1-1994

R&D-Marketing Integration Mechanisms, Communication Flows, and Innovation Success

Rudy K. Moenaert

William E. Souder

Arnoud De Meyer
Singapore Management University, arnouddemeyer@smu.edu.sg

Dirk Deschoolmeester

DOI: https://doi.org/10.1016/0737-6782(94)90117-1

R&D-Marketing Integration Mechanisms, Communication Flows, and Innovation Success

Rudy K. Moenaert, William E. Souder, Arnoud De Meyer, and Dirk Deschoolmeester

Published in Journal of Product Innovation Management, Volume 11, Issue 1, January 1994, Pages 31–45

doi: 10.1016/0737-6782(94)90117-1

Abstract: Rudy Moenaert, William Souder, Arnoud De Meyer, and Dirk Deschoolmeester report the results of their study of forty technologically innovative Belgian companies to examine the interaction between marketing and R&D. They studied one commercially successful and one commercially unsuccessful technological product innovation project in each participating company and collected data from one marketing and one R&D respondent per project. Communication flows between marketing and R&D are increased under conditions involving formalization of projects, decentralization, positive inter-functional climate, and role flexibility.

Introduction

The need for interfunctional coupling has been known for a long time [2, 45]. In this respect, the R&D marketing interface has received truly substantial attention [9, 10, 20, 34-36, 50-53, 71, 77]. The impact of this interface on the commercial and technological success of innovative products has been the focus of much more scientific scrutiny than, for example, the marketing-production interface [63] or the R&D production interface [7, 25, 29, 74]. In addition, also the recent strategic management literature has convincingly argued in favor of a better understanding of this interface [1, 40, 58, 62, 67]: "If core competence is about harmonizing streams of technologies, it is also about the organization of work and the delivery of value . . . . Core competence is communication, involvement and a deep commitment to working across organizational boundaries" [62, p. 821. However, integration is not easy to achieve. To illustrate, we note the director of the R&D operations of a food company who has launched the following mission statement within his business unit: "*I have a DREAM: Development by Research, Engineering And Marketing" . . .*

Sustained interest in the R&D-marketing interface by academic scholars, organizational consultants, and senior executives has resulted in the advocacy of a wide array of integration mechanisms [20, 23, 30, 31, 49, 52, 64, 71, 76]. In the present empirical study, the effects of four important variables on cross-functional communication and innovation success have been investigated, that is, formalization, centralization, role flexibility, and interfunctional climate. We have used an information processing perspective to develop model on the antecedents and the effects of communication between R&D and marketing [52]. Following a theoretical review of the propositional framework, we will discuss the research design we have developed to test the hypotheses. In the final sections, we examine the research findings and the managerial implications of these results.

Communication Flows, Integration Mechanisms and Innovation Success

The research question of the present study can be phrased as follows: to what extent do project centralization, project formalization, interfunctional climate, and role flexibility contribute to communication between R&D and marketing functions during product development (the stage during which the product concept is translated into a concrete product), and how do these factors impact on the commercial success of such a project?

Project centralization is defined as the extent to which project-related communication, decision making and power is concentrated in the hands of a relatively few individuals belonging to the top of the project team or the top management of the organization [65]. Project centralization is expected to have a significant negative effect on the quantity and quality of information sharing between the technological functions (R&D) and the commercial functions (marketing). If the communication flows between the two functions are mediated through the top of the organization, this is expected to result in a severe loss of awareness and appreciation of the other function.

Project formalization refers to the emphasis placed within the project team on following rules and procedures in performing one's job [37]. Project formalization is expected to increase significantly the communication flows between marketing and R&D. In a previous qualitative study [51], marketing and R&D managers acknowledged that formalization of interaction patterns between the two parties serves as an important platform to develop frequent informal interactions.

By inter-functional climate we mean the positive degree of interest, trust, awareness, and support between the R&D and marketing function. Following extensive research by Souder, we may expect that a good climate between marketing and R&D will foster a high frequency of communication between these two functions [71].

Role flexibility refers to the degree of extra-functional tasks a project member assumes in the course of the project [52]. That is, in this article *role flexibility* refers to activities performed by R&D personnel (e.g., contacting customers), or R&D activities performed by marketing personnel (e.g., running lab tests). Role flexibility, that is, out-of-role behavior [52], is expected to have a significant positive effect on the degree of information sharing between marketing and R&D project personnel. Stepping into external roles enables team members to better comprehend the information needs of the other party.

Thus, we postulate the following hypotheses:

H1. The exchange of information between R&D and marketing during development is positively related to (1) the degree of project formalization and (2) the harmony of the interfunctional climate, and (3) negatively related to the degree of project centralization.

H2. (1) The transfer of information from marketing to R&D project personnel during development is positively related to the degree of role flexibility undertaken by marketing project personnel. (2) The transfer of information from R&D to marketing project personnel during development is positively related to the degree of role flexibility undertaken by R&D project personnel.

Viewing product innovation projects from an uncertainty reduction perspective [52], we expect information sharing between the technological and the marketing function to contribute to the commercial success of such projects. Indeed, the sharing of data, knowledge, and skills can lead to new and creative insights. This morphological process [69] is expected to improve the fit between technological solutions and market

requirements. If marketing and R&D do not share information and knowledge, important opportunities may be missed. Consequently, we would expect the three integration mechanisms (project formalization, interfunctional climate, role flexibility) and the integration barrier (project centralization) to have an indirect effect on the commercial success of product innovation projects. Hence, we formulate the following hypothesis:

H3. Project formalization, interfunctional climate, and role flexibility during development relate positively to the commercial success of product innovation projects. Project centralization during development relates negatively to the commercial success of product innovation projects.

Research Method

Research Design

Until the Seventies, research on innovation projects largely followed a correlational design. Rothwell et al. [66] introduced the ex post facto research method for the study of innovation projects when they utilized the paired comparison technique, by means of matching successful and unsuccessful innovation projects. Cooper [19] and Cooper and Kleinschmidt [17] used this matching technique in a Canadian setting. The SAPPHO, and particularly the Cooper, studies, have been repeatedly replicated in other countries (e.g., in Belgium [75], the Netherlands [11], and Australia [28, 46]), in other industries (e.g., the service industry [24]), and with different measures of project failure [18].

There are some important pitfalls with respect to this matching process. First, self-selection may pose a problem. Subjects may drop out during the research cycle for causes that may impact on the dependent variable of the study. It is precisely this issue that Campbell and Stanley [12] refer to as an *"essentially uncorrectable source of under matching"* (p. 7 1). Second, one never matches on all the relevant variables. Within innovation studies, it must be noted that the matching takes place by collecting data on pairs per company, thus implicitly assuming that one has matched all the extraneous variables. Strictly speaking, the researcher is not entitled to make such a *ceteris paribus* assumption. For instance, projects taking place within the same company but within different divisions may not even be comparable. Third, in order to maximize variance, matching in innovation research has traditionally been done on the basis of the dependent variable (success vs failure), and not on the basis of one or more of the independent variables (as is the case in the field of psychological and educational research). In other words, the paired comparison matches on *post treatment attributes* rather than on *pretreatment attributes.* The responses may be thus subject to hypothesis guessing and hindsight bias [55] by the respondents. Where the data of an innovation pair are collected from one person, we can expect "reconstructive logic."

Within the funding constraints of the present study, the inherently long and often irregular time patterns of product innovation projects *compelled us to use an* ex post facto *design* [43]. Within every company, we have selected one commercially successful project and one commercially unsuccessful project. A minimum requirement for the present study was to have one *R&D respondent and one marketing respondent per innovation project.* The R&D respondent answered the questions pertaining to the technological side of the product innovation project, and the marketing respondent answered the questions pertaining to the commercial side of the product innovation project. In contrast with earlier positive reports on the use of a single key informant technique [13], more recent studies have cast serious doubts on the validity of this technique [6, 44, 60]. Therefore, care was taken to be sure that the R&D and marketing respondents for the project had been thoroughly involved with that project, either as a project leader, a product or a marketing manager, or an R&D engineer.

Also, we have *integrated the debriefing stage* of the research into the falsification stage. That is, following the data collection and data analysis, we organized four workshop sessions with the participating companies. As the discussion will show, these debriefing roundtable conversations substantially helped us explain some of the results [3]. They also provided qualitative insights into why some projects eventually failed or succeeded.

Instrument Design

A large number of instruments pertaining to our hypotheses and the implied constructs are available in the literature [e.g., 26, 27, 39, 68, 71]. Following the approach outlined by Churchill [14], the research design as well as the measurement instruments were extensively pretested using a small group of graduate industrial engineering students at an American university and a small-scale study involving sixteen innovation projects (eight successes, eight failures) in five companies in the Pittsburgh, Pennsylvania area. The two pretests and their subsequent discussions served as a platform for the development of the final research design, the measurement instruments, and the field-site contact procedures.

The pretests resulted in major research design and data collection changes. The Pittsburgh pilot study indicated that we should not attempt to collect data on more than one failure/success pair per company. Many companies are reluctant to give access to two or more failed projects. In case they do, it has been our experience that most often some of these failures are better described as "mild successes," rather than as true failures. Also constructs like "formalization" and "centralization" were operationalized with specific reference to the new product development process. For instance, project formalization was clearly linked to the notion of an innovation plan. This helped us to develop "real-world" measures of important constructs in the organization science field. It also helped us interpret the results.

Organization Sample

Forty Belgian companies cooperated in this study. Within each field site, we studied the *most recent failure* and the *most recent success.* The purpose was to exclude projects that compelled the respondent to make a quantum leap back in time. Furthermore, this prevented our contact persons from choosing their "pet projects." We examined *seventy-eight innovation projects in forty companies:* forty successes and thirty-eight failures. Two companies were unable to provide us with a failed project.

The objective was to assemble a heterogeneous sample [16], drawing on several industries (Figures l-3). In the resulting sample, some industries were overrepresented (electronics, industrial machinery, chemicals), while others were underrepresented (e.g., textile). Although some of the companies manufacture consumer products, the sample is largely composed of industrial product firms. The sample is also biased towards medium-sized and large Belgian companies (median company sales = US $63 million; median number of employees = 758). This, of course, does not tell everything. For instance, one bioengineering company in this sample had 150 employees and 120 of them in R&D. Another company in our sample, operating in the industrial machinery industry, employed only sixteen R&D engineers with a total of over 2000 employees.

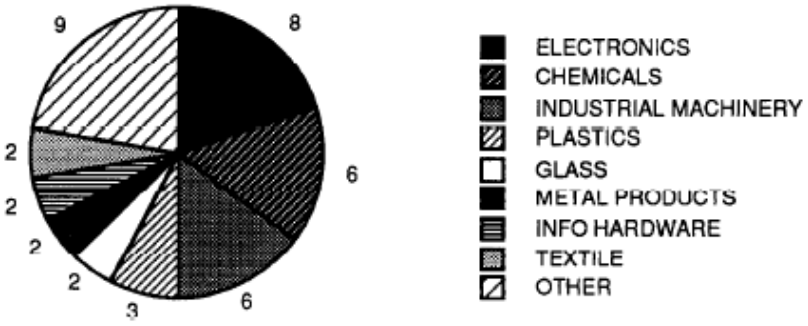

Figure 1. Companies in the study: Industrial profile.

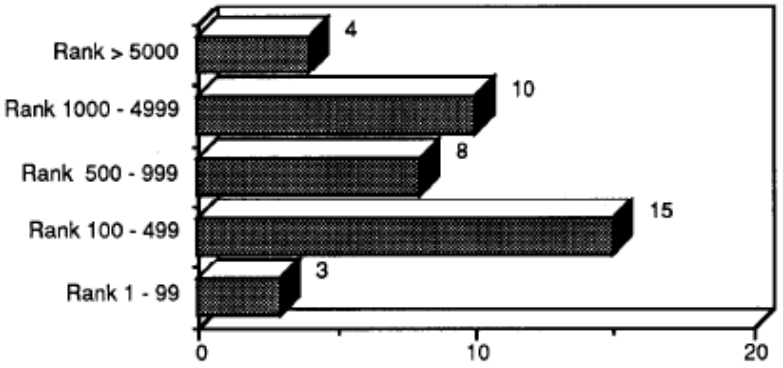

Figure 2. Companies in the study: Belgian sales ranking.

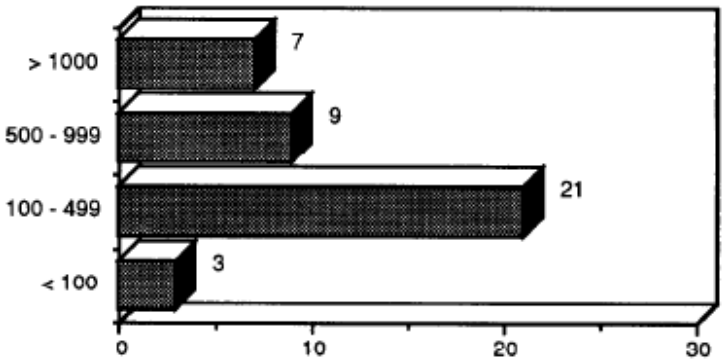

Figure 3. Companies in the study: Personnel employment.

Construct Validity

Of 156 questionnaires administered (seventy-eight projects; two questionnaires, one marketing and one R&D), 147 respondents answered and returned the questionnaire adequately (94.2%). The construct validity of the final measurement instrument is high (see Appendix). The Cronbach alphas of the measures are above the 0.50 limit suggested by Nunnally [57]. In addition, Table 1 presents an *acid test of convergence*. A paired comparison per project of the R&D and marketing perceptions shows convincing support for inter-rater reliability per project. The results in Table 1 justify the use of the *pooled perceptions* by R&D and marketing regarding project centralization and formalization, interfunctional climate, and commercial project success.

In a pairwise comparison per field site, the marketing respondents' perceptions of the success of the successful projects differ by a very convincing margin from the marketing respondents' perception of the success of the failed project (on 1-5 scale: X = 3.89 vs X = 1.54, *P* < 0.001). Similarly, there is a wide gap between the R&D respondents' perceptions of the commercial success of the successful projects and that of the success of the failed projects (X = 3.93 vs
X = 1.86, *P* < .001). Thus, it seems that by not banking on economies of scale, and limiting data collection to one failure and one success per field site, we have adequately secured the maximization of variance within the sample.

Table 1. Correlations and Differences between the Perceptions of R&D and Marketing Respondents of the Same Project

Variable	Δ means	*P*	*r*	*P*	No. of items	Cronbach α
Project centralization	0.063	NS	0.487	<0.01	14	0.88
Project formalization	-0.030	NS	0.262	<0.05	16	0.86
Interfunctional climate	0.242	<0.05	0.417	<0.01	16	0.82
Commercial success	-0.106	NS	0.793	<0.01	1 2	0.88

Note: Columns 2 and 3 present the results of the paired t test (two-tailed) of the perceptions of the marketing and the R&D respondent on the same project. Columns 4 and 5 show the results of the correlation analysis (one-tailed) of the perceptions of the marketing and the R&D respondent on the same project. In the calculation of the f test, the mean of the R&D respondent's perception has been subtracted from the mean of the marketing respondent's perception. Finally, in column 7, we show the Cronbach a coefficient if the measure of the construct is based on the joint perception of R&D and marketing respondents. The analysis is based on 71 projects.

External Validity

The unit of analysis here is the project. Unfortunately, there is no benchmark "population" of innovation projects. However, we believe the field-site contact procedures have enabled us to select a diverse sample of companies that are involved with technological product innovation projects. For instance, little benefit would have arisen by collecting a lot of data in the textile or ready-to-wear clothing industry. Most innovation projects in that industry are process innovations, and the R&D efforts rest to a very large extent with the equipment suppliers [59].

Three additional aspects relating to external validity must be noted. First, the sample is biased towards *industrial product companies.* Only two companies do not exclusively produce for industrial markets, but their major products (outboard marine engines, automotive shock absorbers) are not typical of a fast-moving consumer product market. The study may be in need of replication within a consumer product context. Second, based on the non-responses and the telephone feedback from some respondents, seven projects (live failures, two successes) were excluded from the analysis. The comments indicated that the questionnaire was difficult to complete for a *venture type of project.* Rather than jeopardizing the analysis with unreliable data, we have excluded these projects from the analysis. Thus, all the analyses have been based on seventy-one projects (seventy-eight minus seven). The results of the present research cannot be readily generalized to entrepreneurial start-up innovation projects. Third, there is the issue of cross-cultural comparison. Although the sample is definitely biased towards larger Belgian companies, the companies would be small to medium-sized by US standards. It must be noted that our research has focused on product development projects, as have most other studies in this area. For this type of research problem, most of the relevant interactions between R&D and marketing occur at the business unit level.

Although the average size of the Belgian companies is presumably small in comparison to the type of companies that have participated in other studies [e.g., 71], the size of the business unit might be equivalent.

Research Findings

The Antecedents of Cross-Functional Communication

As shown in Table 2, the correlation analyses support hypotheses 1 and 2. The information marketing receives from R&D during product development relates positively to the formalization of project activities *(r* = 0.57, one-tailed *P* <0.001), the quality of the interfunctional climate *(r* = 0.60, one-tailed *P* <0.001), the role flexibility of R&D *(r* = 0.45, one tailed *P* <0.001). It relates negatively to the degree of project centralization *(r* = -0.50, one-tailed *P* <0.001). Similar strong results are obtained for the reverse flow. The amount of information R&D receives from marketing correlates positively with the degree of project formalization *(r* = 0.39, one-tailed *P* <0.0l), the quality of the interfunctional climate
(r = 0.65, one-tailed *P* <0.001), and marketing's level of role flexibility *(r* = 0.28, one-tailed *P* <.05). It correlates negatively with the centralization of project related communication *(r* = -0.64, one-tailed *P* <0.001).

It may be noted that in the case of correlated independent variables, inferences based on multivariate analyses may be troublesome. Therefore, we have based our hypothesis testing decisions on the bivariate correlation analyses. As mentioned above, the sample size is limited to a maximum of seventy-one cases for the cross-sectional analysis, and thirty-one for paired comparisons. Therefore, the α-level of significance has been set at 0.10, thereby minimizing type II error [5, 41, 42].

Table 3 summarizes the results of the multivariate regression analyses. While there is again ample support for hypotheses 1 and 2, some comments are appropriate. Marketing's role flexibility does not contribute significantly to the information flows from marketing to R&D once the other effects have been accounted for (β = 0.08). This may be due to an interaction of small sample size and moderate colinearity between the independent variables. Indeed, Table 2 also supports the assertion that the antecedents will correlate [52]. In addition, marketing tends to exhibit fewer out-of-role behaviors than R&D personnel (on a 1-5 scale: $\bar{Y}_{R\&D} = 2.68$, $\bar{Y}_{MKT} = 2.16$, $P = 0.001$). This is in line with the conventional wisdom that an R&D engineer can perform commercial tasks more readily than a marketer can perform technical tasks.

Effects of Integration Mechanisms on Innovation Success

As shown in Table 2, H3 is partly supported. The degree of project formalization (r = 0.20, one-tailed P <0.10) and the quality of the interfunctional climate (r = 0.29, one-tailed P <.05) correlate significantly in the hypothesized direction with commercial project success. Neither project centralization (r = -0.05), nor R&D role flexibility (r = 0.13), nor marketing role flexibility (r = -0.01) relate significantly to the commercial outcome of the investigated product innovation projects.

Table 2. Correlation Between the Determinants of Interfunctional Communication, Information Received, and Project Success

Variable	Project centralization	Project formalization	Interfunctional climate	R&D role flexibility	Marketing role flexibility	Information received by R&D	Information received by marketing	Commercial success
1. Project centralization	1.00							
2. Project Formalization	-.30***	1.00						
3. Interfunctional climate	-0.60****	0.42****	1.00					
4. R&D role flexibility	-0.06	0.40****	0.21**	1.00				
5. Marketing Role Flexibility	-0.25**	0.12	0.25**	-0.12	1.00			
6. Marketing info received by R&D	-0.64****	0.39***	0.65****	0.20*	0.28**	1.00		
7. R&D info received by marketing	-0.50****	-0.57****	0.60****	0.45****	0.25**	0.31***	1.00	
8. Commercial success of innovation project	-0.05	0.20*	0.29*	0.13	-0.01	0.39***	0.10	1.00
Mean	2.8	2.81	3.41	2.68	2.19	3.05	3.39	2.73
Standard Deviation	0.77	0.60	0.71	0.87	0.79	0.82	0.88	1.20

Note: Table entries represent the Pearson product moment correlation coefficients between the determinants of interfunctional communication, the amount of information R&D and marketing have received from each other, and the degree of commercial project success. The number of observations varies between 62 and 69. One-tailed significance: ****P <0.001; ***P <0.01;**P <0.05; *P <0.10. Hypothesized correlations have been underlined. Centralization is measured on a scale of 0.85-5.0, information received by marketing or R&D has been measured on a 1–5.13 scale. All other scales vary between 1 and 5. All constructs are scaled **in** such a way that a lower number reflects a lower degree of the measured trait.

Table 3. R&D-Marketing Communication: Multiple Regression Analysis

	Communication from marketing to R&D (n = 60)	Communication from R&D to marketing (n = 62)
Project centralization	-0.36***	-0.24**
Project formalization	0.14*	0.29***
Interfunctional climate	0.34***	0.27**
R&D role flexibility		0.24**
Marketing role flexibility	0.08	
R^2	0.51	0.55
F	14.37	17.40
P	<0.001	<0.001

Note: Table entries represent standardized beta coefficients. Listwise deletion of missing data. One-tailed significance of the beta coefficients: *P < 0.10; **P <0.05; ***P <0.01

There are some plausible explanations for these results. First, we have studied the R&D-marketing interface during the development stage of the innovation projects. Recently, Souder and Moenaert [69] proposed that successful product innovation projects are characterized by "efficient uncertainty reduction." The critical success factor of a new product venture will be the degree of information processed during the planning and assessment stage of the project, that is, before the actual development has been started. The level of integration needed between R&D and marketing will be less once the product specifications have been formulated and resources have been allocated.

Second, we have only investigated the information processing component of the innovation projects. Clearly, any project will be marked by decision making and implementation activities as well [52]. Although centralization may have detrimental effects on information exchange, it may trigger efficient

decision making and implementation. For instance, in many software engineering projects, communications between the technical and the commercial side of the project are channelled through the project leader. While we have heard some severe information complaints from team members from both marketing and R&D regarding this widely accepted procedure, many of the respondents acknowledged that such a network and activity pattern fosters a clear and manifest decision-making structure. The non-significant findings of R&D and marketing role flexibility may be interpreted in a similar way. Role flexibility may stimulate the information exchange between the R&D and the marketing functions, but may render project responsibilities fuzzy over the long run.

However, the information R&D receives from marketing was found to correlate significantly with project success ***(r =*** 0.39), whereas the information marketing receives from R&D did not ***(r = 0.10).*** Given the results of earlier studies in the field [e.g., 61], this requires some explanation. On the one hand, group feedback analysis from the workshop sessions suggested that R&D depended very much on inputs from the commercial side of the organization to accomplish adequate progress. On the other hand, information flows from R&D to marketing serve less as an input to marketing activities, but are more of an informative nature. This seems corroborated by the analysis of some other questions in the questionnaire (frequency of face-to-face contacts, written notes, and meetings with the other function). While the differences in terms of the frequency of channel utilization between successful and unsuccessful projects are significant for all three types of communication channels for the information flows from marketing to R&D, none of these differences is significant for the reverse flow, that is, from R&D to marketing. Thus, the findings in Table 2 are "nomologically valid" [21].

Management Implications

As we have outlined in the research design section, we have employed group feedback analysis to explain the results of this study. In addition, these roundtable discussions-attended by more than 50 participants have been instrumental in relating the research findings to managerial guidelines.

Subtle Control: Achieving Formulization and Decentralization Simultaneously

During development, the issue at hand is clearly one of making a trade-off between autonomy and control, as is evidenced by the strong positive effect of project formalization and the absence of a significant negative effect of project centralization on project success (Table 2). This organizational challenge is probably best captured by the concept of *"subtle control"* [72, p. *1431.* Innovating organizations are in need of formal mechanisms that enhance the communication process, without creating a bureaucratic burden and an overload of procedures.

The feedback roundtables confirmed that each organization ought to *customize its new product planning system* (items 6, 7, and 8 of the project formalization measure; see the Appendix). Such new product plans are diagnostic instruments. They remind the project personnel and the decision makers of the

various issues that must be considered. These plans also specify the transfer points between the different functions (manufacturing, R&D, marketing, and so on). There are hundreds of new product plans and new product development schemes available in the literature on marketing and engineering management. However, none of these is comprehensive enough to fit all industries or types of companies. A high-tech multinational company must account for quite different elements than would a regional low-tech company. There is only one innovation plan that works correctly: the one the organization has custom-designed to meet its own specific needs. More importantly however, there is little use in developing a customized plan, if the various parties are not involved, for example, R&D, manufacturing, marketing, and so on. For every step, every milestone, the functional responsibilities must be clearly mapped. Again, this forces team members from different functions to interact with each other.

In addition, the workshop sessions strongly suggested a major opportunity to accomplish subtle control. The *yearly development of a strategic innovation plan by cross-functional teams* can contribute significantly to the results of a company's new product program. It was felt that every company should make an interdisciplinary reappraisal of its technological product position in the market on a regular basis. The organization can then quickly spot new market opportunities and assess new technological developments. A very important spin-off from interdisciplinary new product planning consists of the informal discussions and formal meetings it stimulates across functional frontiers. Indeed, the plan itself provides a platform for the various parties to initiate discussions.

Maintaining Effective Climates

The results also show that interfunctional climate has a very strong effect on interfunctional communication. It is quite noteworthy that the projects in our sample are characterized by a good climate between the two functions ($\bar{Y}$ = 3.41 on a 1-5 scale; the minimum score was 1.83; see Figure 4). The Belgian projects compare rather favorably to the major study by Souder [71], where 20.5% of the 289 studied innovation projects suffered mild disharmony (lack of interaction, lack of communication, too-good friends syndrome) and 38.7% endured states of severe disharmony (lack of appreciation, distrust). There are some plausible explanations for this difference. First, we have used another measurement instrument. Second, there may be cross-cultural differences between the characteristics of the R&D-marketing interface in Belgium and the USA. Third, since the research by Souder, the R&D-marketing interface seems to have improved in US firms [35]. Fourth, group sizes may have been smaller, which also fosters a good climate between these two functions [71]. Finally, there may be a sampling effect: firms with severe interface problems may have declined to cooperate with this study.

The feedback roundtables suggested that a major responsibility rests with the *project leader* to nurture a positive climate between the team members from R&D and the team members from marketing. Although centralization and project climate (Table 2) show a significant negative correlation, this should not mislead us. Project leaders assume an important role in interdisciplinary integration [15, p. 118]. Although the group feedback during the workshop roundtables suggested that quite often innovation

teams lacked a professional team leader, the consensus was in line with earlier findings on the profile of the "ideal" team leader. This ideal leader has been described in the literature as follows:

- *"They [the successful project manager]* simultaneously exercised close project control and a 'one of the boys' style. They were technically astute and at the same time well-informed about customer needs. The typical successful project manager was 30 to 4.5 years old, had spent 5 to 12 years in a technical function and worked for 4 to 10 years in a marketing or sales function" [71, p. 146].
- "A heavyweight product manager possesses both position and seniority, along with specific skills and experience developed while working in an organizational context that includes a structure and systems to support a strong product focus, multifunctional teams of broadly skilled people, and extensive cross-functional communication and influence" [15, p. 256].

Fostering Flexibility During New Product Development

R&D role flexibility seems to occur more frequently in more formalized project teams (Table 2). We observed this same result in the US pilot study. During the workshop sessions with the participating Belgian companies, the marketing and R&D managers readily acknowledged that one of their primary concerns is to bring the R&D engineer in direct contact with the customer. Thus, out-of-role behaviors may not be spawned so much by individual dissatisfaction with the inflow of information [52] as by the formal planning of project team activities (cf. the Japanese "rugby approach," [72]).

Japanese companies employ highly flexible role schemes [47]. The European and American organizational cultures probably defy the Japanese ideas of continuous job rotation. Although the necessity of cross-functional skills of innovation personnel has been stressed very often in the recent literature on innovation management [6, 35, 48, 56], it still remains a rather controversial issue.

- Consider how George M. C. Fisher (president and CEO of Motorola) replied to the question of rotation between technological and commercial jobs. "We haven't done much of that, and I think it would be a mistake. Serious salespeople can't go in and out of technologist jobs, even if they have an engineering degree. . . . Likewise, serious technologists, who want to pursue technology as a career, would feel there's no benefit to being in sales. They are going to lose momentum. People get on a track early in their careers. It's just not effective to cross those tracks" [4, p. 108].
- By contrast, note how Paul Cook (CEO of the Raychem Corporation) views the matter. "You can't understand the market unless you get your technologists to the customer in a deep and sustained way. Your sales force, the traditional link to the customer, only gets you part of the way. It can open doors and find opportunities, but it really can't solve the customer's problems. And you can't pass the details of what the customer needs through the filter of the salesperson" [73, p. 104]

Given European and American organization cultures, the Japanese ideas of continuous job rotation are probably very hard to realize. As we have shown, *role flexibility* stimulates information flows between

marketing and R&D personnel. R&D personnel *can* assume marketing responsibilities like contacting and informing customers. In some companies, R&D engineers are in direct contact with the market on an almost constant basis. It is in this context that a Belgian R&D director of the subsidiary of a German manufacturing company talked about "automatic marketing." His R&D engineers are constantly running product tests with their prospective customers. The new applications these engineers test at those production facilities induce genuine interest on behalf of the production managers.

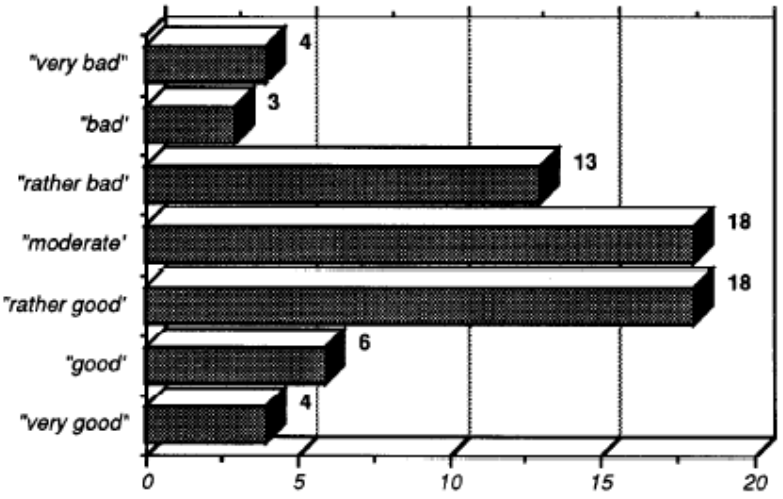

Figure 4. The quality of the climate between R&D and marketing during product development. The figure summarizes the results of sixty-six of seventy-one analyzed projects on the measures of the interfunctional climate during their development (five projects had a missing value code). The labels above contain the following scores (see Appendix): "very bad": $1 < x < 2$; "bad": $2 < x \leq 2.5$; "rather bad": $2.5 < x \leq 3$; "moderate": $3 < x \leq 3.5$; "rather good": $3.5 < x \leq 4$; "good": $4 < x \leq 4.5$; "very good": $4.5 < x \leq 5$.

There are also some industries in which marketing personnel with a strong technical background assume R&D responsibilities. The industrial chemicals and the automotive coatings industry are very good examples of such types of marketing behavior. In the Belgian subsidiary of a US automotive coating company, the marketing director emphasized that "when the pressure becomes too hectic in the R&D lab, some of the marketing professionals provide support by conducting technical product tests. This is an excellent way to keep the two parties up to date about past results, actual problems and opportunities, and future trends in their respective markets and technologies."

Conclusion

Although most of the studies on the R&D-marketing interface have traditionally emphasized the role of communication, this construct has seldom been explicitly modelled or measured [61]. Communication is a prime feature of organizing and corporate effectiveness [64, p. 7]. By investigating the communication interface between two functions whose integration has been shown to have a large impact on innovation success, the present article contributes to a better understanding of the forces that drive innovation success.

This article has investigated the communication interface between R&D and marketing during the development of technological product innovations The present research has explored the information

processing interpretation of interfunctional communication [54]. Theoretical advancement in a particular area can be greatly stimulated by metaphorical reasoning [22]. This metaphorical reasoning has helped us to develop new concepts (e.g., role flexibility), revive attention for existing concepts (e.g., project formalization and centralization), and link them into a propositional model.

Project formalization and decentralization, good interfunctional relations, and the degree of R&D and marketing role flexibility increase communication flows between R&D and marketing. However, only project formalization and the quality of the interfunctional climate were found to have a significant effect on project success. This suggests that other metaphors may be useful in the analysis of the R&D-marketing interface. In thinking about the decision making and implementation dimensions of organizational behaviors, we note that metaphors such as organizations as either machines or even psychic prisons [54] may be used to generate original insights.

Although the present research method has attempted to improve the existing practices within the field of innovation studies, there are many opportunities for significant methodological improvements. An action-oriented research method will generate the needed longitudinal insights of the effects of integration mechanisms on project outcomes. Such an approach may also help uncover some of the interdependencies between the integration mechanisms. The effectiveness of some cross-functional techniques (e.g., quality function deployment), human resource approaches (e.g., job rotation), and organizational and structural interventions (e.g., self-contained project teams) may indeed depend strongly on each other. Furthermore, the feedback roundtables used here suggested that the contributions of interdisciplinary strategic planning activities and the needed qualities of project leaders are not yet thoroughly understood.

The authors gratefully acknowledge financial support from the KM Doctoral Fellowship Program (ICM, Brussels, Belgium) and the Research Foundation of the University of Ghent (Research grant no. 01110692). An earlier version of this article was presented at the Product Development Management Association Conference on "Business Success through New Product Success" (Boston, MA, October 1991). 'The authors wish to thank two anonymous JPIM referees and Thomas P. Hustad for their helpful comments on an earlier version of this paper.

References

1. Anderson, P. F. Marketing, strategic planning and the theory of the firm. *Journal of Marketing* 46: 15-26 (Spring 1982).
2. Ansoff, H. I. and Stewart, .I. M. Strategies for a technology-based business. *Harvard Business Review 45*(6):71-83 (Nov-Dec 1967).
3. Aronson, E. and Carlsmith, J. M. Experimentation in social psychology. In: *Handbook of Social Psychology, Vol. II.* Lindzey and Aronson (eds.). Addison Wesley: Reading, pp. l-75, 1969.
4. Avishai, B., and Taylor, W. Customers drive a technology-driven company: An interview with George Fisher. *Harvard Business* Review 67(6): 107-I 14 (Nov-Dec1989).
5. Baroudi, J. J. and Orlikowski, W. J. The problem of statistical power in MIS research. *MIS Quarterly* 13(1):87-l06 (March 1989).
6. Bentley, K. A discussion of the link between one organization's style and structure and its connection with its market. *Journal of Product Innovation Management* 7: 19-34 (1990).
7. Bergen, S. A., Miyajima R., and McLaughlin, C. P. The R&D/ Production interface in four developed countries. *R&D Management* 18(3):201-216 (1988).

8. Bernard, H. R. and Killworth, P. D. Informant accuracy in social network data II. *Human Communication Research* 4(1):3-18 (Fall 1977).
9. Bonnett, D. C. L. Nature of the R&D/marketing co-operation in the design of technologically advanced new industrial products. *R&D Management* 16(2): 117-126 (1986).
10. Brockhoff, K. and Chakrabarti, A. K. R&D/marketing linkage and innovation strategy: Some West German experience. IEEE *Transactions on Engineering Management* 35(3): 167-174 (August 1988).
11. Bronnenberg, J. J. A. M. and Van Engelen, M. L. A Dutch test with the NewProd Model. *R&D Management* 18(4):321-332 (1988).
12. Campbell, D. T. and Stanley, J. C. *Experimental and Quasi-Experimental Designs or Research.* Rand McNally: Chicago, 1963.
13. Campbell, D. T. The informant in quantitative research. *The American Journal of Sociology* 60:339-342 (January 1955).
14. Churchill, G.A., Jr. A paradigm for developing better marketing measures of marketing constructs. *Journal of Marketing Research* 16:64-73 (February 1979).
15. Clark, K. B. and Fujimoto, T. *Product Development Performance.* Harvard Business School Press: Boston, 1991.
16. Cook, T D. and Campbell, D. T. *Quasi-experimentation. Design and Analysis Issues for Field Settings.* Houghton Mifflin: Boston, 1979.
17. Cooper, R. G. and Kleinschmidt, E. J. An investigation into the new product process. *Journal of Product Innovation Management* 3: 71-85 (1986).
18. Cooper, R. G. and Kleinschmidt, E. J. New product success factors: A comparison of 'kills' versus successes and failures. *R&D Management* 20(1): 47-63 (1990).
19. Cooper, R. G. The dimensions of industrial new product success and failure. *Journal of Marketing* 43:93-103 (Summer 1979).
20. Crawford, M. C. *New Product Management.* Homewood: Irwin, 1983.
21. Cronbach, L. J. and Meehl, P. E. Construct validity in psychological tests. In: *Problems in Human Assessment.* Jackson and Messick (eds). New York: McGraw-Hill, pp. 57-77, 1967. Originally published in *Psychological Bulletin* 52: 281-302 (July 1955).
22. Daft, R. L. Learning the craft of organizational research. *Academy of Management Review* 8(4): 539-546 (1983).
23. Davis, S. M. and Lawrence, P. R. Problems of matrix organizations. *Harvard Business Review* 56: 131-142 (May-June 1978).
24. De Brentani, U. Success and failure in new industrial services. *Journal of Product Innovation Management* 6: 239-258 (1989).
25. Dean, J. W, Jr. and Susman, G. I. Organizing for manufactural design. *Harvard Business Review* 67(1): 28-36 (January-February 1989).
26. Deshpande, R. and Zaltman, G. Factors affecting the use of market research information: A path analysis. *Journal of Marketing Research* 19: 14-31 (February 1982).
27. Dewar, R. D., Whetten, D. A., and Boje, D. An examination of the reliability and validity of the Aiken and Hage scales of centralization, formalization, and task routineness. *Administrative Science Quarterly* 25 (1): 120-128 (March 1980).
28. Dwyer, L. and Mellor, R. *New Product Process Activities of Australian Manufacturing Firms.* Working paper. Sydney: University of Western Sydney (Macarthur School of Business and Technology), 1989.
29. Florida R., and Kenney, M. *The Breakthrough Illusion.* Basic Books, 1990.
30. Galbraith, J. *Designing Complex Organizations.* Reading: Addison-Wesley, 1973.
31. Gibson, J. L., Ivancevich, J. M., and Donnelly, J. H. *Organizations: Behavior, Structure, Processes* (6th ed.). Plano, TX: Business Publications, 1988.
32. Ginn, M. E. and Rubenstein, A. H. The R&D/production interface: A case study of new product commercialization. *Journal of Product Innovation Management* 3: 158-170 (1986).
33. Gobeli, D. H. and Rudelius, W. Managing innovation: Lessons from the cardiac-pacing industry. *Sloan Management Review* 26:29-43 (Summer 1985).
34. Gupta, A. K and Wilemon, D. Why R&D resists using marketing information. *Research-Technology Management* 31(6): 36-41 (Nov.-Dec. 1988).
35. Gupta, A. K. and Wilemon, D. Improving the R&D/marketing relations: R&D's perspective. *R&D Management* 20(4): 277-290 (1990).
36. Gupta, A. K. and Wilemon, D. The credibility-cooperation connection at the R&D-marketing interface. *Journal of Product Innovation Management* 5:20-31 (1988).
37. Gupta, A. K., Raj, S. P., and Wilemon, D. A model for studying the R&D-marketing interface in the product innovation process. *Journal of Marketing* 50:7-17 (April 1986).

38. Gupta, A. K., Raj, S. P., and Wilemon, D. R&D and marketing dialogue in high-tech firms. *Industrial Marketing Management* 14: 289-300 (1985).
39. Hall, R. H., Haas, J. E., and Johnson, N. J. Organizational size, complexity, and formalization. *American Sociological Review* 32(6): 903-912 (December 1967).
40. Hamel, .G. and Prahalad, C. K. Strategic intent. *Harvard Business Review* 67: 63-76 (May-June 1989).
41. Hays, W. L. *Statistics (3rd Ed.). New* York Holt, Rinehart & Winston, 1981.
42. Henkel, R. E. *Tests of Significance.* Beverly Hills: Sage, 1976.
43. Kerlinger, F. N. *Foundations of Behavioral Research (3rd Ed.).* Holt, Rinehart & Winston: New York, 1986.
44. Killworth, P. D. and Bernard, H. R. Informant accuracy in social network data. *Human Organization* 35(3): 269-286 (Fall 1976).
45. Lawrence, P. R. and Lorsch, J. W. Differentiation and integration in complex organizations. *Administrative Science Quarterly* 12: 1-47 (June 1967a).
46. Link, P. L. Keys to new product success and failure. *Industrial Marketing Management* 16: 109-118 (1987).
47. MacDowall, J. The technology innovation system in Japan. *Journal of Product Innovation Management* 2: 165-172 (1984).
48. Maidique, M. A. and Hayes, R. H. Executive leadership and the management of innovation and change. In: *Readings in the Management Innovation (2nd Ed.),* M. L. Tushman and W. L. Moore (eds.). Cambridge, MA: Ballinger, pp. 689-704, 1988.
49. McTavish, R. Approaching the new product organization problem: Favour flexibility and variety of attack. *European Journal of Marketing* 18(6/7): 30-42 (1984).
50. Millman, A. F. Understanding barriers to product innovation at the R&D/marketing interface. *European Journal of Marketing* 16(5): 22-34 (1982).
51. Moenaert, R. K. and Souder, W. E. An analysis of the use of extra functional information by marketing and R&D personnel review and model. *Journal of Product Innovation Management* 7(3): 213-229 (September 1990).
52. Moenaert, R. K. and Souder, W. E. An information transfer model for integrating marketing and R&D personnel in new product development projects. *Journal of Product innovation Management* 7(2): 91-107 (June 1990).
53. Monteleone, J. P. How R&D and marketing can work together. *Research Management* 19(2): 19-21 (March 1976).
54. Morgan, G. *Images of Organization.* Beverly Hills: Sage Publications, 1986.
55. Mowery, D. and Rosenberg, N. The influence of market demand upon innovation: A critical review of some recent empirical studies. *Research Policy* 8: 102-I 53 (1979).
56. Nevens, T M., Summe, G. L., and Uttal, B. Commercializing technology: What the best companies do. *Harvard Business Review* 68(3): 154-163 (May-June 1990).
57. Nunnally, J. C. *Psychometric Theory.* McGraw-Hill: New York, 1967.
58. Nystrom, H. Product development strategy: An integration of technology and marketing. *Journal of Product Innovation Management* 2:25-33 (1985).
59. Pavitt, K. Sectoral patterns of technical change: Towards a taxonomy and a theory. *Research Policy* 13: 343-373 (1984)
60. Phillips, L. W. Assessing measurement error in key informant reports: A methodological note on organizational analysis in marketing. *Journal of Marketing Research* 18: 395-415 (November 1981).
61. Pinto, M. B. and Pinto, J. K. Project team communication and cross-functional cooperation in new program development. *Journal of Product Innovation Management* 7: 200-212 (September 1990).
62. Prahalad, C. K. and Hamel, G. The core competence of the corporation. *Harvard Business Review* 68: 79-91 (May-June 1990).
63. Riggs, H. E. *Managing High-Technology Companies.* Belmont, CA: Lifetime Learning Publications, 1983.
64. Rogers, E. M. and Agarwala-Rogers R. *Communication in Organizations.* New York Free Press, 1976.
65. Rogers, E. M. *Diffusion of Innovations (3rd Ed.). New* York: Free Press, 1983.
66. Rothwell, R., Freeman, C., Horlsey, A., Jervis, V. T P., Roberson, A. B., and Townsend, J. SAPPHO updated-project SAPPHO phase II. *Research Policy* 3: 258-291 (1974).
67. Ruekert, R. W. and Walker, O. C., Jr. Interactions between marketing and R&D departments in implementing different business strategies. *Strategic Management Journal* 8: 233-248 (1987).
68. Ruekert, R. W. and Walker, O. C., Jr. Marketing's interaction with other functional units: A conceptual framework and empirical evidence. *Journal of Marketing* 51 : 1-19 (January 1987).
69. Souder, W. E. and Moenaert, R. K. Integrating marketing and R&D project personnel within innovation projects: An information uncertainty model. *Journal of Management Studies* 29(4): 485-512.
70. Souder. W. E. *Instruments Package.* Technology Management Studies Institute: Pittsburgh, 1986.
71. Souder, W. E. *Managing New Product Innovations.* Lexington MA: Lexington Books, 1987.

72. Takeuchi, H. and Nonaka, I. The new product development game. *Harvard Business Review* 64: 137-146 (Jan-Feb 1986).
73. Taylor, W. The business of innovation: An interview with Paul Cook. *Harvard Business Review* 68(2): 97-106 (March-April 1990).
74. Van Dierdonck, R. The manufacturing/design interface. *R&D Management* 20(3): 203-209 (1990)
75. Vanden Abeele, P. and Christiaens, I. Strategies of Belgian high-tech firms. *Industrial Marketing* Management 15: 299-308 (1986).
76. Weinrauch, D. J. and Anderson, R. Conflicts between engineering and marketing units. *Industrial Marketing Management* 11: 291-301 (1982).
77. Young, C. H. Effective management of research-market teams. *Research Management* 22(2):7-12 (March 1979).
78. Zirger, B. J. and Maidique, M.A. A model of new product development: An empirical test. *Management Science* 36(7): 867-883 (July 1990).

Appendix: Questionnaire Items (for the R&D Respondent)

For reasons of conciseness, we have reproduced the items that had to be answered by the R&D respondent. The items for the marketing respondents were a "mirror image" of the R&D items, with some necessary small changes (e.g., for role flexibility). The order of the items has been randomized. The complete measurement instrument is available from the first author.

Project Centralization

Cronbach alpha R&D respondents = 0.85; Cronbach alpha marketing respondents = 0.84.

1. Communication between R&D and marketing can be centralized or decentralized. In a centralized setting, communication between R&D and marketing occurs mainly through the leaders in respectively R&D and marketing. In a decentralized setting, everybody involved from R&D talks with everybody involved from marketing: superiors as well as project personnel communicate directly with each other. .How was the communication between R&D and marketing for this project during the development? (five point scale: completely decentralized . . . completely centralized)
2. How frequently were there informal, direct person-to-person contacts between the project personnel in R&D and the project personnel in marketing during the development of this product? (six point scale, inversely coded: basically never . . once a day)
3. Communication between R&D and marketing during the development stage was mainly limited to an interaction at the top-level of our company (five point scale: strongly disagree . . . strongly agree)
4. The important decisions during the development stage were taken by the top people of the company (ibidem)
5. The exchange of information between R&D and marketing occurred at all levels during the development: top, middle-management, as well as project members (ibidem, inversely coded)
6. During the development stage, R&D and marketing communicated mainly through their superiors (ibidem)
7. A lot of informal, face-to-face contacts took place at all levels between R&D and marketing during the development stage (ibidem, inversely coded)

Project Formalization

Cronbach alpha R&D respondents = 0.82; Cronbach alpha marketing respondents = 089.

1. To coordinate the activities between the marketing and the R&D personnel during the development stage of this project, to what extent were formal communication channels followed? (five point scale: to a very little extent . . . to a very great extent)
2. To coordinate activities between the R&D and the marketing personnel during development, to what extent had standard operating procedures been established (e.g., rules, policies, forms, monthly meetings, etc.)? (ibidem)
3. To what degree had the terms of the co-ordination between R&D and marketing concerning the development of this product, been explicitly verbalized and written down? (ibidem)
4. R&D was given very specific jobs to do during the development of this project. (five point scale: strongly disagree . . . strongly agree)
5. The development stage was totally unstructured: everybody was allowed to do almost as he pleased. (ibidem, inversely coded)

6. There were precise dates for the start and the completion of the activities to be undertaken during the development stage. (ibidem)
7. During the development stage, project progress was monitored by means of formal procedures (milestones, budgets, actions undertaken). (ibidem)
8. The development stage proceeded by means of a well-documented plan of action. (ibidem)

Interfunctional climate between R&D and marketing

Cronbach alpha R&D respondents = 0.86; Cronbach alpha marketing respondents = 0.76.

1. How would you describe the relation between the R&D and marketing personnel during the development of this project? (five point scale: very bad . . very good)
2. To what extent did the involved R&D and marketing personnel trust one another? (five point scale: to a very little extent . . . to a very great extent)
3. The relationship between R&D and marketing was excellent. (five point scale: strongly disagree . . . strongly agree)

Role Flexibility

Cronbach alpha R&D role flexibility = 0.83; (obtained from marketing questionnaire): Cronbach alpha marketing role flexibility = 0.87 (obtained from R&D questionnaire).

1. Marketing personnel can perform tasks which are actually R&D in nature (check patents, run product tests, analyze products of the competition, . . .). How often did the marketing team members perform R&D roles during the development of this product? (five point scale: never . . . very often)
2. Also marketing can gather and contribute technological information to the innovation team. How often has important technology related information been contributed by the marketing personnel during the development stage of this project? (ibidem)
3. The marketing project members had a strong technical orientation, and they sometimes assumed R&D responsibilities and tasks. (five point scale: strongly disagree . . . strongly agree)
4. Some of the marketing project members also performed technical tasks during the development of this project. (ibidem)

Information Received

Cronbach alpha R&D respondents = 0.92; Cronbach alpha marketing respondents = 0.94.

1. During the development of this project, how good was R&D's insight of what everybody from marketing involved with this project was actually doing on this project? (five point scale, inversely coded: very good insight . . . very poor insight)
2. Your colleagues within marketing all performed specific activities during the development of this product. How much of all the activities the marketing personnel did during the development stage were known by R&D? (five point scale, inversely coded: all marketing activities known . . not one marketing activity was known by us)
3. During the development, how frequently were the R&D personnel updated of what marketing was doing on this project? (five point scale: never . . . very often)
4. How often did R&D receive commercial information related to this project from marketing? (ibidem)
5. During the development stage, how well was R&D kept informed and updated of the findings by the marketing project members? (five point scale: very poorly . excellent)
6. If 100% represents a measure of the total amount of commercial information your marketing colleagues possessed, how much did your marketing colleagues actually transfer to R&D during development? (six point scale: 0 % . . . 100 %)
7. Marketing updated us very accurately of their activities during the development stage of this project. (five point scale: strongly disagree . . . strongly agree)
8. Marketing gave us very little commercial information during the development stage. (ibidem, inversely coded)

Commercial Success of the Innovation Project

1. How would you describe the commercial success of this project? (five point scale: very unsuccessful . . . very successful)
2. *(This item was included in the marketing and the R&D questionnaire.)*

3. To what extent did the project achieve the initial commercial objectives and expectations? (five point scale: far below objectives . . . far above objectives)

(This item was only included in the marketing questionnaire.)

Thus, the final measure consists of three items, two asked of the marketing respondent (items I and 2), and one asked of the R&D respondent (item 1). The Cronbach alpha of the final measure = 0.91

BIOGRAPHICAL SKETCHES

Rudy K. Moenaert, a licentiate in applied economic sciences and MBA (University of Antwerp) holds a doctorate from the University of Ghent (summa cum laude). He teaches at the Free University of Brussels (Belgium) and the Delft University of Technology (the Netherlands). His present research focuses on the international management of product innovation, the integration of R&D and marketing, and the strategic management of technology. In addition to being a frequent teacher in executive management training programs, he is an organizational consultant to innovating companies. Publications by Rudy Moenaert have appeared in journals such as *R&D Management,* and the *Journal of Management Studies.* This is his third contribution to the *Journal of Product Innovation Management.*

William E. Souder holds the Alabama Eminent Scholar Endowed Chair in the Management of Technology at the University of Alabama in Huntsville (UAH). He is the Founder and Director of the Center for the Management of Science and Technology, Professor of Management Science, and Professor of Engineering at UAH. He also presently holds adjunct professorships at the University of Pittsburgh and the Georgia Institute of Technology. He has twelve years of laboratory and management experience as a chemist and an engineer, seven years of laboratory research service with the US government, and twenty years of full-time teaching experience at three universities. Dr. Souder has published over 100 research papers and five books. He serves on the editorial board of several journals and is a consultant to many Fortune 500 firms as well as several government agencies. His areas of expertise are in the management of research, development, engineering, and innovation. He is the principal investigator in an ongoing international study (Interprod) of new product success/failure factors in seven nations.

Arnoud De Meyer has a doctoral degree from the University of Ghent (Belgium). He is Professor of Technology Management at INSEAD (Fontainebleau, France). Arnoud De Meyer's main research interest is in manufacturing and technology strategy, the implementation of new manufacturing technologies, and the management of research and development. He has published in journals such as the Sloan *Management Review, IEEE Transactions on Engineering Management,* the *Strategic Management Journal,* and *Research Policy.* Professor De Meyer has acted as a consultant and has taught at many medium-sized and large companies throughout Europe and Southeast Asia.

Dirk Deschoolmeester holds the rank of Professor of Management and Information Systems at the Vlerick School of Management of the University of Ghent (Belgium). He has been a visiting professor at the Asian Institute of Technology (Bangkok) and the China-EEC Management Programme (Beijing). At the Vlerick School of Management, Dr. Deschoolmeester heads the Department of Management and Information Systems and the Department of Small Business Management. His research interests focus on the competitive impact of information technology, organizational entrepreneurship, and small business management. Dr. Deschoolmeester is the author of two books on the management of information technology. He has published in such journals as the *Journal of Business, R&D Management,* and *Revue de la Banque.*