UNDERSTANDING THE TASK OF THE NEW PRODUCT TEAM

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Understanding the Task of the New Product Team

Interviews with 37 managers of teams developing new products in high technology companies suggest that teams go through predictable stages during the product development process. An understanding of these stages has implications for monitoring the progress of product development and for improving the management of new product teams.
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Pick up any text or article about new product development and you will find a set of sequential stages that organizations should follow in introducing new products. For example, Booz, Allen and Hamilton (3) take us through Idea Generation, Screening and Evaluation, Business Analysis, Development, Testing and Commercialization. Models such as these stages are useful to organizations for monitoring the progress of a new product over time and can facilitate the product development process (10). The value of such models is that they, in essence, describe what the organization must do to manage and improve the product development process.

The actual process of developing and coordinating the new product within an organization is often delegated to a new product team (4). This team becomes responsible for not only the technical aspects of the product, but also for coordinating the numerous functional areas and hierarchical levels that have information or resources necessary to make the new product a success. Descriptions of the stages of the product development process generally do not address the specific actions the new product team must take in moving from an idea to a marketable product. The lack of general descriptions of the stages through which the new product team must go to complete its assignment often make it difficult to understand and monitor the team and ultimately improve its performance.
Understanding a Team's Task

Recently, Goodman (7) has presented a strong argument for the necessity of understanding the task of a group or team as an integral part of any model of group performance. An appreciation of the specific tasks a group must complete has two implications for understanding how to improve any group's, including a new product team's, performance. First, without a clear understanding of a group's task, it is impossible to determine how activities the group undertakes contribute to its success or failure (8). Second, since the task of developing new products is unique, we cannot necessarily barrow conclusions about how to improve a new product team's performance from other types of groups, be they t-groups or sales teams.

Research indicates that groups completing complex tasks must engage in three general types of activities: technical, social and external. The first represents those activities needed to carry out the actual task the group has been assigned (8). For example a team designing a computer may have to develop a way of speeding up computation while keeping the new computer compatible with the existing product line. Another example would be deciding how the work on a project should be divided among team members. The second type of activities relate to how members actually become a team and maintain their commitment to the product and the team (12). Examples here might include the development of conflict resolution methods within the group and extent to which group loyalty is developed through informal socializing. The third refers to how the group manages its relations with other parts of the organization (5). Examples of this might
include a product team building support with manufacturing to speed up production or negotiating with top management for additional personnel.

Most general models of groups have focused on the technical and social domains, and have downplayed the importance of how the group manages relationships with other groups yet the new product development task requires a good deal of external interaction. Although a number of studies have investigated how research and development groups acquire information from others (e.g. 1,9,13,14) less research has investigated the broader set of activities such groups engage in in interacting with other groups. Understanding such activities is particularly important since the failure to do them well may contribute to such common inter-unit problems as marketing-engineering conflict, the "not invented here syndrome," and difficulties with technology transfer.

Goals of this Research

The purpose of this research is to describe the task of the new product team with particular emphasis on the external activities such teams must complete. Our goal is to describe a general model of the stages of the product development process from the perspective of the new product team. To do so, we examine the activities that new product teams perform as they create a team, gain the support and resources they need, develop a product, and ultimately transfer the ownership of that product to others in the organization. We will focus on the most difficult stumbling blocks that teams must overcome, as well as the changes teams must manage as the demands of product development shift over time. We end by offering some suggestions for managers about how
an understanding of the product development process from the team's perspective can improve new product team performance.

**Methodology**

As part of a large study on new product team performance, we interviewed 37 new product team managers at seven corporations in the computer, integrated circuit and analytical instrumentation industries. Interviews were semi-structured and ranged from one to eight hours, with an average length of approximately three hours. We asked each manager to describe, in detail, the activities that he and his team members carried out, both within and outside the group; we asked each to discuss shifts in team activities over the product development process and describe stumbling blocks that impeded progress. The interviews were tape recorded and transcribed; the transcriptions were evaluated to identify patterns of activity and transitions in the product development process.

This sample is not meant to be representative or large enough to test specific hypotheses. Rather, our goal is to ensure that we adequately describe the task and processes of the new product team and augment the current literature with observations from the field. This research strategy is chosen because we believe that research on complex tasks in organizations is at an early stage of development. Given the lack of formal research on interdependent groups within organizations, we believe that exploration and description, classification of phenomena, and attempting to identify observable patterns of activity must all precede the proposition and testing of specific hypotheses (6).
Results

Our respondents indicate that the task of product development, at least from the team's perspective, is less straightforward than the sequential phase model suggests. However, for most teams a general pattern did emerge. Two events served to divide the process and direct the new product team's activity. We refer to these events as transition points because they also mark major shifts in the activities of team members. These two transition points divide the product development process into three phases which we label: creation, development, and diffusion. The first transition point represents a shift from a "possible product" to "definite product." The second involves a transfer of the technology and product ownership from the new product team to others in the organization. For some teams, these transition points represent crises in that if the group does not meet certain critical goals its viability is threatened.

Our interviews suggest that each phase and transition point require different patterns of team functioning and different patterns of interaction with outsiders on the part of the new product team. We will illustrate the nature of the phases and transition points with excerpts from our interviews and summarize a wider range of activities found across the teams. In addition, we will integrate our data with other relevant research findings.

The Creation Phase

The first thing I did was to go to talk to lots of people to find out what they thought the product was and how to get there. This was at the technical level, what are the details, not just global suggestions. I started out with the guy who brought me here, he sent me to see someone else, and so it when that I came to talk to a lot of high- and middle-level people. The interviews were open-
ended but I pushed and maybe even taught them a few things about their concept; what it meant to produce the product they envisioned. So I gained knowledge about details of what the product ought to be, who the players were, what they did, and what they wanted.

It's not exactly clear how the whole thing got started, but then it seldom is. There were these two other projects going on, but they weren't doing too well. So, about a year ago the Product Committee decided to start this new project. We started out by having a meeting with the two old project teams, and members of the top corporate and division management. This was May and we were supposed to have this wonder machine ready to ship by January. After the two former leaders were signed up for the project I pulled in two more key people and had an initial meeting. This was the core of the group. We added a few more people and then spent a couple of weeks frittering about, reading stuff, deciding if the product was feasible. People were saying 'no way it can happen' and I was busy setting things up so we'd have a place to live. We moved in and launched into work.

Our interviewees typically reported that a large volume of activity took place across the teams boundary in this early creation phase. Most of these activities fell into one of three categories: Collecting information or resources; Modeling the organizational environment; and Building links with other groups.

Teams collect large amounts of information: technical information about what is and is not feasible and what the latest innovations have been; market information about what products are selling well and what the competition is doing; and political information about who supports the project and who does not.

In addition to collecting information, teams attempt to create models of how other groups will respond to the product. This includes forecasts of top management's response to the product concept or potential "snags" which might occur in the future.
Team leaders' reports suggest that the new product teams also developed communication links with other groups who did not have information or resources currently needed by the team. Many of these contacts were undertaken in anticipation of a later phase, when the cooperation and support of the target groups would be needed. In other cases, communication links were clear influence attempts. Here team members would try to shape outside opinion to make it more favorable towards the team.

The new product team is not solely negotiating outside its boundaries at this time. There is a great deal of technical and social activity as well. Product definition is a clear priority, particularly the process of moving from a very general idea to a specific design plan. One manager described this phase as "working in the sandbox"; members were occupied with exploring various ideas and determining feasibility. This preceded the difficult job of selecting the best of the alternatives that had been examined.

This phase also brought changes as members were added, and people got to know one another. It is a period of exploration and testing of who knows what, and can we rely on this person to get a particular job done. Thus, in terms of their internal interactions, team members define the product, determine feasibility, get to know one another, and begin to develop norms about how to work together.

Possible to Definite Project: A Transition Point

The design review was set up to make sure we weren't going off in crazy directions. All of R&D was invited, quite a few showed up. We had answers to most of their questions, and we got lots of helpful input. We were official now, they had given us the OK. We went back to work.
The first sell was to the R&D staff. We had decided what we wanted to do and we had to get them to agree, the VPs had to sign off. We're spending their money, we have to meet their needs to keep getting resources. We got lots of comments. Then we had to present our responses to their comments at another meeting with a broader audience. We were seeking the blessing of top management.

Management just couldn't all get together and decide which chip they were going to use. It was debated and changed and debated and we couldn't really get working. The cost and time to delivery got out of control. We had to scrap the whole thing and most of the team left the company.

Our interviews suggest that the first transition point occurs just prior to the major portion of the development phase and involves a shift from recognition of potential feasibility to commitment to one new product idea. This entails movement from low-cost effort with minimal organization support to major capital investment and support from top management. In our sample there was usually some formal, organizationally imposed, design review that forced the new product team to present and defend its design. Even when this was not the case, there was usually informal organizational pressure about this time to brief top management and get their support. Team leaders describe spending a great deal of frenzied time and activity preparing for these reviews, be they formal or informal.

Three of our interviewees reported difficulties with this transition. Two of the teams failed to get agreement with and the support of other groups and could not progress. The third could not agree among themselves about certain technical issues. These groups could not build both internal and external consensus on project specifications, hence they could not move from the process of deciding what the product should be to deciding how to actually make the
product. Our interviewees generally reported a shift in activities in the teams that successfully completed this transition point. The general task of the team moved from defining the new product idea, determining feasibility, and gaining support for it to actual product development.

**Development**

There was a lot of coordinating to do. I wanted to make sure they had ordered the components and the printed circuit boards. George was the liaison to manufacturing, but I needed to check on things once in awhile. As time went on there was so much to watch over that we decided to bring in three people from manufacturing. They helped with the components decisions: which could be obtained, did they have the right performance specs. At this point we also started meeting with people outside the group to provide a status update. We had representatives from purchasing, larger manufacturing areas, production planning, diagnostics and marketing. We informed them of progress and changes and published the meeting minutes on-line so everyone could access them. We also kept the Product Committee informed.

By November the top committee was getting panicky: they were nice, but they were nervous. I tried hard to protect the team from the pressure, but the rest of the company was like a pressure cooker. Some of the team even had to come in during Christmas time. The machine just wasn't working and everybody felt as though we'd failed, even though we'd done the impossible. Still we were late to Manufacturing and everyone was scared.

Several rules are in place now, such as minimizing new technology so that this thing gets out in time. Now for every piece of the product we have a plan and every Monday morning people have to report on where they are with respect to this plan. I'm in the middle of two ends of a problem. From above I get major direction and goal setting, like we really don't want to deliver in February but in December, and then Monday mornings I get reality.

I decided to house us in an isolated building. This was a novel task, there were lots of new people, and we were going to be going hard and fast. That kind of intensity has to be isolated. Besides, if people aren't together the project isn't going to turn out as good as it could have. People who are working have two things to do. One is they have to do the operating system for the project. The other is they have to stay in touch with the rest of the organization, so they are torn. I want people to make project optimizations not local ones.
Many of our interviewees described the type of dilemma illustrated in the final quotation. The development stage requires that the team focus much of its effort internally, on technical issues. However, team leaders also reported that substantial efforts were needed to maintain and build relationships with other groups.

In this phase, the team needs to spend its time on technical development; therefore, it can not be interrupted constantly. An important dilemma that team leaders talked about is how much separation there should be between the team and the rest of the organization. Specifically, should the team obtain separate facilities or perhaps even physically isolate itself from the rest of the organization? Isolation allows the team to focus on technical innovation and speed but may make it difficult for the team to carry on transactions with other functional groups. Within the group, this stage requires the highest need for close coordination among team members and most teams appear to work out routines and methods for accomplishing this.

Isolation allows the group to shift its activities. During the development phase, the team must move from product definition to setting goals and schedules for actual development. In order for this to be done, inputs from others regarding their priorities and suggestions for the product design need to be restricted unless market or competitive information radically changes. This restriction may be difficult to maintain since other functional groups may view the product as a concept that is open to constant change and updating. Isolation can facilitate information restriction. Groups that are unable to restrict this information may lose valuable time and suffer
reduced effectiveness. The potential importance of this isolation was illustrated in that two of the three of the team leaders who informed us that their teams failed at this stage, reported continually changing work goals and schedules in response to new information and inputs to be the cause of the failure.

Our interviewees report that the development phase is characterized by periods where group members feel as if they have failed. At these times team leaders report that they frequently had to push the group by stressing the importance of the product and continued work on it and maintain the group's spirit by providing a vision of the completed product.

During this stage, the group's priorities change to managing its internal activities, however, our interviews indicate that in development stage there is a need to manage team activities and relations with others. Resources have already been obtained and information and mapping of the rest of the organization has been done. Yet behaviors aimed at coordination with other groups tend to increase. The new product team must ensure that other functional groups, those that will provide components and those that will take the product over are working to the schedule agreed upon. During this time, top corporate management needs to be informed of the product's progress as well.

Technology Transfer: A Second Transition Point

Then we had this big fight. Manufacturing said lets build it and make repairs later. Engineering said let's hold it. I was in the middle. Manufacturing yanked these people out. I was in a tenuous position. I wanted the product to stay with the team to get the bugs out but the product committee and the rest of the organization were going crazy. We had made a deal with some
customers. There were huge pressures to get it over to manufacturing.

DECLARATION OF IMPATIENCE: A time has come, we believe, to call a halt to product XX engineering and ship the product. We believe it is time to say IT'S DONE!!! Put the unfinished business on the shelf for product 2XX. This product already is the best on the market, by far, and the momentum of things to come will insure that it stays that way. BUT NOT IF IT DOESN'T SHIP! We sell the customer on evolution, not on a solution for all men, for all time, now. Get on with the final game. NO MORE DEVELOPMENT!!! (Memo sent to a new product team by one team leader)

A second transition point normally occurs somewhere during the testing phase. In most cases, technological problems have been assessed and a prototype exists and has been tested. The transition consists of moving from team ownership of the product to more general organizational ownership. Our interviewees report a change that is similar to what Quinn and Mueller (11) call a technology transfer point where the emphasis moved from developing the technology to passing information, enthusiasm, and authority to use that technology to other groups in the organization. The transition will not occur if the group is either unwilling to relinquish the product or unwilling to continue to work on the product when it has passed into the hands of others.

This was a difficult transition for all the teams we examined. Problems ranged from members who were unwilling to transfer the product to others, to less committed team members who began work on other projects, leaving the project before a smooth transition to manufacturing occurred. For most teams, this transition signaled a decrease in the isolation and commitment of team members. Many interviewees reported a shift in team activities from internal team decisions to "selling" the product idea to other groups.
Diffusion and Ending

The team now has a whole different form. Those who are helping manufacturing are spending most of their time in New Hampshire at the factory. That is a small subset of the original team. Some of the team members are busy going over documentation and support products. There are still a lot of other groups that have to come through for us to make this product shine. Then there were quite a few people who left when there part of the project was done. They went back to their functional units or joined other teams. Some did this even before I wanted them to, there is so much work still to be done. Then, there are a few who have stayed on along with some new people along with the third generation. This is sort of a transition from one team to another.

At this point, the team wasn't meeting much. People didn't seem to know what to do. It was the end of an intense group. People were burnt out. People were zombies. People weren't ready to start over. They hadn't recovered. Maybe I should have been doing some career planning but that's not really what I wanted to do. People were lost but the product was great. I sent all my people on vacation.

Our interviewees reported that during the diffusion phase teams' external activities increased dramatically as members began transferring technical data as well as a sense of ownership to other groups that must manufacture and market the new product. The necessity of transferring product ownership causes some obvious difficulties for a team. Some interviewees reported that the nature of the second stage of the development process, particularly if the team has isolated itself, caused teams to develop a very impermeable boundary. Although the isolation this boundary created may have been important in facilitating the internal decision making and group cohesiveness often necessary during the second stage, it occasionally made the product transfer difficult.

The team leaders reported that variability of individual involvement in completing the product was high at this stage. The key issue was keeping those members needed to finish up the project
committed to it; while moving those whose efforts were no longer needed on to other activities. A number of team leaders mentioned that balancing these responsibilities was difficult. Maintaining motivation was difficult because the major product development decisions had already been made and what remained was completing product details and transferring the product to other groups. In addition, some individuals resisted career planning or left the group earlier than the leader desired.

**Implications and Conclusions**

Our interviews suggest that new product teams follow a pattern as the product development process proceeds. As the product development task change, so do the internal processes of the group and the ways in which it must deal with others in the organization. We found three phases of activity: creation, development, and diffusion. Each phase can be described in terms of a dominant task requirement either exploration, exploitation, or exportation.

During the Creation phase, the team must obtain the information and resources it will need initially and in the future. The dominant issue for the team at this time is **exploration**. Teams must explore what resources are available to them, what the product can and should be, what other areas of the organization want the product to be. In addition, teams must explore technologies and markets at this time. Exploration inside the team involves getting to know other team members, determining who has particular skills, and who can be trusted.

Teams then face a difficult transition as they move from exploration of numerous alternatives to commitment to a specific
product design. The dominant issue following this transition is the efficient exploitation of the information and resources the team has collected in order to develop the product in the form that was agreed upon. Primary emphasis for the team becomes solving technical problems and efficient team operations.

Following a second transition, the emphasis for the team becomes that of exportation of its product to others and transferring the ownership of the product to other groups. During this stage, the emphasis on the team's internal processes declines and the team shifts to working with other functional groups.

An understanding of the new product team's task has a number of implications for both understanding and potentially improving the product development process. Among these implications are the following.

FIRST An understanding of the product development task allows for the establishment of more meaningful milestones and review cycles.

In most of our teams, formal reviews were associated with the transition from a possible to a definite product. Milestones were measured during the development phase but often did not exist for creation or diffusion. The result was often a great deal of time lost during creation, since no one was monitoring progress. There was also often frustration during this early phase because although groundwork was laid, it often did not appear that work was being done. In the diffusion stage, there is the difficult problem of members believing the job is done, when much important detail work remains.

Meaningful milestones and review cycles can create energy and enthusiasm when the task itself does not provide tangible feedback.
For example, in the creation stage important items to monitor might be the extent to which the group has collected input from marketing, manufacturing and customers and identified key areas of needed expertise outside the group. In addition, progress toward product definition can be monitored and creative technical ideas rewarded. Freedom to explore new ideas may mean broad, rather than narrowly defined milestones.

During development, PERT charts and coordination mechanisms force more careful monitoring of product progress, but rewards often end when the design is complete. Milestones and rewards also may help in the diffusion stage by encouraging people to complete the details of their work and transfer it to others.

SECOND Much of the new product development team's work is developing and maintaining relationships with other groups.

Much of the emphasis in group research and "how to" books on team building have stressed internal team functioning. All of our interviews also stressed the importance and complexities of managing relations with other groups. External behaviors ranged from modelling the surrounding environment to negotiating for resources, from opening up communication channels to buffering the group from external pressures, and from translating the meaning of external communications to managing the profile of the group that is shown to outsiders (for a more complete list and explanation of these activities see Ancona and Caldwell (2).

The demand for this amount and variety of behavior means that the group must have the staff and skill necessary to carry on these behaviors. Often, the sole criteria used for staffing is technical
competence, yet the best conceived product may not be produced if others in the company do not know about it, support it, and work to help in its development. Hence, technical competence must be coupled with skill for internal team management and external boundary-spanning behavior.

THIRD As the task of the new product team changes over time, different ways of managing the team are required.

The different phases of the product development process require very different actions to facilitate progress. During the initial stage, the team manager must ensure that the team receives sufficient information and resources to complete its task. The manager must also work to help the group establish relationships with others. In addition to these external activities, the manager must allow for the exploration of technical possibilities and team members' skills and abilities. In order to actually create a product concept and begin the development of a team, an atmosphere tolerant of trial and error and a freedom from constraint and procedure should mark this phase.

During the second stage, the activities of the team must shift. During this time, the manager must act to gain consensus on product specifications and then limit inputs and restrict information flows related to changes in design. The team leader may devote primary effort to managing the group's internal process and buffering it from the political battles which may be fought at the upper levels of the hierarchy. The potential value of such actions are that they allow the group to work without interruption and to focus directly on internal decision making and problem solving.
During the diffusion stage, the manager's role again changes. The manager's responsibilities relate again to building relations with other groups, while gaining greater commitment from some team members and moving others on to other projects. Because other functional areas may require the fast transfer of the new product or its technology the number of transactions during this stage may become quite large in many teams. The manager must be able to monitor and track all of them.

The fact that very different types of management skills are required as the product development task changes complicates the process of selecting and developing new product team managers. Skills appropriate for one stage of the process may be inappropriate at other times. This suggests that new product team managers must have both a wide range of skills and an ability to match the appropriate skills to the situation.

FOURTH An understanding of the product development process from the new product team's perspective can supplement organizational models of product development.

Just as descriptions of the steps an organization must take to successfully introduce new products can focus effort and energy in appropriate places, so too can a description of the steps new product teams must complete. An understanding of the changes in the product team's task potentially allows more effective monitoring of the team's progress over time. Similarly, understanding the changes in the task allows the organization to better match its allocation of resources to team requirements.

We believe that any effort to understand and improve product development must to some degree focus on the team of individuals
responsible for the product and the task they must complete. It is our hope that an improved understanding of the team's task can lead to better solutions to a number of coordination problems often inhibiting the critical job of developing new products.
References


