The Interface Between Project Managers And Functional Managers In Matrix Organized Product Development Projects

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Abstract

This study presents the results of an empirical investigation on the impact of the interface between Project Managers and Functional Managers on the performance of development projects for matrix organized products in Brazilian companies. Three dimensions of this interface are analyzed: clarity on responsibilities; participation in decisions, and communication channels utilized. A sample of 60 recently completed projects, of different sizes and degrees of complexity, integrating departments like R&D, Marketing, Manufacture and others, from 5 large private Brazilian companies, were analyzed. The results show that the projects which achieved better performance had a much greater level of clarity in terms of the attributions of the managers, a greater proportion of joint decisions, and a direct communication flow between the Project Manager and his technical team. In addition, such relations seem to be stronger in more complex projects, suggesting that the managers should use different mechanisms according to the situation.

Key-Words: Project Management, New Product Development, Matrix Organizations, Management of Innovation

Introduction

In the industrial context of the end of this century, the amounts which companies have invested in R, D & E (Research, Development and Non-Routine Engineering) have been one of the indicators of their competitive strength. However, the processes to transform this investment more quickly and rapidly into products which fulfill the requirements of the market have been considered more important. In fact, in many companies, the quality of the market-technology-manufacture integration has been vital in order to show the efficiency of the innovation process and the superiority of the new/ better products which have been launched on the market (Iansiti & West, 1997).

The growth of the so-called “cross-functional” initiatives has created a situation where use of the matrix forms of the organization is seen as one of the most important ways of bringing about integration so that results are obtained. In this type of structure, the Project Manager is the leader of the project from the beginning to the end, bringing together all the necessary contributions, maintaining the progress of the activities and attempting to satisfy the interests of the company in relation to the clients. At the same time, the Functional Managers must ensure the quality of their contributions to the project, the professional interests of their technical personnel working on the project and the medium and long-term capabilities of their areas.

However, though matrix schemes have been seen as a highly recommendable organizational solution for such situations (Marquis, 1969; Manley, 1975; Galbraith, 1971; Youker, 1977; Likert, 1975; Vasconcellos, 1977; Knight, 1976; Jermakowics, 1978; Sbragia, 1978), the conflict which it imposes on the organization has become a weakness of this type of structure. At both the theoretical and practical levels, it has been shown that matrix forms of structure tend to generate more conflicts than pyramid-type structures (Davis, 1974). In fact, the ambiguity inherent in matrix schemes in terms of the definition of roles, the relations of authority and communication models, although seeming to constitute an excellent opportunity for the adaptation of people and models to the problems of dual chains of command (Knight, 1977), tends to lead the organization to a highly unproductive state of tension.

As a consequence, various proposals have been elaborated and discussed in order to ensure a more effective operation of matrix schemes, both from the point of view of human relations as from that of organizational relations (El-Najdawi & Liberatori, 1997; Maximiano, Sbragia & Kroner, 1997). Recognizing that the complexity of this area has been little explored, this study, based on a previous study (Sbragia, 1985), will try to further investigation. It is an attempt to obtain empirical information to provide proposals for the following basic questions:

- to what extent is the clarity of the responsibilities between the Project Managers and Functional Managers associated with a more effective performance in product development projects which operate through matrix schemes? Do the complexity and size of such projects have any influence on this relationship?

- to what extent is the use of bilateral or participatory decision-making processes between Project Managers and Functional Managers associated with a better performance of the projects which operate through these schemes? Do the complexity and size of such projects have any influence on this relationship?

- to what extent is the use of direct communication models between Project Managers and the members of his technical team, who will come from various functional areas of the company, associated with a better performance of the development projects? Do the complexity and size of such projects have any influence on this relationship?

Methods and Procedures

1. Nature and Conceptual Model of the Study

We can classify the present study as being predominantly correlational, and, according to the method employed, a field study. Its justification for being a correlational study lies in the fact that attempts to investigate, according to the research problem which has been formulated, relations between specific variables, without, however, entering the field of causality. (Selltiz et alii, 1974; Festinger & Katz, 1966).

Figure 1: Conceptual Model of the Study

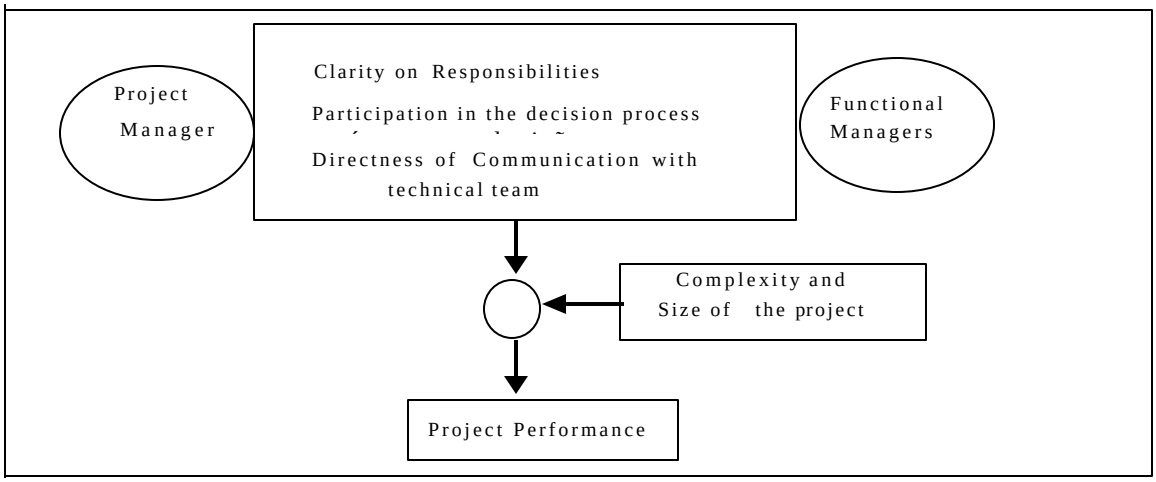

Figure 1 attempts to graphically represent the questions which have been formulated and the nature of the study, within a logical model, the variables which are under consideration and the relations between them which are being recommended. Using as units of analysis the matrix product development projects which are operating in industrial companies and the of the managers of such projects (PM), and those of the Functional Managers (FM) whose areas were involved throughout their life cycles, the model contains six variables, three independent factors (clarity in terms of responsibilities, participation in decisions and communication models), one dependent factor (project performance), and two intervening factors (complexity and project size).

2. Sample

A total of 60 projects which had recently been completed by the 5 national private industrial companies which spent most on R,D&E in 1998, according to the ANPEI- Brazilian National Association for R&D in Industrial Companies (ANPEI, 1998) database. These are all large companies, from the sectors of aeronautics, chemical, agriculture and electronics (2 cases) which invested an average of 34.5 million dollars on R,D&E, equivalent to about 3.8 % of their sales revenues, which had an average team of 144 (full-time people) devoted to such activities and which received 33 % of their sales revenues from new products introduced on to the market. A synthesis of the profiles of these companies can be seen in Table 1.

Table 1 - Synthesis of the main characteristics of companies whose projects have been included in the study (average values/ratios per company)

Selected Indicators of Technological Innovation	ANPEI Database (n=388)	Firms of the study (n=5)
Firms Profiles		
Number of Employees	1,107	3,444
Gross Sales Revenues (U$ 1.000)	1,227,159	659,276
Net Income per Gross Sales Revenues(%)	7.73	6.18
R,D&E Intensity		
R, D&E Expenditures (U$ 1.000)	3,288	34,504
R,D&E Expenditures per Gross Sales Revenues (%)	1.25	3.84
Capital Investment in Technological Innovation (US$ 1.000)	1,602	320
Personnel in R,D&E (full-time employees)	29.16	144.31
Masters and PhDs as part of R,D&E Technical Staff (%)	17.00	25.92
R,D&E Results		
Patents Granted in the Country (average in the last 10 years)	0.47	0.26
New Product Sales as % of Gross Sales Revenues (last 5 years)	36.18	33.00
Process Cost Reduction as % of Gross Income (last 5 years)	1.38	1.20

A total of 205 projects oriented to the development of new or improved products which were completed in 1998 were initially included. Of these, just the projects which involved at least two functional areas of the company such as Marketing, Manufacture, Supplies, etc. were selected, in addition to the technical area of the company (R&D, Engineering, or similar). It is equally important to consider the characteristics of the projects which have been studied, since they reflect the conditions according to which the conclusions of the study should be considered. Thus, regarding to nature, we are dealing with project of experimental development of new or improved products that also contain applied research and technical support services such as design, tests and essays, documentation, etc. (OECD, 1992). These projects have an average budget of US$ 2,250,200, last on average 14.4 months and have an average

team of 25.6 technical people (in full-time employees, with a devotion, in average, of 33% of their monthly time to them).

3. Definition of the Variables

3.1. Clarity about Responsibilities

The term responsibility is being used in the sense of indicating the role which people play in their work group and their organization and which constitute the obligations which are required of them (Melcher, 1967). Even in this sense, there are terms like general responsibility, operational responsibility and specific responsibility. The first indicates a situation in which an individual provides the general lines, directing and coordinating the tasks through which people who work with him. The second type attempts to characterize a situation where one person is directly responsible for carrying out a task. The specific responsibilities indicate a situation in which an individual is directly responsible for a limited part of a wider task. This study will concentrate on the first type, general responsibilities.

Table 2 - Managerial activities chosen to evaluate the clarity between PM and FM as to their responsibilities

1.	Elaboration of the project plan, including targets, methodology, schedule and budget
2.	Communication of the content of the work program to be developed with the team which will carry it out
3.	Distribution of the specific activities between the personnel of the involved functional areas and the communication of detailed instructions
4.	Direction of the elements of the functional areas allocated to the project as part of their daily schedule and discussion of specific technical details during the work
5.	Administration of the overall time of the personnel of the functional areas involved, in order to efficiently coordinate its use
6.	Development and training of the elements of the functional areas involved in the project, in order to meet the requirements of the project
7.	Supply of the necessary technical support for the project (installations, equipment, technical support services, etc.) in each of the involved areas
8.	Monitoring of the quality of work developed in the functional areas in order to ensure its high technical quality
9.	Communication with the high administration for clarifications or to answer requests related to the project

10.	Evaluation, throughout the project, of the technical results, costs and deadlines as a whole, bearing in mind the commitments taken on by the company

For operational effect, the variable "clarity of responsibilities" was evaluated by taking into account a number of managerial activities which were typical of the life cycle of a project, and which would supposedly be relevant from the organizational point of view as negligence could have serious consequences for the project. Using as a base previous works which referred to the content of the main responsibilities of the Project Manager and the Functional Manager in matrix operation situations (Shannon, 1972; Youker, 1977; Pywell, 1979), we used in this study ten specific activities whose clarity of general responsibility we attempted to evaluate. These activities can be seen in Table 2.

In order to produce a index of clarity between the Project Manager and the Functional Manager about their responsibilities in each project in the sample, each managerial activity was initially evaluated in a field situation on a nominal scale with three options to choose from: (1) the general responsibility of the activity was of the Project Manager, (2) was of the Functional Managers, and (3) it was unclear whose the responsibility was. A Clarity of Responsibility Index (CRI) was then defined for each project. This was made up by dividing the number of activities whose responsibility was attributed to the Project Manager or to the Functional Manager (options 1 and 2) by the total number of activities evaluated. This index therefore allowed a variation from 0 to 1, the lower range corresponding to less clarity between both about their responsibilities, and the higher range corresponding to greater clarity.

3.2. Participation in the Decision Process

Initially, we need to consider the meaning of the term participation in decisions. We shall consider that a given decision was taken in a participative way by someone when the chance for others to offer their opinion before the decision was made concrete. This opinion might be supplied in the form of information, news, contributions, etc., which may or may not necessarily be taken into consideration by the decision maker(Melcher, 1967). In other words, for the purpose of this study, the act of the decision maker in consulting other people whose professional expertise may affect the decision to be taken characterizes a decision which is taken in a participative way.

Table 3 – Decisions chosen for evaluation of the reciprocal participation between PM and FM

1.	Approval of the project proposal so the company can begin to carry it out.
2.	Determination of the team to be allocated to the project in terms of names and amount of time of technicians and scientific personnel.
3.	Acquisition of personnel/ external bodies to fulfill the requirements of the project.
4.	Determination of the suitable types of training to be given to those involved in the project.
5.	Designation of the priorities within the functional areas related to the work which is being carried out within the project (relaxing deadlines in favor of quality, altering work method or sequence,

	substituting key technicians, etc..
6.	Approval of changes in the technical content of the project (scope, specifications, methodology, etc.).
7.	Approval of changes in the budget and schedule of the project.
8.	Evaluation of the performance of the various elements of the functional areas which have been allocated to the project as part of evaluation system of the company.
9.	Determination of promotions within the career plan of the company of those belonging to the functional areas involved in the project.
10.	Approval of the final report of the project inside the company.

For operational effect, the evaluation of this participation took into account a number of typical decisions in the life cycle of the project which were seen to have been taken in a participative way by Project Managers or by Functional Managers. It was not important who took the decision but rather the fact that the other had been previously consulted or that there had been no type of consultation. Returning to a number of studies (Vasconcellos, 1977; Goodman, 1976) on the content of the of the main decisions which are taken in matrix operation contexts, we chose ten decisions which we thought relevant in terms of whether they had been taken in a participative way between Project Managers and Functional Managers. These decisions can be seen in Table 3.

Once again, in order to find the degree of the participation between the Project Manager and the Functional Managers in the decisions which they took at the level of each matrix operated project, each decision was initially evaluated in the field situation through a nominal scale made up of three options: (1) the final decision was taken by the Project Manager involving the Functional Manager; (2) by the Functional Manager involving the Project Manager; or (3) by one or the other unilaterally. A Decision Participation Index (DPI) was then defined for each project. This was defined by dividing the number of decisions taken in a participatory way (options 1 and 2) by the total number of decisions. This index therefore allowed a variation from 0 to 1, the lower range corresponding to less participation, and the higher range corresponding to greater participation.

3.3. Communication Model

The term communication model is being used in this study to identify the form through which communication is processed between the Project Manager and the technical team allocated to the project under the figure of the Functional Managers whose areas have sent personnel to the project. At one extreme, there could be a totally direct communication model between the Project Manager and his team, with no interference, participation or involvement by the managers of the Functional Areas. At the

other extreme, there could be a totally indirect model in which all communication to the technical team would be channeled through the Functional Managers.

The communication model used by the Project Manager in his contact with his technical team was operationally identified by using four alternative models presented in Table 4 (Vasconcellos, 1977). At the field level, an attempt was made to see which of them had been most frequently used in each situation in the project. These frequencies were then placed on an ascending scale, showing the levels of direct communication flow.

Table 4 – Alternative communication channels used by Project Managers in their contacts with their technical team

1.	The Project Manager has direct contact with the Functional Managers and doesn't even informally speak to the technicians allocated to the project.
2.	The Project Manager has direct contact with the the Functional Managers; he will only informally talk to the technicians allocated to the project.
3.	The Project Manager will have direct contact with the technicians allocated to the project, but he will keep the Functional Managers informed.
4.	The Project Manager will have direct contact with the technicians allocated to the project, regardless of the Functional Managers involved.

3.4. Performance of the Projects

In order to evaluate the project performance we must firstly specify the criteria used in the evaluation. Our nine performance criteria were based on previous studies (Murphy, Baker and Fisher, 1974; Benton, 1976; Rothwell et alii, 1979; Ball and Cook, 1976; Bennigson, 1978). The meanings of these criteria, as used for the data collection, and their relative weightings, are given in Table 5.

Each project was evaluated for each of the performance criteria using a seven point scale. Lower marks were associated with a poorer performance project performance in terms of the criteria considered, and the higher points with a better performance. In order to find the aggregate measurement for the performance of each project, the marks for each criterion were added up and multiplied by their relative weighting, the result of prior evaluation of their relative importance in company contexts (Sbragia, 1984). Although the performance criteria which were considered are normally treated as independent dimensions, using their aggregate as a way of producing an overall index may be partially justified in this study by the fact that many criteria have a high level of convergence, estimated through Kendall's Competition Coefficient (Siegel, 1975) which, applied to the available data, produced a value of $w = 0{,}233$ ($p<.01$).

3.5. Complexity of the Project

Complexity refers here basically to the complexity which is experienced by the Project Manager in his task of administering the project. In operational terms, for the aims of this study, it was defined by the following indicators: number of functional areas involved in the project; intensity of the interaction between the elements from the different functional areas in the project; and difficulty of cooperation between the functional areas involved in the project.

Table 5 – Description of the evaluation criteria for the project performance used in this study

Description of the criterion	Weight
1. Technical performance: the extent to which the technical specifications were fulfilled according to the best available information in the company	0.18
2. Performance in terms of Cost: the extent to which real costs incurred by the project obeyed the estimates made when it was conceived	0.15
3. Performance in terms of deadline: the extent to which the project obeys the established deadline, both in overall terms and its stages	0.12
4. Satisfaction of the High Administration: the extent to which the members of the High Administration of the company who are directly involved with the project are satisfied with the project	0.11
5. Technical Skills Developed: the extent to which the project has made technical contributions to the company, including personnel training (new knowledge and skills) and materials (new equipment, laboratories, etc.)	0.11
6. Knowledge Development: the extent to which the project has helped in the state of the art in its particular scientific and technical area, obtaining results which are highly important in terms of the available knowledge	0.06
7. External recognition: the extent to which the project has helped the external company image (clients, suppliers, competitors, government, etc.) thereby increasing its credibility and prestige	0.09
8. Commercial Results: the extent to which the project has helped the company to better exploit its market and/or conquer new unexploited markets, thereby extending its market share	0.13
9. Economic results: the contribution of the project to improvements in the competitiveness of the company in terms of its economic and financial requirements	0.05

Through the data collection instrument, the surveyed projects were described in terms of these characteristics. More specifically, the number of functional areas involved varied from 2 to 8 and the

intensity of the interaction and the difficulty of cooperation between them was evaluated on an ascending five-point scale. A Complexity Level for each project was then made from this data. This was a result of the total of the values attributed to the project relative to the indicators under consideration. The minimum value on this scale was 4 (Low Complexity), and the maximum 18 (High Complexity). It should also be remembered that the level of complexity was calculated from attributes which may be considered convergent as the Kendall's Competition Coefficient (Siegel, 1975), which was calculated between them, had a value of equal to $w = 0{,}365$ ($p<0.1$).

3.6. Size of the Project

Although the concept of the size of the project may alternatively refer to a series of indicators such as duration, budget, team and others, for the effect of this study, we shall use only the number of technicians allocated to it in order to describe its size. This number varied from 5 to a maximum of 80 for each project, with an average of 33% of the technical people's time being devoted to it.

4. Data Collection Procedure

It was thought advisable to concentrate the data collection on the figure of the Manager in each of the projects. If on one hand this decision implied that the results were merely considered from the viewpoint or perception of the Project Managers, on the other hand, as is typical of field studies, where indirect and approximate measurements are used (Festinger & Katz, 1966), we believe that the evaluations made by the Project Managers are a primary and reasonable way of measuring the phenomena that are the subject of this study.

The questionnaire, which was made up from the operational definitions which had been previously established and because of the type of informant who had been defined for this study, the Project Manager, was the basic instrument through which the field data were collected. We decided to apply the survey instrument through an interview, which was used to supplement the questionnaire, thereby helping to accompany and control responses. We thought that this procedure was mainly necessary in order to minimize the disadvantages of using just one kind of informant for the study. Through the interview, it was possible to go more deeply into the situation, analyzing the reasons for the responses of the Project Managers and discussing their position regarding the various functional areas involved in the projects. A total of 60 interviews were thus made personally by the author with the Project Managers during a six-month period from September 1998 to February 1999. These interviews were made, on average, 5.6 months after the project had finished (variation from 1 to 13 months) and lasted an average of 23 minutes (varying from 15 to 60 minutes).

Results

1. The interface between PM and FM and project performance

This section will analyze aspects of the interface between Project Managers and Functional Managers and the performance of the product development projects made by the companies which were analyzed. In Table 7, which presents the correlation indexes between the variables studied, it is interesting to see that

all of them are significant in the three dimensions analyzed, with even greater intensity in Clarity about Responsibilities and the Overall Performance of Projects.

Table 7: Correlation between the dimensions of the interface between PM and FM and the overall project performance

Interface Dimensions	Overall Project Performance
Clarity on responsibilities between PM and FM	Rs= 0.324***
Participation between PM and FM in key decision making processes	Rs = 0.210*
Directness of communication flow between PM and technical people from functional areas	Rs = 0.166*

* = p < 0.10 , ** = p < 0.05, *** = p < 0.01, Rs = Rank Order Spearman Correlation Coefficient

The results, far from being surprising, and with the limits within which they should be examined, show, firstly, that in order for matrix schemes to be effective in business contexts, they need a minimal internal discipline in terms of specification of roles and managerial attributions in order to avoid duplications and gaps of responsibility between Project Managers and Functional Managers. Secondly, such schemes do not need unilateral authority but rather the use of participative styles by the managers involved so that key aspects which have a high potential for conflict can be decided at local levels, thereby avoiding taking these problems to the high administration. Thirdly and finally, although direct communication between the manager and his team are natural and strengthened by the requirements of the work flow, dispensing with any more detailed attention, the results of this study also show that in matrix operation situations, the proximity and the direct communication flow may be a relatively important mechanism for the performance of projects which operate according to this organizational scheme. The underlying logic (Videlo, 1976) is that the communication made by the Project Managers with technicians through the various Functional Managers involved effectively has a greater possibility of resulting in inefficiency, consuming more time and resources.

1. The Interface between Project Manager and Functional Manager and project performance in view of their complexity and size

In order to see whether the relative complexity and the size of the projects under study influenced the association between the dimensions of the interface between PM and FM and the project performance, we established Table 8. As can be seen, we created two groups in terms of the complexity and size variables: the first had below average levels of complexity/size (30 cases); and the other had above average level of complexity/size (30 cases). These were respectively called less and more complex /smaller and larger. The correlations were once again calculated for each of these groups. We also established a measurement of the difference between the correlation indexes, and, in order to test the significance of this difference, we used the Fisher transformation (McCall, 1980), which enables it to be

expressed through the score "z". However, it should not be forgotten that such an analysis has its limits as the Fisher transformation is useable when there are parametric correlation coefficients, which is not the case here.

We can initially say that the size of the project had no influence on the results analyzed, concluding, initially, that the interface between PM and GM, in the clarity of responsibilities, reciprocal participation in decisions and communication flow, is associated with the performance obtained by development project regardless of their size, this being, in this study, the number of technicians involved.

Table 8: Correlation between the dimensions of the interface between PM and GM and the overall performance of the projects in view of their complexity and size

Interface Dimensions	Project subgroups	Complexity	Size
Clarity about Responsibilities between PM and FM	Low (n1=30)	Rs= .270**	Rs= .270**
	High (n2=30)	Rs= .286**	Rs= .243
	Difference between the two Correlation Coefficients	z= .080	z =.10
Participation between PM and FM in key decisions	Low (n1=30)	Rs=.049	Rs= .261**
	High (n2=30)	Rs= .364***	Rs=.240**
	Difference between the two Correlation Coefficients	z= 1.34*	z = .09
Directness of Communication Flow	Low (n1=30)	Rs= .006	Rs= .277**
	High (n2=30)	Rs= .366***	Rs= .260**
	Difference between the two Correlation Coefficients	z= 1.51**	z= 0.08

* = p < 0.10 , ** = p < 0.05, *** = p < 0.01, Rs = Rank Order Spearman Correlation Coefficient and z=Fisher Transformation for the Difference between two Correlation Coefficients

Nevertheless, when the complexity of the project studied is considered, the complexity seems to be an important modulating variable between the interface of PM and the GMs and the project

performance, especially in the dimensions which refer to participation in the communication flow. In other words, this means that reciprocal participation in the key decisions between PM and GM and the direct communication flow between the PM and the members of the technical team seem to be more decisive when projects of the development of more complex products are being dealt with. This evidence is compatible with other studies (Aram & Javian, 1976), which state that the more organizational schemes favor people deciding together, communicating with no external interference, and the greater the complexity, the more chance there is that projects which use these schemes will be successful.

CONCLUSIONS

This study has attempted to examine the impact of elements related to the interface between Project Managers and Functional Managers in matrix organized product development projects in the five national industrial companies which most invested in R,D&E in 1988 in Brazil, according to the ANPEI-National Industrial Association for R&D data. In matrix operation situations, the PM must superimpose horizontal contacts on the traditional and hierarchical chains of command of the companies, the functional departments, as a form of ensuring that the project is technically, commercially and economically successful.

Three elements were considered as dimensions of the interface: the clarity between the PM and FM on their responsibilities, reciprocal participation in decisions, and the level of the directness of the flow of communication between the Project Manager and those from the functional areas involved who were temporarily allocated to the projects. A total of 60 projects which were completed in 1998, all matrix organized along the areas of R,D&E, Marketing, Manufacture and others were analyzed through an interview with their respective managers, which used a questionnaire which the respondents could fill out.

The findings obtained and the underlying literature showed that the organizational characteristics which contribute to the most successful projects are (1) a greater level of clarity between the PM and FM on their typical responsibilities, (2) a greater degree of reciprocal participation in key decisions, and (3) a higher level a direct flow of communication between the PM and the technicians of the functional areas allocated to the project, as against communication channeled through the FM. This situation also seems to be more intense in the case of more complex development projects, that is, those which involve a greater number of functional areas, a greater interaction between personnel, and greater cooperation difficulties. These are generally caused by the tight compartmentalization that traditionally characterizes such environments. On the other hand, no evidence of this kind has been obtained in relation to the different sizes of the analyzed projects, measured by the absolute number of people involved.

In view of these results, the implications are obvious: the choice of matrix operation schemes in development projects of new products in company contexts needs, among other measures, to be followed by the clarification of the managerial roles of the key players , the PM and FM. Joint decisions should also be encouraged, and a strong appeal should be made for the use of direct communication between the PM and his technical team. If this is not done, there will be a strong chance of there being a confusing work scheme, with unpleasant effects for the success of development projects which, through such schemes, attempt to conciliate the quick search for results with existing functional skills.

The inherent limitations of this study must be recognized as they clearly interfere in the possibilities of arriving at reliable results. The study should therefore be seen as providing a tentative basis whose results are subject to future confirmation. Firstly, due to the process used compose the sample, which makes its representativeness difficult to evaluate. Secondly, due to the fact that this study deals above all with the perceptions of people, and not just those of the PM. Thirdly and lastly, due to the fact that there is an infinite number of other variables, in addition to the size and complexity of the projects, which could easily influence the relations under study, and, therefore, modify the results of the analyses. This all illustrates the inherent complexity in the subject and the need for new empirical information.

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