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# Managing Relations Between R&D and Marketing in New Product Development Projects

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*This article examines the R&D/marketing interface conditions found within an extensive data base of new product development innovation projects. The incidence of different types of problems between these two important functions are analyzed and the effects of these observations on project outcomes are discussed. The article contains a number of recommendations for increasing the success rates of innovation projects by using a model that improves conditions at the R&D/marketing interface.*

## Introduction

Research and development (R&D) and marketing personnel depend on each other for the creation of new product innovations. Yet R&D and marketing departments have frequent misunderstandings and conflicts.

Many managers have first-hand experience with R&D/marketing interface problems and behaviors between R&D and marketing groups have been carefully studied [3,5,7–11]. However, much more information is needed about this complex and important topic. This paper examines the R&D/marketing interface conditions found at 289 new product development innovation projects. Based on these findings, strategies and guidelines are presented for improving the relationships between R&D and marketing groups.

## Methodology of This Study

This study was carried out on a comprehensive data base of life cycle information on 289 new product development innovation projects. The data were collected through ten years of intensive field research at 56 consumer and industrial product firms [7–10]. Exhibit 1 and Table 1 present the methodology and the project outcome measurement scales used in collecting that data base.

The 289-project data base contains numerous detailed descriptions and ratings of key events, activities, attitudes and behaviors of the R&D and marketing personnel who worked on each project. As part of the content analyses, statisti-

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**BIOGRAPHICAL SKETCH**

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al reduction and factor analyses of this large ata base [1,2,4], these items were reduced to 42 ttitudinal and behavioral descriptors of the &D/marketing interface. Some examples of these descriptors are "Frequency of Joint Meetings," "Frequency of Joint Customer Visits," "Degree of Perceived Need to Interact," and "Degree of Regard for the Other Party's Competency."

Each of the 289 projects was rated on each of these descriptors. Some of these ratings came directly from the instruments, while others were developed through content analyses of the interviews [1,2,7–10]. Redundancies were built in at several points. For example, the "Frequency of Joint Meetings" was primarily measured by questionnaire items that asked for the number of times per year that joint meetings were held. Details about these joint meetings were solicited during the interviews. Differences greater than 10% in the questionnaire responses of the marketing,

**Exhibit 1. About the Data Base**

*Data:* Life cycle data were collected on 289 new product development innovation projects at 53 consumer and industrial product firms [7–10]. The data collection focused on project events, with detailed attention given to organization structures, environments, climates, behavioral processes and project success/failure factors. The ultimate objective was to understand development processes for new product innovations.

*Sample of Firms:* Using published statistics, an industry by industry compilation was made of firms with significant new product activities in either consumer or industrial goods. Target firms were then randomly selected from this list, based on a compromise design that carefully considered the cost of traveling to distant sites and the need to maintain representivity on several important dimensions [7–10]. Approximately five firms were selected from each of the following ten industries: metals, glass, transportation (includes automotive and mass transit), plastics, machinery, electronics (includes computers and instruments), chemicals, food, aerospace and pharmaceuticals.

*Sample of Projects:* Using carefully specified definitions, the population of new product innovation projects initiated during the preceding five years was assembled at each firm. A random sampling of equal numbers of success and failure outcome projects was taken from these populations at each firm, while maintaining a range of types of technologies, types of innovations, degrees of difficulty of projects, central vs. divisional R&D efforts, and several other important dimensions [7–10]. Several ongoing projects whose success or failure outcomes were unknown at that time were intentionally included in this sampling. Following these procedures, approximately 10% of each firm's portfolios were selected into the 289 project sample studied here.

*Data Collection:* A total of 27 instruments, numerous telephone interviews and 584 in-depth face-to-face interviews were carried out on each project to record the life cycle histories and extract the relevant data on each of the 289 projects [7–10]. A cascading interview procedure was used to cross-validate information collected from each marketing, R&D and other subject on each project [7–10].

**Table 1. Project Outcome Measurement Scale**

| Degrees of Success | Success Outcomes: Descriptors — Technical Outcomes | Success Outcomes: Descriptors — Commercial Outcomes |
|---|---|---|
| High | Breakthrough | Blockbuster |
| Medium | Enhancement | Above expectations |
| Low | Met the specs | Met expectations |
| **Degrees of Failure** | **Failure Outcomes: Descriptors — Technical Outcomes** | **Failure Outcomes: Descriptors — Commercial Outcomes** |
| Low | Learned a lot | Below expectations |
| Medium | Gained some technology | Protected our position but lost money |
| High | Complete dud | Took a bath we won't forget |

Other Outcome

*SE* = Stopped the effort early due to poor progress

R&D and other personnel on the same project were reconciled during the interviews. As another example, the "Degree of Perceived Need to Interact" was primarily measured by asking pointed questions of the respondents during the interviews. The information from the interviews was then checked against the Likert-type scale ratings supplied on the questionnaires. Apparent disparities were resolved by returning to the subjects to clarify their responses and ratings. This type of multi-method, multitrait measurement approach is commonly used to maximize the validity of social science measurements [4].

A profile of ratings was thus developed for each of the 289 projects. Some of these profiles appeared to be very similar; others appeared to be very dissimilar. Statistical cluster analyses techniques were then applied to the profiles in order to exhaustively cluster the projects by the various types of profiles that were found [2,4].

## Seven R&D/Marketing Interface States

Using a 95% statistical significance level, seven different clusters were found from the cluster analysis. Each cluster was then labeled according to its observed items. For example, a review of the items in one cluster showed that it was characterized by a low frequency of meetings between the R&D and marketing personnel, highly specialized and organizationally separated R&D and marketing functions, and a low degree of perceived need to interact. Therefore, the label "Lack of Interaction" was coined to describe this R&D/marketing interface state of affairs. Twenty-two of the 289 projects, or 7.6% of the sample, exhibited this state. Similarly, the other states and percentages shown in Table 2 were found and accordingly labeled.

Several firms that experienced the Lack of Interaction, Lack of Communication and Too-Good Friends problems on the projects studied here avoided these states on some subsequent projects. Follow-up studies with these firms showed that they overcame these states through modest efforts. These efforts included more frequent joint meetings, joint involvements in planning proposed projects and increased sharing of information. Moreover, though these problems often lowered the organization's new product development effectiveness, they were not totally disruptive and they seldom led to major project failures. Therefore, as shown in Table 2, these problems were labeled 'mild'. By contrast, the Lack of Appreciation and Distrust problem states

**Table 2. Incidence of Harmony and Disharmony States**

| States | Percentage of Projects Experiencing Each State |
|---|---|
| Mild Disharmony | |
| Lack of interaction | 7.6% |
| Lack of communication | 6.6 |
| Too-good friends | 6.3 |
| Subtotal | 20.5 |
| Severe Disharmony | |
| Lack of appreciation | 26.9 |
| Distrust | 11.8 |
| Subtotal | 38.7 |
| Disharmony total | 59.2 |
| Harmony | |
| Equal partner | 11.7 |
| Dominant partner | 29.1 |
| Harmony total | 40.8 |
| Overall total | 100% |

vere labeled 'severe'. Follow-up studies showed hat these types of problems were not easily vercome, they usually caused operating disuptions, consumed many hours of managerial alent in moderating disputes, delayed key acions and important decisions and led to project ailures.

Many other projects were found that did not xhibit either mild or severe disharmonies. As hown in Table 2, these projects were considered o be in a 'harmony' state.

## Characteristics of the Mild Disharmony States

### *Lack of Interaction*

n this state of affairs, there were very few formal nd informal meetings between the R&D and arketing personnel. Both parties were deeply oncerned with their own narrow specialties and either saw any reason to learn more about the ther's work. Neither party saw the need for lose interaction. R&D expected marketing to se whatever they gave them, and marketing xpected R&D to create useful products.

This state resulted more from simple neglect han from any strong animosities between the arties. For example, one subject noted: "You et busy and you don't stop to think about whether or not they should know about this or hat. . . . when you have to get your part of the ob done." Another subject said: "If you don't et used to seeing each other you don't miss each ther, and if you don't think about each other you on't make any effort to get together. And you lways have to make an effort." It may be noted hat several projects experiencing the Lack of nteraction state were in older, commodity prodct firms that were attempting to develop new roduct lines. Most of these firms had no histores of close R&D/marketing interactions.

### *Lack of Communication*

n this state, the two parties purposely mainained verbal, attitudinal, and physical distances rom each other. R&D purposely did not inform arketing about their new technologies until very ate in the development cycle. Marketing purosely did not keep R&D informed about market needs. This occurred because neither party felt the other had much information of significant value. And neither felt it was important to inform the other of the details of their own work. This state was aptly summed up in the comments of one respondent. "If we told them all this, they wouldn't know what to do with it. . . . We know more about it than they do. Our best source of information comes from right here, from ourselves." Note how this state of affairs is different from the above Lack of Interaction syndrome, where the perceived urgency of pursuing their own activities caused the parties to neglect each other. Here, both parties harbored negative feelings about the worth of the other that stood in the way of interaction.

Though various causes of the Lack of Communication state were observed within the data base, two experiences repeatedly lead directly to this problem. One was the perceived theft of credit. When either party took what the other thought was undue credit for meritorious project achievements, this inevitably led to a Lack of Communication problem. The impression that the other party had taken unfair advantage was long remembered. Another experience that frequently led to the Lack of Communication state was top management's uneven use of accolades. If top management praised one party and did not praise the other, rivalry invariably developed that shut off some future communication. As one subject noted: "If we don't tell them anything, they can't go to management and take credit for it."

### *Too-Good Friends*

In this state of affairs, the R&D and marketing personnel were too friendly and maintained too high a regard for each other. They enjoyed each other's company so much that they frequently met socially, outside the work environment. These social affairs often included the individual's families, e.g., family picnics and Sunday afternoon socials were common. In most of the Too-Good Friends cases, work and social aspects were commingled, e.g., joint visits to customer facilities might also involve a round of golf and the Sunday afternoon socials always included some informal discussions of business. Each party felt that the other had their own area of

exclusive expertise, and that the other was beyond reproach. This inhibited each party from challenging the other's assumptions and judgments. Consequently, important information and subtle observations were overlooked that were significant for the project.

What factors led to this type of problem? Surprisingly, past successes sometimes led the team members to become too-good friends. Teams of R&D and marketing personnel who had worked together successfully for long periods of time often became complacent. Their potency appeared to decline once they had achieved complete harmony. Apparently, they needed some conflicts or the challenge of building harmonious relationships to maintain their alertness. A related factor was a kind of blind faith in the correctness of the counterpart person. As one respondent observed: "You are always sort of reluctant to challenge and question what your colleague tells you. He's the expert in that area. And you don't expect that he'll play politics with you, so there's no reason to question his integrity. And you figure he's the best man you've got, so he probably won't steer you wrong."

A detailed examination of the other clusters of projects showed that past successes and great faith in each other also characterized effective R&D/marketing interfaces, i.e., the Equal Partner Harmony state in Table 2. What were the distinguishing factors? The answer appears to be a matter of interpersonal dynamics. The parties to an effective interface always challenged and penetratingly questioned eath other. They appeared to enjoy and thrive on this aspect, sometimes with impish good humor. When one partner found a gap in the other's logic, both partners were suddenly energized to close that gap. Such experiences further strengthened their relationship. The partner who committed the logic gap never seemed to suffer any loss of prestige in the other's eyes. Rather, the ambience was described by one partner as "a climate where we look for flaws, and it's not important who committed the flaw. We just want to find it and work together to fix it." This is clearly a different climate from the above Too-Good Friends state.

It should be noted that such professional disagreements and challenging behaviors, that often characterize effective R&D/marketing interfaces, may give the outside observer the mistaken impression of disharmony and strife. Professional disagreement appears to be a very healthy and enlightening climate for its members. At times, such disagreements may seem to become very heated and destructive. Yet if these discussions are confined to the issues and do not become personally threatening to the participants, they can actually strengthen the R&D/marketing interface. Thus, it is the lack of professional disagreement (Too-Good Friends) that constitutes disharmony, and not its presence.

## Characteristics of the Severe Disharmony States

### *Lack of Appreciation*

This state was characterized by strong feelings that the other party was relatively useless. Marketing felt that R&D was too sophisticated, while R&D felt that marketing was too simplistic. Marketing felt that R&D should be prohibited from visiting customers because they would talk over their heads. R&D felt that marketing did not have a good grasp of the market needs. In this state, the marketing groups often purchased their R&D work outside the firm rather than use the in-house R&D group. R&D often independently moved ahead with its own ideas, by-passing marketing and attempting to launch their own new products. These efforts seldom succeeded, and the failures were usually rationalized by the R&D personnel as marketing's fault for failing to assist them!

What caused the Lack of Appreciation? No single cause was identified. Some cases had long remembered histories of ineffectiveness by one party, e.g., R&D failed to develop the promised product or marketing failed to correctly identify the market. Sometimes, the organizational climates fostered a lack of appreciation. For example, several respondents indicated that they "never see any signals from management that collaboration is desired." Other respondents noted that "management has not indicated that we are expected to cooperate with them." It is interesting that management must make a special effort to encourage cooperation: it does not seem to be automatic.

The organization of R&D and marketing into separate departments with separate budgets and operations often fostered a lack of appreciation.

s evidence, consider the following sampling of atements from personnel at five firms in the ack of Appreciation state. "We don't have any iputs into their plans and budgets". "They have ieir own operations and so do we". "We get our :wards from doing our thing and they get theirs om something else". "No one is responsible for ow it all comes together". "We just go our :parate ways."

*istrust*

istrust is the extreme case of deep-seated jealusies, negative attitudes, fears and hostile beaviors. In this state of affairs, marketing felt that &D could not be trusted to follow instructions. &D felt they were blamed for failures, but iarketing was credited for successes. Several &D groups in this state feared that marketing anted to liquidate them. R&D lamented that iarketing often attempted to dictate exactly hat, where, when and how to do the project, lowing no room for rebuttal and no tolerance for ieir suggestions. Marketing lamented that when &D got involved the project disappeared and iey never saw it before it was completed, at hich point it was seldom what they wanted. everal cases were found where R&D initiated iany projects and kept them secret from marketig "so marketing wouldn't kill them before they iined enough strength to move along on their wn." Cases were found where marketing rought R&D into the picture only after the roduct specifications had been finalized "in or:r to avoid any arguments from R&D about how ) do it".

What caused the Distrust state? Though no ngle cause was found, several important contriiting factors were isolated. All the Distrust ises began as either a Lack of Appreciation or a ack of Communication problem that evolved to Distrust. Many of the Distrust cases were iaracterized by personality conflicts that top anagement had allowed to exist for a long time. i some cases, these conflicts had become so stitutionalized that even personnel who had not :en involved harbored feelings of Distrust. As i example, note the following quote from one :spondent, referring to his counterpart in anher department. "He once did some things to s. I'm not sure what they were. It all happened before I came into this group. So, you see, you really have to watch out for him." This type of institutionalized Distrust was found surprisingly often.

## Characteristics of the Harmony States

*Equal Partner Harmony*

In this state, each party appeared to share equally in the work loads, activities and rewards. Each party felt free to call joint meetings on almost any issue. These meetings were characterized by an open give and take of facts, opinions and feelings. No issues were left unresolved and consensus was sought by everyone. Study committees and task forces with joint memberships were common, with the task force chairmanships rotated between the R&D and marketing personnel. Moreover, it was part of the Equal Partner culture to involve R&D and marketing personnel jointly in all customer visits, customer follow-ups, customer service, new product planning and forecasting, project selection and product strategy formulation activities.

Three features were common to all the Equal Partner cases. One, the marketing personnel were technically trained. They all had undergraduate degrees in science or engineering. Two, the marketing personnel had prior careers in R&D. Thus, personnel were often successfully exchanged or rotated between the R&D and marketing functions. Three, the R&D and marketing personnel had a strong sense of joint partnership. As evidence, note the following sampling of quotes collected from R&D and marketing personnel in Equal Partner states. "We couldn't get along without them". "We're on the phone with each other constantly". "I feel like I've known them a long time". "We've been through 'thick and thin' together."

*Dominant Partner Harmony*

In this state, one of the parties was content to let the other lead. Both R&D-dominant and marketing-dominant cases were found. For example, one R&D subject in a marketing-dominant case noted: "We have no idea at all what the market needs are. But if they'll tell us what they want and supply the specs we can sure make it for

them." A marketing respondent in an R&D-dominant case said: "We can usually sell what R&D gives us. We don't really know what they are able to come up with. They know what it takes to make a good performing product better than we do."

It may be noted that the dominant partner cases seldom involved complex technologies, exacting customer needs or large R&D efforts. Most of these cases involved developmental efforts as opposed to research efforts. This reinforces the notion that problems at the R&D/marketing interface escalate as the technology or the user's environment become more complex.

## Incidence, Severity and Consequences of Disharmony

As the percentages in Table 2 show, a surprisingly high incidence of R&D/marketing disharmony was found. Nearly two-thirds (59.2%) of the projects studied here experienced some type of R&D/marketing interface disharmony. Moreover, it is especially disconcerting that over one-third (38.7%) of the projects studied here experienced severe disharmonies. These results are statistically significant at the 99.9% level of confidence (using the binomial statistical test [6]). That is, a statistically significant number of projects were found to be experiencing disharmonies. And a statistically significant number of these projects had severe disharmonies.

But is disharmony disruptive to project success? Table 3 responds to this question. Most of the Harmony projects succeeded. Partial success characterized the Mild Disharmony projects. And most of the Severe Disharmony projects failed. As noted in Table 3, these results evidence a statistically significant relationship between the degree of harmony/disharmony and the degree of project success/failure. This relationship is significant at greater than the 99.9% confidence level. Thus, these results demonstrate that the quality of the R&D/marketing interface effects the degree of success of new product development efforts.

A case-by-case examination of the data base revealed many informative details underlying the results in Table 3. In many of the projects experiencing the Too-Good Friends problem, important information was overlooked that severely diminished the effectiveness of the end products. In many of the projects experiencing the Lack of Communications problem, the new products either did not match the market needs or failed to meet some important customer specification. In about half of the projects with Lack of Interaction problems, the end products either did not perform as originally planned or arrived too late to capture a rapidly changing market. Thus, Mild Disharmonies generally depreciated the degree of success of the end products. But they seldom resulted in dismal product failures.

By contrast, in a majority of the projects experiencing Lack of Appreciation problems, the end products either failed to perform or they were not cost-effective. In many of the projects where Distrust occurred, the products did not perform at all. Thus, Severe Disharmonies resulted in a high frequency of rather dramatic failures. Moreover, it should be noted that Severe Disharmonies were very difficult to overcome. Attempts by management to ameliorate them through negotiation, reorganization, bargaining or personnel transfers often left deep scars and sowed the seeds for a renewed outbreak of similar problems elsewhere. Thus, the prognosis for firms experiencing Severe Disharmonies is unusually pessi-

**Table 3. Distribution of Project Outcomes by Harmony/Disharmony States**

| States | Percentage of Projects in Each State Exhibiting Each Outcome[a] | | |
|---|---|---|---|
| | Success | Partial Success | Failure |
| Harmony | 52% | 35% | 13% |
| Mild disharmony | 32 | 45 | 23 |
| Severe disharmony | 11 | 21 | 68 |

$\chi^2$ statistic = 88.84, $C$ = .61, significant at <.001[b]

[a] The following definitions are used, based on Table 1:
Success= High plus Medium Degrees of Commercial Success (Blockbuster plus above Expectations)
Partial Success= Low Degree of Commercial Success plus low Degree of Commercial Failure (Met Expectations plus Below Expectations)
Failure= Medium plus High Degrees of Commercial Failure (Protected Our Position But Lost Money, plus Took a Bath We won't Forget)

[b] For details on the $\chi^2$ and contingency correlation statistics see, Sidney Siegel, *Nonparametric Statistics for the Behavioral Sciences*. McGraw-Hill: New York, 1956. pp. 196–202. Note that the statistical tests were run on the absolute numbers and not on the percentages.

nistic. Once they appear, their persistence can loom the firm's new product success rate for a ong time.

Thus, these results show that the incidence and seriousness of R&D/marketing interface problems are distressingly high. Moreover, many of hese problems are chronic, persistent, difficult to correct and seriously detrimental to new product success. These results are both surprising and disappointing. In spite of previous awareness and study of these problems [3,5,7–11], they still persist.

The reader is cautioned to use some care in nterpreting these results. As mentioned above in connection with the discussion of the characteristics of the various R&D/marketing interface states, disharmony is a complex facet of human behavior. Professional disagreements, that may appear disharmonious to a casual observer, are often a sign of a very healthy and harmonious nterface. The strong statistical relationships found here between disharmony and success do not mean that every disagreement and all apparent disharmonies are bad. One must be very careful in defining what constitutes real disharmony. In fact, the results show that a lack of professional disagreement (Too-Good Friends) may indicate disharmony. Thus, the reader is cautioned to use these results in the context of the definitions of the R&D/marketing states set forth here.

## Eight Guidelines for Overcoming Disharmony

An analysis of the projects in the data base revealed eight practices that alleviated R&D/marketing interface problems. These practices are summarized in Exhibit 2.

Each of these eight practices reflects an actual experience of one or more firms in the data base. The users contended that the practice significantly increased the harmony of their R&D/marketing interface. In every case, these contentions were borne out by the data. The firm's interface became more harmonious after the practice was implemented.

Each guideline in Exhibit 2 is effective for managing innovations because it pushes the R&D and marketing parties into a more collaborative, partnership role. The guidelines create conditions in which disharmonies are discouraged and harmonious behaviors are encouraged. Unfortunately, the guidelines do not provide much information about where and when they should be used. For example, when is it best to use guideline #8 (decision authority clarification)? Should guideline #8 always be used, on every project? In order for managers to intelligently apply the guidelines, a framework is needed for analyzing the role needs of the situation and for selecting the guidelines that best meet that need. The Customer–Developer–Conditions (CDC) model depicted in Table 4 is such a framework.

## Framework for Integration: The CDC Model

A detailed examination of the data base revealed some new product customers with little awareness of their own needs. Other customers understood their needs but were unable to translate them into product specifications. Still other customers were highly sophisticated: they could

**Exhibit 2. Guidelines for Improving Relations Between R&D and Marketing**

1. *Break Large Projects into Smaller Ones.* Three-fourths of the projects with nine or more persons assigned to them experienced interface problems. By contrast, projects with five or fewer persons assigned to them seldom experienced problems. The smaller number of individuals and organizational layers on the small projects permitted increased face-to-face contacts, increased empathies and easier coordination.

2. *Take a Proactive Stance toward Interface Problems.* In those cases where potential interface problems were avoided and actual problems were overcome, the parties maintained a posture of aggressively seeking out and facing such problems head-on. They openly criticized and examined their behaviors. As one individual noted: "We don't treat it like a social disease and sweep it under the rug. If we got it, we want to know about it so we can get rid of it."

3. *Eliminate Mild Problems before They Grow into Severe Problems.* All the cases of severe (Lack of Appreciation and Distrust) problems studied here began as mild problems at some earlier points in time. As noted elsewhere in this paper, severe disharmonies were extremely difficult to eliminate. Mild disharmonies were much easier to overcome. Thus, it is wise to eliminate mild problems while they are still mild.

4. *Involve Both Parties Early in The Life of The Project.* Much has been said and written about the benefits from participation and early involvement of the R&D and marketing parties in decision processes [3,5,10,11]. The results here reinforce the conclusion that when R&D and marketing are joint participants to all the decisions, from the start of the project to its completion, Lack of Appreciation and Distrust are lessened.

5. *Promote and Maintain Dyadic Relationships.* A dyad is a very powerful symbiotic, interpersonal alliance between two individuals who become intensely committed to each other and to the joint pursuit of a new product idea [10,11]. Dyads are fostered any time persons with complementary skills and personalities are assigned to work together and given significant autonomy. Dyads are worth promoting not only because they encourage innovation in particular cases, but because they can become the kernel of a much wider circle of interrelationships between R&D and marketing. A successful dyad composed of an R&D person and a marketing person will draw other R&D and marketing personnel onto their bandwagon.

6. *Make Open Communication an Explicit Responsibility of Everyone.* This was dramatically illustrated by the Open Door policy at one of the firms in the data base that had a history of poor R&D/marketing interfaces. This policy consisted of quarterly information meetings between R&D and marketing, day-long and week-long exchanges of personnel, periodic gripe sessions, and the constant encouragement of personnel to visit their counterparts. Every employee was formally charged with the responsibility of playing a role in this Open Door policy. Moreover, each employee's success in meeting this responsibility was formally evaluated at the end of each quarter. The open-door policy survived the initial skepticism that surrounded it, and the examples set by a few diligent individuals eventually spread.

7. *Use Interlocking Task Forces.* A vivid illustration of the use of interlocking task forces was provided by one firm in the data base. The top-level task force or steering committee consisted of the company president, the vice presidents of R&D, marketing, and finance, the project coordinator, the R&D task force leader and the marketing task force leader. The marketing and R&D task force memberships changed as the project metamorphosed over its life cycle. In the early stages of the project, phenomenological research work was carried out by Ph.D. scientists. Application oriented scientists gradually replaced them as the project aged. Finally, engineering personnel replaced them. This interlocking task force structure was repeatedly successfully used by this firm to foster R&D/marketing harmony and new product development success.

8. *Clarify the Decision Authorities.* The decision authority is a kind of charter between R&D and marketing. It governs and guides the R&D/marketing venture by detailing who has the right to make what decisions, under which circumstances. For example, at one firm the policy specified that marketing had the sole authority and responsibility for defining the user's needs. R&D had the ultimate authority and responsibility for selecting the technical means to meet these needs. R&D and marketing were given the joint responsibility for deciding when an adequate product had been defined. Complaints and appeals to top management could not be made unilaterally by either party. Top management only entertained an audience composed of both parties. A decision authority policy, as well as the group process of developing such a policy, can contribute enormously to clarifying the roles between R&D and marketing. Well-developed decision authority policies were observed at several firms. They fostered a sound foundation for the avoidance of many time-consuming conflicts.

**Table 4. Customer–Developer Conditions (CDC) Model**

| | | | | Customer's Level of Sophistication | | |
|---|---|---|---|---|---|---|
| | | | | High | Need Awareness and translation abilities | Low |
| | | | | Understands own needs and can translate them into product specifications | Understands own needs but can't translate them into product specifications | Does not understand own needs |
| R&D's Level of Sophistication | Product knowhow and means knowhow | High | Understands the product specification and the technical means to develop new products | *A* | *B* | *C* |
| | | | Understands the technical means but does not understand the product specification | *D* | *E* | *F* |
| | | | Understands the product specification but not the technical means to develop it | *G* | *H* | *I* |
| | | Low | Does not understand either the technical means or the product specification | *J* | *K* | *L* |

specify precisely what they needed and they could write a complete set of exact product specifications that met those needs. Analogously, the data base revealed some R&D groups that possessed a detailed understanding of the forms and specifications of most types of new products and the technical means to create them. Other R&D groups were found that did not have these high levels of sophistication. They possessed extensive knowledge of product forms, but they lacked the technical means to create them. Still other R&D groups were found that were technically astute, but lacked the know how to convert their knowledge into successful new products.

The Customer–Developer–Conditions (CDC) model depicted in Table 4 evolved from an awareness of these facets. Two variables describe the customer's level of sophistication: need awareness (the customers' awareness of their own needs) and translation abilities (the customers' ability to communicate their needs). Two variables describe R&D's level of sophistication: product know how (R&D's understanding of products) and means know how (R&D's technical sophistication). Each of these variables can be scaled on a continuum from low to high, as indicated in Table 4. Taken together, these variables create various conditions or cells. Each cell dictates the roles that must be played for success under those cell conditions. Though many cells are possible, only twelve characteristic cells are shown here for illustration in Table 4. This version of the CDC model depicts R&D and the customer. Other versions can depict other parties within the new product development process [10].

### *Twelve Cells and Their Implications*

Customers who reside in Cell *A* are highly sophisticated. They know exactly what they want and can state precisely what will satisfy their needs. R&D groups who reside in cell *A* are also sophisticated. Once the customer informs them of the needs, they can immediately use their superior knowledge to make the desired product. Thus, cell *A* is a case where R&D should lead marketing, e.g., a Dominant Partner Harmony case.

Customers who reside in cell *B* fully understand their own needs, but are unable to translate them into product specifications. A translator is needed. Here is a role for the professional marketer. However, marketing personnel cannot perform this role without continuously interacting with R&D. The customer's needs will normally only be revealed through a series of repetitive activities: need translation, development of prototypes based on these translations, customer trial of prototype, translation of newly discovered needs from this trial, development of modified prototype based on these needs, trial of modified prototype, etc. Thus, cell *B* is a case where marketing should lead R&D, e.g., another Dominant Partner Harmony case.

Based on the experiences of the firms in the data base that developed successful Dominant Partner climates, guidelines #1–#4 in Exhibit 2 should be used in cells *A* and *B*. These guidelines appear to be the most appropriate ones for evoking the required roles between R&D and marketing under the Dominant Partner model. The information in the data base suggests that when management takes an active role in explaining the nature of the conditions in cells *A* and *B*, and when management consistently uses guidelines #1 through #4, Dominant Partner climates can be maintained. Personnel at most of the Dominant Partner field sites examined here quickly accepted and played the appropriate roles when the conditions in cells *A* and *B* were fully explained to them, and the rationales for the Dominant Partner model became obvious to them. It may be noted that some dissatisfied personnel at one firm in the data base voluntarily left when the management dedicated that firm to a Dominant Partner climate. However, dissensions between R&D and marketing diminished and product success rates rose at this firm after this change.

In Cell *C*, the customers do not understand their needs and cannot therefore translate them into product specifications. Marketing professionals are needed to help the customer define needs and help the customer translate these needs into product specifications. Cell *C* thus places great demands on the joint R&D/marketing interface. Close collaboration between marketing and R&D are mandatory in order to fully understand the user's technical environments, define the user's needs and describe the user's motives. A strong willingness of the R&D and marketing parties to share information and generally act like a team is required for success in

cell *C*. To achieve and maintain these roles, guidelines #1–#5 in Exhibit 2 appear to be necessary. For example, one firm in the data base experienced repeated problems in transferring accurate information on customer requirements between its marketing and R&D departments. To correct this, it used a dyad (guideline #5). The firm appointed two counterpart project coordinators, one in the marketing department and one in the R&D department. These coordination jobs were staffed with two younger individuals who had worked together before and who had established a strong, long-standing interpersonal relationship (a dyad). Though neither person was a logical choice for these jobs on the basis of their technical knowledge, their personalities and their harmony in working together effectively eliminated the communication problems.

In cells *D*, *E* and *F*, R&D has lower product form sophistication than in the corresponding cells *A*, *B* and *C*. Here, R&D is technologically adept in the underlying sciences and skilled in the relevant engineering disciplines, but unsure about using these skills to achieve want-fulfilling products. Thus, marketing has a teaching function to perform in addition to their translation function. They must teach R&D the meaning of the product specifications that they translate from the customer. But they cannot do this alone. R&D must teach marketing enough about the world of R&D that the two parties can build on this shared knowledge to develop the appropriate new product. To achieve this, the use of guidelines #1 through #6 from Exhibit 2 appear to be needed. Two firms in the data base found that Open Door type policies (guideline #6) were important when it was necessary for the R&D and marketing parties to share openly and work very closely together.

Conditions in cells *G*, *H* and *I* are very different from any of those discussed above. Here, R&D needs to learn which particular means are associated with which particular end performance specifications. Learning to match means with ends requires the joint efforts of both R&D and marketing. Typically, these joint efforts will take the following form. In response to marketing's presentation of the end specifications they think are needed, R&D will inquire what these specifications imply and whether or not they can be achieved in various ways. This dialogue will often stimulate whole new ways of looking at the problem, new technical processes and new product concepts. Thus, cells *G*, *H* and *I* will require very close team relationships between R&D and marketing, along with a patient mentality that allows time for R&D to move up on their learning curve. Under these circumstances, guidelines #1 through #7 in Exhibit 2 may be needed. Guideline #6 (Open Door policies) and guideline #7 (Interlocking Task Forces) were successfully used together by six firms in the data base under the conditions of cells *H* and *I*. The dual use of guidelines #6 and #7 appears to be especially important for large projects that cannot readily be broken up (e.g., where guideline #1 isn't feasible) or where the R&D and marketing groups have not previously worked together.

In cells *J*, *K* and *L*, R&D lacks both the depth of technical knowledge and the skills to convert this knowledge into want satisfying products. These conditions demand the most effective R&D/marketing interface. Time, patience, experimentation, give and take, trial and error and sharing are vital to success under these conditions. Thus, in cells *J*, *K* and *L* all the guidelines in Exhibit 2 should be used. Guideline #8 (decision authority clarification) may be especially important in these cells.

### *Implications for Managing the R&D/Marketing Interface*

New product developers must take the time to study and assess their own levels of sophistication and the levels of sophistication of their customers for every new product they contemplate developing. This will provide them with the information to decide which cell of the CDC model they occupy in the case of that new product. The cell conditions define the roles that the R&D and marketing parties must play to succeed, and suggest which guidelines in Exhibit 2 to employ to evoke these roles. It must be noted that cell *A* is the only one where a highly developed R&D/marketing interface is not mandatory, and therefore where few guidelines are required. Since this is a relatively rare condition for new product innovations, developers who think they are in cell *A* are well advised to verify this impression.

Success in cell *L* demands great knowledge of

the relevant sciences, applications know how, user needs and user psychologies. Achieving this requires a very well developed R&D/marketing interface, which may be attained through careful attention to the use of all the guidelines in Exhibit 2.

Success in the other cells requires varying degrees of R&D/marketing integration. As outlined above, various combinations of guidelines may be used to achieve the required levels of integration.

## Summary and Conclusions

Nearly two-thirds of the 289 projects in the data base examined here experienced one of five types of R&D/marketing disharmony. The severity of disharmony was found to be statistically significantly related to the degree of success of innovation projects. Eight guidelines and a Customer–Developer–Conditions (CDC) model framework for using them were empirically developed for successfully overcoming disharmonies. Since the data base showed that severe disharmonies were extremely difficult to overcome, it is essential to prohibit their formation.

The results of this research indicate that R&D and marketing managers should jointly work together to help avoid disharmonies in seven ways. First, they should make all their personnel aware that R&D/marketing interface problems naturally occur. Second, they should encourage their personnel to be sensitive to the emergence of R&D/marketing interface problems by watching for the appearance of any characteristics of five types of disharmonies, as discussed above. Early detection is the key to their elimination. Third, managers should be especially careful to give equal credit and public praise to their R&D and marketing personnel in order to eliminate jealousies that might form a basis for severe disharmony. Fourth, R&D and marketing managers must make special efforts to reinforce in words and deeds their desire that the R&D and marketing parties collaborate. They must constantly send signals to their personnel that cooperation is essential. Fifth, managers should use teams of R&D and marketing employees at every opportunity. This will help avoid the natural impression that R&D and marketing are two separate organizational entities and cultures. Sixth, managers must not let personality clashes and other problems remain for so long that they become institutionalized into extremes of distrust. Finally, managers must also be aware that there is such a thing as too much harmony: R&D and marketing personnel can become too complacent with each other.

Outdated role concepts appear to be a major obstacle to achieving R&D/marketing harmony. This study encountered a surprising number of organization structures, organization behaviors, organizational reward systems, product strategies and new product development processes that emphasized a clear separation of roles and specialization of functions between R&D and marketing. This separation was only effective for handling simple technologies, simple markets and well defined customer needs, i.e., the Dominant Partner Harmony case. To successfully develop many types of new product innovations, R&D and marketing must work closely together. In some cases, they must work jointly with the customer in a trial and error fashion, trying various prototypes as a means to discovering the customer's real needs and the appropriate product. In other types of innovations, a true creative process is required in which new information and concepts are generated on the basis of the information shared between members of the R&D/marketing team. In still other cases, it is essential that the parties feel a strong sense of joint responsibility for setting new product goals and priorities, generating and selecting new product ideas, researching and analyzing customer wants, setting product performance requirements, and defining the new product's performance and cost trade-offs. The Customer–Developer–Conditions (CDC) model developed as a result of this research can be used to define the appropriate roles that the R&D and marketing parties must play to succeed with various types of innovations. Once these appropriate roles are defined, eight different guidelines may be implemented to eliminate disharmonies between the R&D and marketing parties.

It appears that the institutionalized roles between R&D and marketing must be radically changed before new product development success rates can significantly increase. The only effective means to permanently avoid disharmonies is for the R&D and marketing parties to

fully understand and appreciate their reciprocal roles, and to play out these roles in a true team setting. Moreover, it is essential that the R&D and marketing parties establish a team relationship that permits them to flexibly swap roles in response to evolving technologies, markets and customer needs. Unfortunately, until the dynamics of harmony/disharmony states, the CDC model's cell conditions and movements between the cells in the CDC model are more fully understood, there is no recipe for such role swapping. Each R&D/marketing team must discover what works best for them. The point is: this discovery process can only unfold when the R&D and marketing parties act like a true team.

These conclusions and recommendations are all too familiar. Many firms are not implementing the team approaches and organizational techniques that this research has once again shown to be effective. Disharmonies between R&D and marketing continue to be surprisingly prevalent, chronic and disruptive to successful new product development. These findings are discouraging, in view of the obvious importance of the topic and an emerging awareness of it.

As noted above, the lack of detailed experimental knowledge of R&D/marketing interface problems remains a barrier to their prevention. Far too little is known about what constitutes real disharmony, the distinctions between professional disagreement and disharmony, how to alter the institutionalized roles between R&D and marketing and how to implement new team approaches between R&D and marketing personnel. It is hoped that this broadbased, ex post exploratory field study may provide a convincing basis for more advanced experimental research. Perhaps these results can serve as a basis for deriving empirically based propositions and operational hypotheses, that can then be tested through interventions and administrative experiments in real organizations. The results from these experiments should eliminate the last barrier to informed actions for reducing R&D/marketing interface problems.

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