interest rates and the political turmoil in which Brazil has found itself in recent years have forced companies to adopt predominantly "fire-fighting" reactive approaches to management ("six months is long term planning in Brazil", in the words of a Brazilian manager). Such approaches normally consume substantial amounts of managerial effort and resources which therefore are not used for strategic planning.

Responding effectively to change, therefore, seems to be a dominant part of the manager's activities in Brazil. Any framework which aims to be effective in supporting the development of manufacturing strategy in Brazil has to consider change and responding well to change as central concepts. By analysing this reality and at the same time bearing in mind the models found in the literature, some aspects started to emerge as necessary for the development of a framework to help the development of manufacturing strategy in Brazil:

- *The size of the changes*: the external changes affecting the organization are so frequent and relevant that external change should be the main trigger for the replanning process rather than only time, as the literature generally suggests. A company cannot afford to wait for, say, six months to alter its strategic direction, once a relevant change (such as a drastic change in import taxes of the products it makes – favouring competitors or in the goods it buys – favouring the company itself) has happened.
- *The variety and frequency of the changes*: changes may frequently affect so many functional areas that it is impossible for just one or a few of them to keep such changes monitored and under control. Each and every function should adopt a proactive attitude, trying to anticipate changes and think contingently about possible future changes with regard to its main field of interest. In the literature, although most of the authors advocate the need for proactive manufacturing, most of the frameworks suggested are, in fact, almost totally top-down. No formal means for the manufacturing function to exercise its contribution proactively seems to be provided. They seem to rely solely on people's attitudes in order to make the manufacturing "proactivity" happen. It seems to be risky though to assume that managers will assume a proactive attitude in the short term, mainly in environments as turbulent as the Brazilian

marketplace, in which the manufacturing managers have historically had a reactive role.

- *Importance of breaking organizational barriers*: breaking organizational barriers is absolutely essential for the company to adapt and respond effectively and as a coherent whole to such environmental changes. Although the authors broadly agree that breaking the inter-functional barriers within the organization is necessary, when one analyses some frameworks found in the literature, such as Hill's[4], for instance, one has the impression that there are only two functions within the organization: marketing and manufacturing. The strict adoption of such a framework may represent the risk of repeating one of the basic mistakes which triggered the whole manufacturing strategy "movement" – the confinement of the strategic planning process within the limits of one or a few functional areas within the organization. The strategy formulation process should thus consider explicitly all the relevant functions within the organization.

With these aspects in mind, the authors introduced an exercise of finding ways to operationalize them in terms of a consistent framework which could be more appropriate for the Brazilian environment. They decided to adopt "action research" to develop the model and therefore a company was chosen to house the exercise.

The company in study

The work reported here was developed in Brasilata, a tin-plated can manufacturer based in São Paulo, Brazil. Brasilata has approximately 1,000 employees and four plants. In 1994 Brasilata's turnover was around U$60 million, ranking fourth in the Brazilian tin-plated cans industry. The work presented here was developed in the biggest Brasilata plant in São Paulo, responsible for more than 60 per cent of the company's total sales. This plant has 700 workers and produces ten different types of cans. Most of Brasilata's customers are large chemical companies. The cans are normally made-to-order. The company has a "total quality" programme running and intends to achieve the ISO 9002 certification by the end of 1995.

The process

The idea of developing a manufacturing strategy for Brasilata was initially proposed in 1993. While performing his operational activities as a production engineer working for the company, one of the authors noticed serious difficulties which Brasilata managers faced in their decision-making process due to the lack of well-defined strategic directions. After giving a presentation to the middle management (the level of his immediate functional superiors) in which he justified his proposal and presented some basic manufacturing strategic concepts found in the literature[2-4,6], some of the middle managers started to get involved with the idea. Soon manufacturing strategy concepts

became a current issue at that managerial level. The effective development and implementation of the process itself, however, still needed top management approval to be put into practice.

Despite the proponent's efforts, initially top management was not convinced of the tangible benefits of the project. Tired as it was of so many and so frequent government-driven radical changes in Brazil, it is not surprising that top management preferred to adopt a more conservative stance. It also had regarded the proposal as just one more expensive manufacturing fad ("…two years ago, total quality, one year ago, ISO, this year manufacturing strategy; what next?…"). Besides, the company had been having reasonably good results in the past three years – in top management's view, it was not time to change anything. Some middle-managers did not completely agree with the top management position, as they had also been subject to the problems of not having clear strategic directions on which to base their operational decisions. The middle managers then proposed the development of a manufacturing strategy "pilot project" in one area of the company, which would demand little top management commitment.

The pilot project would be triggered by the middle managers themselves, who would be responsible for the formulation of the manufacturing strategy and for its operationalization in the pilot area. Based on the (possibly more tangible) results of the pilot, top management would then decide whether the project should be extended to the whole company. This proposal was accepted by the top management, and the process started. This way, instead of the traditional top-down approach, the process start up followed what can be called a "middle-down-top-down" approach: triggered at the middle management level, going down for operationalization in a pilot area, then going up so that top management, based on the results of the pilot project, was more comfortably able to evaluate and decide whether the project should be extended to the whole company. Figure 1 shows the implementation model proposed.

As the process is triggered by the middle managers, they are deeply involved with the project right from the beginning, making the implementation process easier and faster.

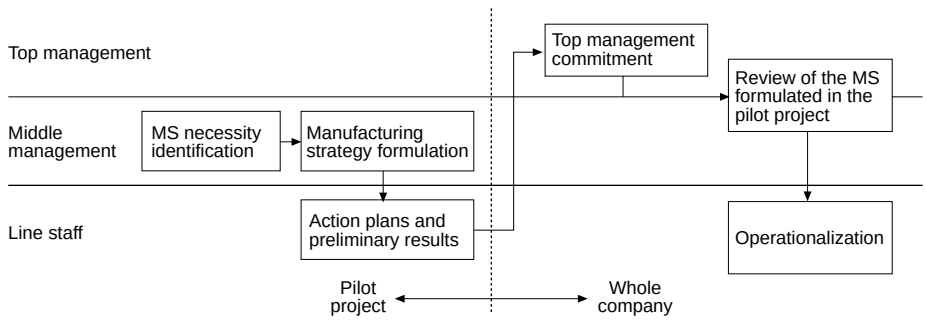

Figure 1.
The proposed implementation model

First steps in the process

As the process would not be conducted by the top managers themselves, it appeared that it would be necessary to form a group of people interested in the development of the process who should then drive it. This group was formed by the engineer who had initially proposed the idea (he would be the facilitator of the process), and five middle managers (manufacturing, finance, sales, purchasing and human resources). This group will be referred here as the MSG (manufacturing strategy group).

As manufacturing strategy was a new theme in the company, the process started with the application of a questionnaire to the main managers involved with the pilot. The aim was to evaluate their perceptions regarding the role of manufacturing in corporate planning and also their views on the relationships between strategic and operational issues in manufacturing. Hum and Leow[9], studying the level of awareness of operations managers with regard to operations strategy issues, successfully performed a survey with 200 companies belonging to the electronics industry in Singapore. Based on Hum and Leow's[9] research instrument, the questionnaire was composed of 18 statements to be analysed by the respondents and marked by them using a 5-point Likert-scale ranging from "totally agree" to "totally disagree". The objective of the questionnaire was two-fold: to start having a better understanding of the degree of agreement among the managers regarding manufacturing strategy issues such as the manufacturing importance, role and influence in the company's competitiveness; to bring up the issue of manufacturing strategy to people's personal agendas.

From the analysis of the questionnaire's answers, it was clear that, although the strategic importance of manufacturing was generally recognized, the manufacturing role was seen as predominantly "reactive". The managers predominantly (78 per cent of the respondents) considered that manufacturing does its job well when it is able to respond well to any sales department's requirements. The "tradeoffs" between different competitive criteria such as quality, cost, flexibility, speed and dependability[2] were also not recognized explicitly by the managers. The "total quality" mentality dominated: "we must be able to be excellent in everything", for example, was a statement endorsed by around 90 per cent of the respondents.

After this first gathering of perceptual data, a series of seminars was prepared and run in order to discuss the "whys" behind the discrepancies of the different managers' views reflected in the questionnaires. A second objective of the seminars was to try to form a consensus with regard to manufacturing strategy concepts. After the seminars, it was then time to seek an agreement of the involved managers with regard to manufacturing competitive priorities or, in other words, the manufacturing performance criteria which could contribute the most to the company's competitive power.

Determining the manufacturing priorities: gathering data

In order to determine the most relevant manufacturing competitive criteria, the following activities were performed.

First, direct interviews with customers. The sales manager selected five customers which were considered to be representative of the 80 customers of the company. These five customers were interviewed by a team of members of Brasilata's manufacturing and sales departments, aiming to identify the importance, given by each customer, of the various competitive criteria (cost, quality, speed, dependability and flexibility) and the customer's views about Brasilata's performance on the same criteria when compared to their main competitors.

Second, assessment of Brasilata's managers' views. Worksheets originally developed by Platts and Gregory[1] were used to help determine the most important manufacturing competitive criteria, according to Brasilata's managers. The objective was to evaluate the mangers' perceptions regarding the importance of each criterion and also their perception on the company's performance in these criteria when compared to competitors. Three worksheets were used: the first, aiming to determine the criteria importance, asked the managers to distribute 100 points among the criteria which they considered to be the order-winners, according and proportionally to the importance of each of these criteria. The criteria considered to be qualifying were marked with a "Q". The second worksheet aimed at judging the performance of the company when compared to competitors: the managers were asked to classify each criterion in a scale ranging from –3 (performance much worse than competitors) to +3 (performance much better than competitors). The last worksheet asked the managers to identify external opportunities and threats, in order to gather data about future options for the company. When filling in the worksheets, the managers could divide the answers if they felt the products competed in different market segments.

A summary of the results of the worksheets and the most relevant information from the interviews with the customers was distributed to the members of the MSG. A meeting was then held to discuss the results and to establish a set of agreed priorities for the company. The tool used in this phase was the matrix proposed by Slack[2]. The matrix judges criteria's priorities by putting different criteria's importance and performance scales together in a matrix. In broad terms, the importance scale classifies criteria as less important, qualifying and order winner; the performance is judged against competitors in a scale that goes from much worse than competitors to much better than competitors. By its very nature, the matrix defines zones which show whether each criterion should demand priority improvement action or not.

The meeting started with the definition of which criteria were relevant to the company. It was decided that five criteria – cost, quality, speed, dependability and flexibility – were relevant. During the meeting, the criteria were discussed one by one until the participants reached an agreement. Not only was the

current situation considered, but also the tendencies for the future. Importance and performance were discussed separately; for each of the two dimensions, a 9-point scale chart[2, Ch. 10] was used, which was filled in after agreement was reached about each criterion. After a somewhat painful process of reaching agreement about all the pre-defined criteria, the importance-performance matrix was constructed. Each criterion was plotted in the most suitable area, according to the information obtained from the importance and performance charts. The final matrix for one of the product families is shown in Figure 2. The arrows represent future trends.

The next step was to define the priority actions and goals, and to determine how the process should be implemented at the operational level. However, the MSG members felt that they were not yet prepared to define goals and set priority actions. “Dependability, for instance, which is our number one priority, is still not objectively measured by the company. How can we know where to get to, if we do not even know where we are?”, said the manufacturing manager

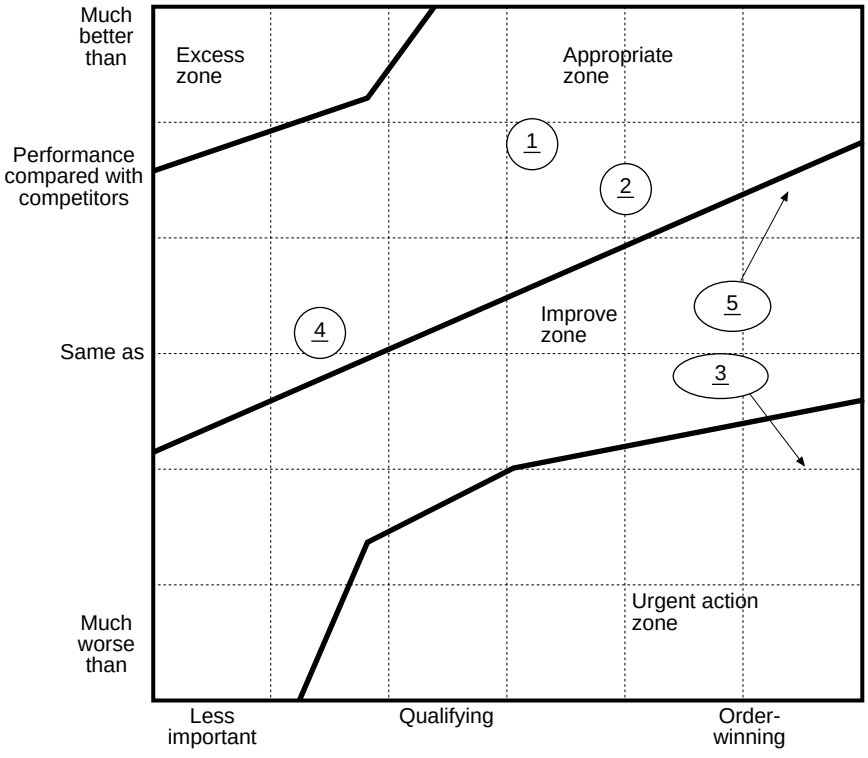

Figure 2. The importance – performance matrix (based on [2])

during one of the meetings. The MSG then decided that, before going on with the process at the operational level, it was necessary to study the most important competitive criteria in more depth in order to evaluate the company's current performance and its drivers. During one month, studies on the company's determinants of dependability and cost (priorities one and two, according to the importance-performance matrix – see Figure 2) were conducted. Both studies brought up some very important issues. The study on dependability showed that the company delivered more than 30 per cent of its orders late. This had not been anticipated by the managers' perceptions. The study on costs evidenced opportunities to work with more cost effective imported materials. This had not been considered until then.

The process at the operational level: breaking the barriers through the internal customer-supplier approach

The study described in the previous session made it possible to define objective goals for the most important competitive criteria. The process could then go on at the operational level. Owing to the characteristics of the environment (see introduction), the MSG decided to adopt an internal customer-supplier approach: the process would be strongly based on negotiations between departments within the company. The basic assumption is that everybody in the organization has customers (either internal functions or external customers) and should serve them in the best possible way, given the constraints imposed by the availability of resources and also bearing in mind the corporate objectives, policies and strategies[10]. Customer and supplier functions should negotiate and agree on the level of service or goods which the supplier is to provide. They have to agree on a specific set of performance criteria which represents the "point of contact" between the two functions. The negotiation can be based on gap analysis between the required (by the customer function) set of performance criteria and the set which is offered by the supplier function.

The initial step was to make the internal customer-supplier network explicit. It was decided that the company organizational structure should be maintained (given that, by top management decision, a complete re-engineering of the company was not to be considered). Two or three people from each department were selected to become members of the MSG at the operational level. They were introduced to the main concepts of manufacturing strategy through a series of seminars and discussions with the senior members of the MSG. After the concepts were clear and homogeneous among the participants, the internal customers and suppliers started their negotiation processes, aiming to determine the priorities and the improvement action plans for their departments. The process went on through a number of steps.

- *Establishing local criteria*: the representatives of each pair, customer-supplier, were put together to establish which local criteria would be relevant for their negotiation. They initially could propose any criterion they thought to be important for their departments.

- *Linking local with global criteria*: aiming to avoid the "local fixes" in each negotiation customer-supplier, the MSG built matrixes to relate each local criteria with the global competitive criteria. Figure 3 shows an example of the matrix developed for the negotiation between sales and the production planning departments. The importance of each local criterion for each negotiation was obtained from this matrix; the criteria which are strongly related to the company's global priority competitive criteria were considered to be the most important in the internal negotiation.
- *Evaluating internal suppliers and self-assessment*: in order to help the negotiation between departments, two kinds of worksheets were developed. For each criterion of the negotiation, two worksheets were filled in: one by the customer, evaluating the supplier, and the other by the supplier, for self-assessment. (These worksheets were filled in in a meeting with two or three members of the MSG group with representatives of the department involved.) Figure 4 shows an example of the worksheet filled in by the internal customers. The self-assessment worksheet (to be filled in by the internal supplier) asked for the same kind of information aiming at facilitating the negotiating process. Besides giving a clearer idea of the desired performance in each criterion, the worksheets brought many improvement suggestions that could be used later at the implementation phase.
- *Negotiating*: having the information from the worksheets, the departments were then put together to compare and discuss their answers ("how I evaluate myself" compared with "how my customer evaluates me" – the aim was helping the negotiating functions to have more homogeneous assessment standards) and to build an agreed importance-performance matrix. It was decided that the negotiations should start at the sales departments and be "pulled back" through the internal supply chain, ending with the purchasing department. This aimed to guarantee that external customer demands for product (quality, level of innovation, rates of new product introduction), delivery (time,

Global criteria:	Quality	Speed	Dependability	Flexibility	Cost
Local criteria					
Exactness	⦿⦿		⦿		⦿
Dependability			⦿⦿⦿		⦿
Speed		⦿⦿⦿	⦿⦿	⦿⦿	⦿
Cost					⦿⦿⦿

Key
⦿ Weak relation ⦿⦿ Medium relation ⦿⦿⦿ Strong relation

Figure 3.
Correspondence matrix for the negotiation between sales and production planning

WORKSHEET FOR SUPPLIER EVALUATION

Supplier evaluated:_____
Customer:_____
Criteria:_____

Quantitative evaluation of supplier (0 to 10):_____
Performance Measures:_____
Suppliers' performance impact on your performance (from –3: strong negative contribution to +3: strong positive contribution):_____
Suppliers' performance impact on company's overall performance (from –3: strong negative contribution to +3: strong positive contribution):_____
Desired Performance:
Strengths:_____
Weaknesses: _____
Suggestions for improvement: _____
Projection for the future: _____

Figure 4.
Example of worksheet for internal supplier evaluation

dependability) and service – felt by the sales department – would be disseminated through the whole organization. As the process goes from one end of the company to the other, passing through all departments, customers' needs and expectations drive the negotiations.

The importance-performance matrix used at this phase was adapted from Slack's[2] importance/performance matrix (see Figure 2) with slight yet important differences. The importance of each criterion was established based on the result of the matrix shown in Figure 3. The local criteria with the strongest relation to the company's overall priority competitive criteria were considered to be the most important.

Differently from Slack's [2] matrix, the performance was not compared with competitors, but with internal customers' expectations[11]. Based on the worksheets' results, the criteria were classified in a scale ranging from "worse than necessary" to "better than necessary". Necessary, in this case, means the standard performance the customer needs to fulfil his/her strategic objectives. Figure 5 shows this matrix. The matrix helps determine which local criteria require priority improvement action.

- *Establishing action plans*: based on the matrix results, the departments had then to negotiate the action plans to improve the performance in the priority criteria. A worksheet was developed to help this determination. For each priority criterion, the departments should determine which improvement actions could be done in ten main decision areas: capacity, facilities, technology, vertical integration, labour, quality management, materials flow, new product development, performance measures and

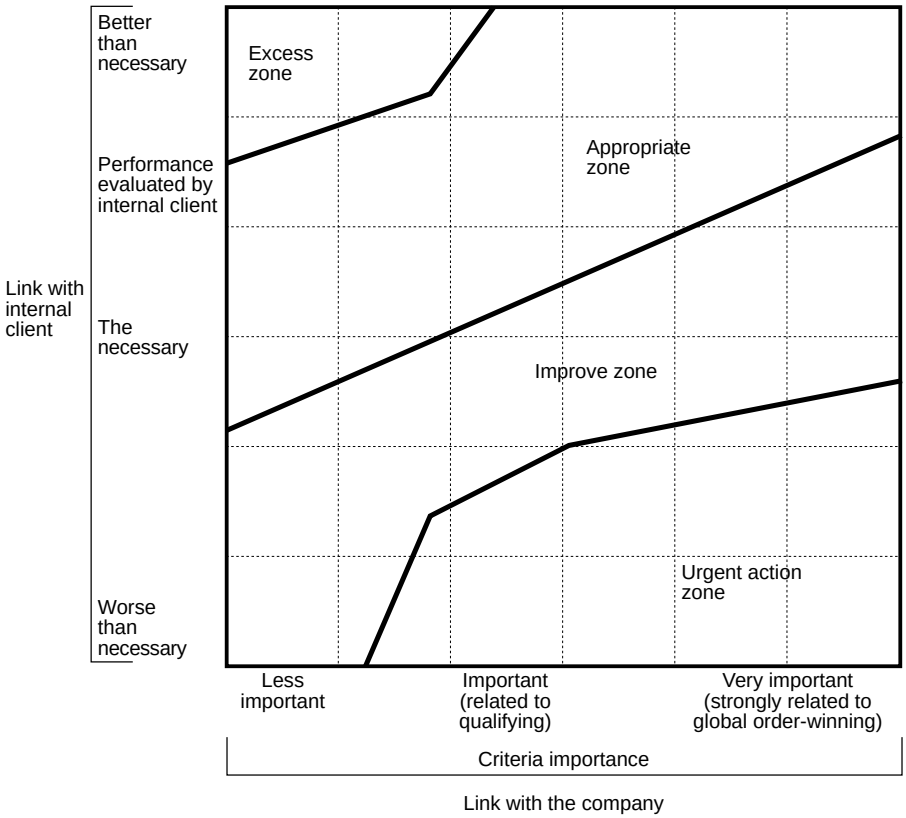

Figure 5. Importance-performance matrix for internal customer-supplier negotiations

organization. These improvement actions were then presented to the top management for approval. Task-forces were then established aiming at putting the projects into practice.

Proactivity achieved by using scenarios: the role of contingency models

The first phase of the project had finished. An initial model had been developed which resulted in operational action plans. In developing the process, the aspect of helping break the barriers had already been addressed. However, more was necessary. We did not want simply that the functions negotiated, with the internal supplier trying to respond well to its internal customer. We wanted them to be proactive. The concept of “contingency models” was then developed and included in the framework. In the proposed framework, proactivity is achieved through the explicit consideration of future possible scenarios by all functions.

In order to develop these scenarios, the function representatives and analysts have to be aware of current and prospective developments in their fields of

interest. In the internal customer-supplier negotiation process, people from other functions will eventually demand alternatives from them in order that they will be able to achieve a better performance in their own functions. Manufacturing people, for instance, will demand from finance people that they are able to offer alternatives for obtaining cheaper capital, in order to make investments. Marketing people will demand from manufacturing alternative technologies for possible future use which can provide different sets of competitive performance levels with regard to delivery, quality, costs and flexibility in order that they can choose from a broader array of markets to be targeted in the future. This should motivate the representatives from the different functions to act proactively, in search of new alternatives in their specific fields. For the people within the particular functions to be able to devise scenarios, and also for them to be able to negotiate with other functions, they have to develop what we call "contingency models".

Contingency models are defined here as formal conceptual models which link possible present and future contingencies (characteristics, actions and decisions) with the various "points of contact" between the function and other interacting functions. In terms of the manufacturing-marketing interface, manufacturing people should develop contingency models which associate possible future decisions and actions (such as investments in equipment, hiring and training of people, adoption of control systems, among others) with the resulting alternative set of order winning and qualifying criteria. This would require that manufacturing people monitor and acknowledge new developments in production processes in order that they are able to assess the possibility of attending or not to the marketing "time-phased" requirements and also to produce alternative scenarios for them. Marketing people, on the other hand, should develop contingency models which should allow them to associate sets of order winning and qualifying criteria with different market segments, in order that they are able to reformulate marketing plans (target-market, frequency of new product introduction, among others) given that some change happened in the possible set of "time-phased" competitive criteria which the manufacturing function is able to provide either in the present or in the future. Figure 6 illustrates the negotiation process and Figure 7 is an example of the worksheet for the operationalization of proactivity of the various functions.

The replanning process – triggered by relevant events and time

In the proposed model the replanning process can be triggered by relevant events and time as opposed to that triggered only by time as the main frameworks in the literature suggest. This can prevent the company from delaying in responding to relevant changes which occur between replanning points in time. The replanning process can also be triggered by any function which considers that something relevant has changed or may come to change relevantly in that field of interest. A sudden and significant change in import rates is typically a change which can trigger a replanning process in order that the whole of the company realign its efforts in face of the new situation brought

about by the change. The worksheet explained in the last section (see Figure 7) helps to formalize the process: the function that wants to trigger the replanning process fills in the worksheet and sends it to the other functions; a meeting is then set to decide the need for a replanning process or just minor adjustments to the new reality.

Managing change: judging the proposed process according to Pettigrew and Whipp's model

The development and implementation of manufacturing strategy is a major organizational change. Pettigrew and Whipp[12] suggest five central factors for managing change:

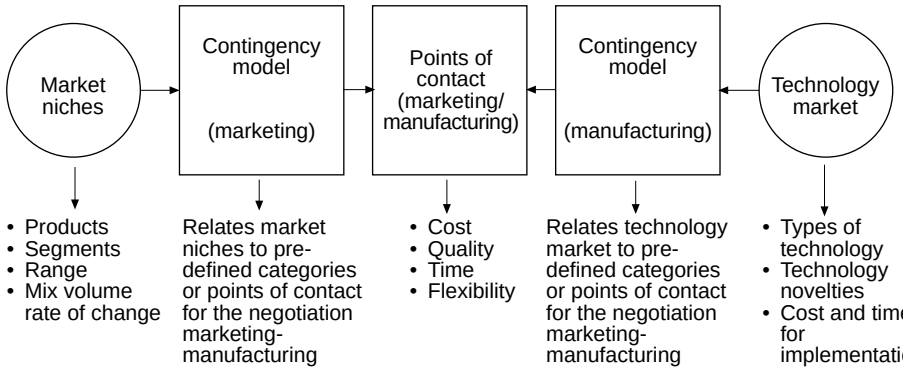

Figure 6.
Negotiation process for the operationalization of proactivity – example for the marketing/ manufacturing interface

Worksheet for building contingency models

Function: _____

Scenario A
Main characteristics:
Cost and resources required to have it operational:
Time to implement:
Future decisions and actions:
Reflex in criteria:
Criteria A -_____; Criteria B -_____; …Criteria n -_____
.
.
.
Scenario **X**
Main characteristics:
Cost and resources required to have it operational:
Time to implement:
Future decisions and actions:
Reflex in criteria:
Criteria A -_____; Criteria B -_____; …Criteria n -_____

Figure 7.
Example of worksheet for building contingency models

(1) Environmental assessment.
(2) Leading change.
(3) Linking strategic and operational change.
(4) Human resources as assets and liabilities.
(5) Coherence.

The process here described covers these five areas, and some conclusions may be drawn about these factors (see Table I).

Conclusions

The development model presented here is summarized in Table II, along with the conclusions about each phase of the process.

Issues in the proposed process related to factor	Conclusions about factor
Environmental assessment	
Direct interview with customers, benchmarking Use of scenarios	Very important in turbulent environments Constant change brings many differences in managers' views about the environment. These differences must be carefully discussed before setting the actions, otherwise there will be problems with managers' commitment to the project
Leading change	
Middle-down-top-down approach Use of a pilot project to get top-management commitment	Top-managers, facing many environmental change-related problems, find little time to be updated in newly developed techniques. A resulting conservatism makes the development of new ideas normally difficult. In this case, the use of pilot projects triggered by the normally more adventurous middle-management appears to be a good way of introducing new ideas and techniques
Linking strategic and operational change	
Step-by-step process Internal customer-supplier approach	Breaking internal barriers is essential for breaking emergent strategy into actionable pieces The internal customer-supplier approach is very suitable for setting up local negotiation climate for targets
Human resources as assets and liabilities	
Negotiations between internal customers and suppliers "Contingency models" being built across the whole organization to reach proactivity	In order to raise human resources consciousness every function should be actively involved in the process
Coherence	
Process "facilitator" who makes sure that local performance criteria support global order winners	A process "facilitator" present in all meetings is essential to achieve the desired coherence in the whole process

Table I.
Judging the process according to Pettigrew and Whipp's [12] model

Phase	Tool/method used	Conclusions
Feeling the initial environment	Questionnaires [9]	Good for "setting ground" Some misunderstanding may happen because some concepts are still not known by everyone
Forming a consensus with regard to MS concepts	Lectures [2,4,6,10]	Important before starting the process "Total quality" mentality brings resistance – managers want to be excellent in everything and do not agree with the idea of prioritizing criteria. In order to avoid this, many real examples have to be used during lectures
External assessment	Direct interviews with customers	Qualitative approach brings useful information from customers, including information about competitors Interviews should be conducted by manufacturing and sales members together; the relationship between them gets better during the process Interviewers should not try to respond to complaints, but listen to customers; this way, they tend to give more information In such unstable environments, interviews should be made regularly and aim at anticipating/monitoring tendencies in the market
Internal assessment	Worksheets[1]	Quantitative approach makes the following phase (building the importance/performance matrix) easier Answers were so different in some cases that a meeting was needed to discuss them and form a consensus; managers felt that these discussions were very important in the process. They agreed that the differences were mainly due to the uncertainty of the environment
Criteria priorization	Importance/ performance matrix[2]	It is difficult to reach agreement and build the matrix, as managers feel that a mistake in this phase can ruin the whole process. They want to be sure about every factor they discuss Representing future tendencies in the matrix is very important in such environments
Priority criteria study	No specific tool	Reaching a set of agreed priority criteria "labels" is not always sufficient; sometimes managers need to discuss before making decisions about priorities since the same label ("flexibility" for instance) may mean different things to different people
Internal criteria prioritization	Correspondence matrix Importance/ performance matrix (modified)	Use of the same kind of matrix that was used in the global criteria prioritization is very positive; employers "speak the same language" across the whole organization A formal tool as the criteria correspondence matrix is essential to avoid the local fixes
Negotiation for action plans	Worksheets	In such environments, negotiations between all functions is very effective to respond quickly to changes A "facilitator" should be present in the negotiation process to assure coherence
Achieving proactivity environments	Worksheets	Talking about building future scenarios is very difficult due to the "fire-fighting" culture in turbulent environments

Table II.
Conclusions about the process

This article has attempted to shed some light on a very under-explored theme in the literature: the development of manufacturing strategy in environments which are notoriously uncertain and turbulent such as those found in developing countries or reorganizing economies. The conclusions are that the characteristics of such environments actually call for solutions that are different from the methods normally found in the literature. Aspects such as proactivity, breaking functional barriers and managing environmental change demand different treatment because they are more than desirable – they are a qualifying condition for the companies to remain in business. However, the generalizability of the propositions here contained are arguable to a certain extent, since they are heavily based on one principal application in one specific industry in a Latin American environment and culture. Some of the ideas developed here can possibly add to the debate on this very important theme.

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