Organizing and Leading "Heavyweight" Development Teams

Kim B. Clark   Steven C. Wheelwright

Effective product and process development requires the integration of specialized capabilities. Integrating is difficult in most circumstances, but is particularly challenging in large, mature firms with strong functional groups, extensive specialization, large numbers of people, and multiple, ongoing operating pressures. In such firms, development projects are the exception rather than the primary focus of attention. Even for people working on development projects, years of experience and the established systems —covering everything from career paths to performance evaluation, and from reporting relationships to breadth of job definitions—create both physical and organizational distance from other people in the organization. The functions themselves are organized in a way that creates further complications: the marketing organization is based on product families and market segments; engineering around functional disciplines and technical focus; and manufacturing on a mix between functional and product market structures. The result is that in large, mature firms, organizing and leading an effective development effort is a major undertaking. This is especially true for organizations whose traditionally stable markets and competitive environments are threatened by new entrants, new technologies, and rapidly changing customer demands.

This article zeros in on one type of team structure—"heavyweight" project teams—that seems particularly promising in today's fast-paced world yet is strikingly absent in many mature companies. Our research shows that when managed effectively, heavyweight teams offer improved

communication, stronger identification with and commitment to a project, and a focus on cross-functional problem solving. Our research also reveals, however, that these teams are not so easily managed and contain unique issues and challenges.

Heavyweight project teams are one of four types of team structures. We begin by describing each of them briefly. We then explore heavyweight teams in detail, compare them with the alternative forms, and point out specific challenges and their solutions in managing the heavyweight team organization. We conclude with an example of the changes necessary in individual behavior for heavyweight teams to be effective. Although heavyweight teams are a different way of organizing, they are more than a new structure; they represent a fundamentally different way of working. To the extent that both the team members and the surrounding organization recognize that phenomenon, the heavyweight team begins to realize its full potential.

Types of Development Project Teams

Exhibit 1 illustrates the four dominant team structures we have observed in our studies of development projects: functional, lightweight, heavyweight, and autonomous (or tiger). These forms are described below, along with their associated project leadership roles, strengths, and weaknesses. Heavyweight teams are examined in detail in the subsequent section.

Functional Team Structure—In the traditional functional organization found in larger, more mature firms, people are grouped principally by discipline, each working under the direction of a specialized subfunction manager and a senior functional manager. The different subfunctions and functions coordinate ideas through detailed specifications all parties agree to at the outset, and through occasional meetings where issues that cut across groups are discussed. Over time, primary responsibility for the project passes sequentially—although often not smoothly—from one function to the next, a transfer frequently termed "throwing it over the wall."

The functional team structure has several advantages, and associated disadvantages. One strength is that those managers who control the project's resources also control task performance in their functional area; thus, responsibility and authority are usually aligned. However, tasks must be subdivided at the project's outset, i.e., the entire development process is decomposed into separable, somewhat independent activities. But on most development efforts, not all required tasks are known at the outset, nor can they all be easily and realistically subdivided. Coordination and integration can suffer as a result.
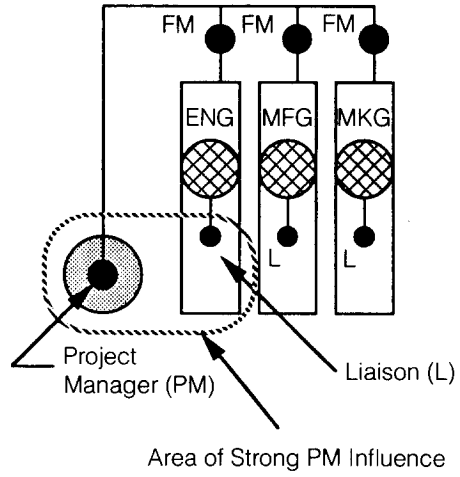
Another major strength of this approach is that, because most career paths are functional in nature until a general management level is reached,
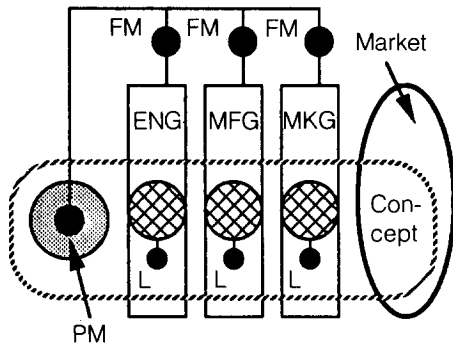
Exhibit 1. Types of Development Teams
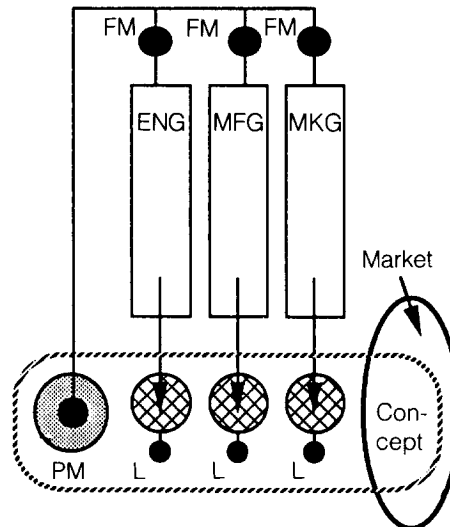
1. Functional Team Structure
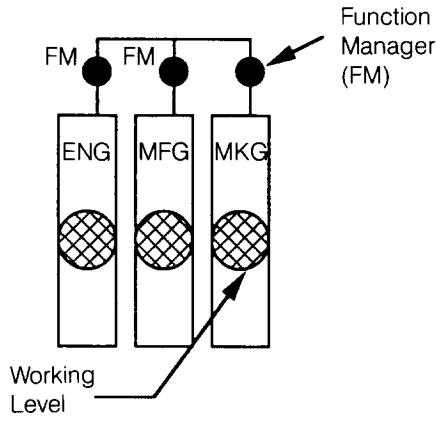
2. Lightweight Team Structure

3. Heavyweight Team Structure

4. Autonomous Team Structure

the work done on a project is judged, evaluated, and rewarded by the same subfunction and functional managers who make the decisions about career paths. The associated disadvantage is that individual contributions to a development project tend to be judged largely independently of overall project success. The traditional tenet cited is that individuals cannot be evaluated fairly on outcomes over which they have little or no control. But as a practical matter, that often means that no one directly involved in the details of the project is responsible for the results finally achieved.

Finally, the functional project organization brings specialized expertise to bear on the key technical issues. The same person or small group of people may be responsible for the design of a particular component or subsystem over a wide range of development efforts. Thus the functions and subfunctions capture the benefits of prior experience and become the keepers of the organization's depth of knowledge while ensuring that it is systematically applied over time and across projects. The disadvantage is that every development project differs in its objectives and performance requirements, and it is unlikely that specialists developing a single component will do so very differently on one project than on another. The "best" component or subsystem is defined by technical parameters in the areas of their expertise rather than by overall system characteristics or specific customer requirements dictated by the unique market the development effort aims for.

Lightweight Team Structure—Like the functional structure, those assigned to the lightweight team reside physically in their functional areas, but each functional organization designates a liaison person to "represent" it on a project coordinating committee. These liaison representatives work with a "lightweight project manager," usually a design engineer or product marketing manager, who coordinates different functions' activities. This approach usually figures as an add-on to a traditional functional organization, with the functional liaison person having that role added to his or her other duties. The overall coordination assignment of lightweight project manager, however, tends not to be present in the traditional functional team structure.

The project manager is a "lightweight" in two important respects. First, he or she is generally a middle- or junior-level person who, despite considerable expertise, usually has little status or influence in the organization. Such people have spent a handful of years in a function, and this assignment is seen as a "broadening experience," a chance for them to move out of that function. Second, although they are responsible for informing and coordinating the activities of the functional organizations, the key resources (including engineers on the project) remain under the control of their respective functional managers. The lightweight project manager does not have power to reassign people or reallocate resources, and instead confirms

schedules, updates time lines, and expedites across groups. Typically, such project leaders spend no more than 25% of their time on a single project.

The primary strengths and weaknesses of the lightweight project team are those of the functional project structure. But now at least one person over the course of the project looks across functions and seeks to ensure that individual tasks—especially those on the critical path—get done in a timely fashion, and that everyone is kept aware of potential cross-functional issues and what is going on elsewhere on this particular project.

Thus, improved communication and coordination are what an organization expects when moving from a functional to a lightweight team structure. Yet, because power still resides with the subfunction and functional managers, hopes for improved efficiency, speed, and project quality are seldom realized. Moreover, lightweight project leaders find themselves tolerated at best, and often ignored and even preempted. This can easily become a "no-win" situation for the individual thus assigned.

Heavyweight Team Structure—In contrast to the lightweight set-up, the heavyweight project manager has direct access to and responsibility for the work of all those involved in the project. Such leaders are "heavyweights" in two respects. First, they are senior managers within the organization; they may even outrank the functional managers. Hence, in addition to having expertise and experience, they also wield significant organizational clout. Second, heavyweight leaders have primary influence over the people working on the development effort and supervise their work directly through key functional people on the core teams. Often, the core group of people are dedicated and physically co-located with the heavyweight project leader. However, the longer-term career development of individual contributors continues to rest not with the project leader—although that heavyweight leader makes significant input to individual performance evaluations —but with the functional manager, because members are not assigned to a project team on a permanent basis.

The heavyweight team structure has a number of advantages and strengths, along with associated weaknesses. Because this team structure is observed much less frequently in practice and yet seems to have tremendous potential for a wide range of organizations, it will be discussed in detail in the next section.

Autonomous Team Structure—With the autonomous team structure, often called the "tiger team," individuals from the different functional areas are formally assigned, dedicated, and co-located to the project team. The project leader, a "heavyweight" in the organization, is given full control over the resources contributed by the different functional groups. Furthermore, that project leader becomes the sole evaluator of the contribution made by individual team members.

In essence, the autonomous team is given a "clean sheet of paper"; it is not required to follow existing organizational practices and procedures, but allowed to create its own. This includes establishing incentives and rewards as well as norms for behavior. However, the team will be held fully accountable for the final results of the project: success or failure is its responsibility and no one else's.

The fundamental strength of the autonomous team structure is focus. Everything the individual team members and the team leader do is concentrated on making the project successful. Thus, tiger teams can excel at rapid, efficient new product and new process development. They handle cross-functional integration in a particularly effective manner, possibly because they attract and select team participants much more freely than the other project structures.

Tiger teams, however, take little or nothing as "given"; they are likely to expand the bounds of their project definition and tackle redesign of the entire product, its components, and subassemblies, rather than looking for opportunities to utilize existing materials, designs, and organizational relationships. Their solution may be unique, making it more difficult to fold the resulting product and process—and, in many cases, the team members themselves—back into the traditional organization upon project completion. As a consequence, tiger teams often become the birthplace of new business units or they experience unusually high turnover following project completion.

Senior managers often become nervous at the prospects of a tiger team because they are asked to delegate much more responsibility and control to the team and its project leader than under any of the other organization structures. Unless clear guidelines have been established in advance, it is extremely difficult during the project for senior managers to make mid-course corrections or exercise substantial influence without destroying the team. More than one team has "gotten away" from senior management and created major problems.

The Heavyweight Team Structure

The best way to begin understanding the potential of heavyweight teams is to consider an example of their success, in this case, Motorola's experience in developing its Bandit line of pagers.

The Bandit Pager Heavyweight Team—This development team within the Motorola Communications Sector was given a project charter to develop an automated, on-shore, profitable production operation for its high-volume Bravo pager line. (This is the belt-worn pager that Motorola sold from the mid-1980s into the early 1990s.) The core team consisted of a heavyweight project leader and a handful of dedicated and co-located individuals, who

represented industrial engineering, robotics, process engineering, procurement, and product design/CIM. The need for these functions was dictated by the Bandit platform automation project and its focus on manufacturing technology with a minimal change in product technology. In addition, human resource and accounting/finance representatives were part of the core team. The human resource person was particularly active early on as subteam positions were defined and jobs posted throughout Motorola's Communications Sector, and played an important subsequent role in training and development of operating support people. The accounting/finance person was invaluable in "costing out" different options and performing detailed analyses of options and choices identified during the course of the project.

An eighth member of the core team was a Hewlett Packard employee. Hewlett Packard was chosen as the vendor for the "software backplane," providing an HP 3000 computer and the integrated software communication network that linked individual automated workstations, downloaded controls and instructions during production operations, and captured quality and other operating performance data. Because HP support was vital to the project's success, it was felt essential they be represented on the core team.

The core team was housed in a corner of the Motorola Telecommunications engineering/ manufacturing facility. The team chose to enclose in glass the area where the automated production line was to be set up so that others in the factory could track the progress, offer suggestions, and adopt the lessons learned from it in their own production and engineering environments. The team called their project Bandit to indicate a willingness to "take" ideas from literally anywhere.

The heavyweight project leader, Scott Shamlin, who was described by team members as "a crusader," "a renegade," and "a workaholic," became the champion for the Bandit effort. A hands-on manager who played a major role in stimulating and facilitating communication across functions, he helped to articulate a vision of the Bandit line, and to infuse it into the detailed work of the project team. His goal was to make sure the new manufacturing process worked for the pager line, but would provide real insight for many other production lines in Motorola's Communications Sector.

The Bandit core team started by creating a contract book that established the blueprint and work plan for the team's efforts and its performance expectations; all core team members and senior management signed on to the document. Initially, the team's executive sponsor—although not formally identified as such—was George Fisher, the Sector Executive. He made the original investment proposal to the Board of Directors and was an early champion and supporter, as well as direct supervisor in selecting the project leader and helping get the team underway. Subsequently, the vice president and general manager of the Paging Products division filled the role of executive sponsor.

Throughout the project, the heavyweight team took responsibility for the substance of its work, the means by which it was accomplished, and its results. The project was completed in 18 months as per the contract book, which represented about half the time of a normal project of such magnitude. Further, the automated production operation was up and running with process tolerances of five sigma (i.e., the degree of precision achieved by the manufacturing processes) at the end of 18 months. Ongoing production verified that the cost objectives (substantially reduced direct costs and improved profit margins) had indeed been met, and product reliability was even higher than the standards already achieved on the off-shore versions of the Bravo product. Finally, a variety of lessons were successfully transferred to other parts of the Sector's operations, and additional heavyweight teams have proven the viability and robustness of the approach in Motorola's business and further refined its effectiveness throughout the corporation.

The Challenge of Heavyweight Teams—Motorola's experience underscores heavyweight teams' potential power, but it also makes clear that creating an effective heavyweight team capability is more than merely selecting a leader and forming a team. By their very nature—being product (or process) focused, and needing strong, independent leadership, broad skills and cross-functional perspective, and clear missions—heavyweight teams may conflict with the functional organization and raise questions about senior management's influence and control. And even the advantages of the team approach bring with them potential disadvantages that may hurt development performance if not recognized and averted.

Take, for example, the advantages of ownership and commitment, one of the most striking advantages of the heavyweight team. Identifying with the product and creating a sense of esprit de corps motivate core team members to extend themselves and do what needs to be done to help the team succeed. But such teams sometimes expand the definition of their role and the scope of the project, and they get carried away with themselves and their abilities. We have seen heavyweight teams turn into autonomous tiger teams and go off on a tangent because senior executives gave insufficient direction and the bounds of the team were only vaguely specified at the outset. And even if the team stays focused, the rest of the organization may see themselves as "second class." Although the core team may not make that distinction explicit, it happens because the team has responsibilities and authority beyond those commonly given to functional team members. Thus, such projects inadvertently can become the "haves" and other, smaller projects the "have-nots" with regard to key resources and management attention.

Support activities are particularly vulnerable to an excess of ownership and commitment. Often the heavyweight team will want the same control over secondary support activities as it has over the primary tasks performed

by dedicated team members. When waiting for prototypes to be constructed, analytical tests to be performed, or quality assurance procedures to be conducted, the team's natural response is to "demand" top priority from the support organization or to be allowed to go outside and subcontract to independent groups. While these may sometimes be the appropriate choices, senior management should establish make-buy guidelines and clear priorities applicable to all projects—perhaps changing service levels provided by support groups (rather than maintaining the traditional emphasis on resource utilization)—or have support groups provide capacity and advisory technical services but let team members do more of the actual task work in those support areas. Whatever actions the organization takes, the challenge is to achieve a balance between the needs of the individual project and the needs of the broader organization.

Another advantage the heavyweight team brings is the integration and integrity it provides through a system solution to a set of customer needs. Getting all of the components and subsystems to complement one another and to address effectively the fundamental requirements of the core customer segment can result in a winning platform product and/or process. The team achieves an effective system design by using generalist skills applied by broadly trained team members, with fewer specialists and, on occasion, less depth in individual component solutions and technical problem solving.

The extent of these implications is aptly illustrated by the nature of the teams Clark and Fujimoto studied in the auto industry.[1] They found that for U.S. auto firms in the mid-1980s, typical platform projects—organized under a traditional functional or lightweight team structure—entailed full-time work for several months by approximately 1500 engineers. In contrast, a handful of Japanese platform projects—carried out by heavyweight teams— utilized only 250 engineers working full-time for several months. The implications of 250 versus 1500 full-time equivalents (FTEs) with regard to breadth of tasks, degree of specialization, and need for coordination are significant and help explain the differences in project results as measured by product integrity, development cycle time, and engineering resource utilization.

But that lack of depth may disclose a disadvantage. Some individual components or subassemblies may not attain the same level of technical excellence they would under a more traditional functional team structure. For instance, generalists may develop a windshield wiper system that is complementary with and integrated into the total car system and its core concept. But they also may embed in their design some potential weaknesses or flaws that might have been caught by a functional team of specialists who had designed a long series of windshield wipers. To counter this potential disadvantage, many organizations order more testing of completed units to discover such possible flaws and have components and subassemblies

reviewed by expert specialists. In some cases, the quality assurance function has expanded its role to make sure sufficient technical specialists review designs at appropriate points so that such weaknesses can be minimized.

Managing the Challenges of Heavyweight Teams—Problems with depth in technical solutions and allocations of support resources suggest the tension that exists between heavyweight teams and the functional groups where much of the work gets done. The problem with the teams exceeding their bounds reflects in part how teams manage themselves, in part, how boundaries are set, and in part the ongoing relationship between the team and senior management. Dealing with these issues requires mechanisms and practices that reinforce the team's basic thrust—ownership, focus, system architecture, integrity—and yet improve its ability to take advantage of the strengths of the supporting functional organization—technical depth, consistency across projects, senior management direction. We have grouped the mechanisms and problems into six categories of management action: the project charter, the contract, staffing, leadership, team responsibility, and the executive sponsor.

The Project Charter—A heavyweight project team needs a clear mission. A way to capture that mission concisely is in an explicit, measurable project charter that sets broad performance objectives and usually is articulated even before the core team is selected. Thus, joining the core team includes accepting the charter established by senior management. A typical charter for a heavyweight project would be the following:

> The resulting product will be selected and ramped by Company X during Quarter 4
> of calendar year 1991, at a minimum of a 20% gross margin.

This charter is representative of an industrial products firm whose product goes into a system sold by its customers. Company X is the leading customer for a certain family of products, and this project is dedicated to developing the next generation platform offering in that family. If the heavyweight program results in that platform product being chosen by the leading customer in the segment by a certain date and at a certain gross margin, it will have demonstrated that the next generation platform is not only viable, but likely to be very successful over the next three to five years. Industries and settings where such a charter might be found would include a microprocessor being developed for a new computer system, a diesel engine for the heavy equipment industry, or a certain type of slitting and folding piece of equipment for the newspaper printing press industry. Even in a medical diagnostics business with hundreds of customers, a goal of "capturing 30% of market purchases in the second 12 months during which the product is offered" sets a clear charter for the team.

Exhibit 2. Heavyweight Team, Contract Book—Major Sections

- Executive Summary

- Business Plan and Purposes

- Development Plan
  —Schedule
  —Materials
  —Resources

- Product Design Plan

- Quality Plan

- Manufacturing Plan

- Project Deliverables

- Performance Measurement and Incentives

The Contract Book—Whereas a charter lays out the mission in broad terms, the contract book defines, in detail, the basic plan to achieve the stated goal. A contract book is created as soon as the core team and heavyweight project leader have been designated and given the charter by senior management. Basically, the team develops its own detailed work plan for conducting the project, estimates the resources required, and outlines the results to be achieved and against which it is willing to be evaluated. (The table of contents of a typical heavyweight team contract book are shown in Exhibit 2.) Such documents range from 25 to 100 pages, depending on the complexity of the project and level of detail desired by the team and senior management before proceeding. A common practice following negotiation and acceptance of this contract is for the individuals from the team and senior management to sign the contract book as an indication of their commitment to honor the plan and achieve those results.

The core team may take anywhere from a long week to a few months to create and complete the contract book; Motorola, for example, after several years of experience, has decided that a maximum of seven days should be allowed for this activity. Having watched other heavyweight teams—particularly in organizations with no prior experience in using such a structure—take up to several months, we can appreciate why Motorola has nicknamed this the "blitz phase" and decided that the time allowed should be kept to a minimum.

Staffing—As suggested in Exhibit 1, a heavyweight team includes a group of core cross-functional team members who are dedicated (and usually physically co-located) for the duration of the development effort. Typically

there is one core team member from each primary function of the organi-
zation; for instance, in several electronics firms we have observed core
teams consisting of six functional participants—design engineering, mar-
keting, quality assurance, manufacturing, finance, and human resources.
(Occasionally, design will be represented by two core team members, one
each for hardware and software engineering.) Individually, core team mem-
bers represent their functions and provide leadership for their function's
inputs to the project. Collectively, they constitute a management team that
works under the direction of the heavyweight project manager and takes
responsibility for managing the overall development effort.

While other participants—especially from design engineering early on
and manufacturing later on—may frequently be dedicated to a heavyweight
team for several months, they usually are not made part of the core team
though they may well be co-located and, over time, develop the same
level of ownership and commitment to the project as core team members.
The primary difference is that the core team manages the total project and
the coordination and integration of individual functional efforts, whereas
other dedicated team members work primarily within a single function
or subfunction.

Whether these temporarily dedicated team members are actually part of
the core team is an issue firms handle in different ways, but those with con-
siderable experience tend to distinguish between core and other dedicated
(and often co-located) team members. The difference is one of management
responsibility for the core group that is not shared equally by the others.
Also, it is primarily the half a dozen members of the core group who will
be dedicated throughout the project, with other contributors having a por-
tion of their time reassigned before this heavyweight project is completed.

Whether physical colocation is essential is likewise questioned in such
teams. We have seen it work both ways. Given the complexity of devel-
opment projects, and especially the uncertainty and ambiguity often as-
sociated with those assigned to heavyweight teams, physical colocation is
preferable to even the best of on-line communication approaches. Problems
that arise in real time are much more likely to be addressed effectively with
all of the functions represented and present than when they are separate and
must either wait for a periodic meeting or use remote communication links
to open up cross-functional discussions.

A final issue is whether an individual can be a core team member on
more than one heavyweight team simultaneously. If the rule for a core team
member is that 70% or more of their time must be spent on the heavyweight
project, then the answer to this question is no. Frequently, however, a
choice must be made between someone being on two core teams—for
example, from the finance or human resource function—or putting a dif-
ferent individual on one of those teams who has neither the experience nor

stature to be a full peer with the other core team members. Most experienced organizations we have seen opt to put the same person on two teams to ensure the peer relationship and level of contribution required, even though it means having one person on two teams and with two desks. They then work diligently to develop other people in the function so that multiple team assignments will not be necessary in the future.

Sometimes multiple assignments will also be justified on the basis that a function such as finance does not need a full-time person on a project. In most instances, however, a variety of potential value-adding tasks exist that are broader than finance's traditional contribution. A person largely dedicated to the core team will search for those opportunities and the project will be better because of it. The risk of allowing core team members to be assigned to multiple projects is that they are neither available when their inputs are most needed nor as committed to project success as their peers. They become secondary core team members, and the full potential of the heavyweight team structure fails to be realized.

Project Leadership—Heavyweight teams require a distinctive style of leadership. A number of differences between lightweight and heavyweight project managers are highlighted in Exhibit 3. Three of those are particularly distinctive. First, a heavyweight leader manages, leads, and evaluates other members of the core team, and is also the person to whom the core team reports throughout the project's duration. Another characteristic is that rather than being either neutral or a facilitator with regard to problem solving and conflict resolution, these leaders see themselves as championing the basic concept around which the platform product and/or process is being shaped. They make sure that those who work on subtasks of the project understand that concept. Thus they play a central role in ensuring the system integrity of the final product and/or process.

Finally, the heavyweight project manager carries out his or her role in a very different fashion than the lightweight project manager. Most lightweights spend the bulk of their time working at a desk, with paper. They revise schedules, get frequent updates, and encourage people to meet previously agreed upon deadlines. The heavyweight project manager spends little time at a desk, is out talking to project contributors, and makes sure that decisions are made and implemented whenever and wherever needed. Some of the ways in which the heavyweight project manager achieves project results are highlighted by the five roles illustrated in Exhibit 4 for a heavyweight project manager on a platform development project in the auto industry.

The *first role* of the heavyweight project manager is to provide for the team a direct interpretation of the market and customer needs. This involves gathering market data directly from customers, dealers, and industry

Exhibit 3. Project Manager Profile

	Lightweight (limited)	Heavyweight (extensive)
Span of coordination responsibilities	|————————————————|
Duration of Responsibilities	|————————————————|
Responsible for specs, cost, layout, components	|————————————————|
Working level contact with engineers	|————————————————|
Direct contact with customers	|————————————————|
Multilingual/multi-disciplined skills	|————————————————|
Role in conflict resolution	|————————————————|
Marketing imagination/concept champion	|————————————————|
Influence in: engineering	|————————————————|
marketing	|————————————————|
manufacturing	|————————————————|

Exhibit 4. The Heavyweight Project Manager

Role	Description
Direct Market Interpreter	First hand information, dealer visits, auto shows, has own marketing budget, market study team, direct contact and discussions with customers
Multilingual Translator	Fluency in language of customers, engineers, marketers, stylists; translator between customer experience/requirements and engineering specifications
"Direct" Engineering Manager	Direct contact, orchestra conductor, evangelist of conceptual integrity and coordinator of component development; direct eye-to-eye discussions with working level engineers; shows up in drafting room, looks over engineers' shoulders
Program Manager "in motion"	Out of the office, not too many meetings, not too much paperwork, face-to-face communication, conflict resolution manager
Concept Infuser	Concept guardian, confronts conflicts, not only reacts but implements own philosophy, ultimate decision maker, coordination of details and creation of harmony

shows, as well as through systematic study and contact with the firm's marketing organization. A *second role* is to become a multilingual translator, not just taking marketing information to the various functions involved in the project, but being fluent in the language of each of those functions and making sure the translation and communication going on among the functions—particularly between customer needs and product specifications—are done effectively.

A *third role* is the direct engineering manager, orchestrating, directing, and coordinating the various engineering subfunctions. Given the size of many development programs and the number of types of engineering disciplines involved, the project manager must be able to work directly with each engineering subfunction on a day-to-day basis and ensure that their work will indeed integrate and support that of others, so the chosen product concept can be effectively executed.

A *fourth role* is best described as staying in motion: out of the office conducting face-to-face sessions, and highlighting and resolving potential conflicts as soon as possible. Part of this role entails energizing and pacing the overall effort and its key subparts. A *final role* is that of concept champion. Here the heavyweight project manager becomes the guardian of the concept and not only reacts and responds to the interests of others, but also sees that the choices made are consistent and in harmony with the basic concept. This requires a careful blend of communication and teaching skills so that individual contributors and their groups understand the core concept, and sufficient conflict resolution skills to ensure that any tough issues are addressed in a timely fashion.

It should be apparent from this description that heavyweight project managers earn the respect and right to carry out these roles based on prior experience, carefully developed skills, and status earned over time, rather than simply being designated "leader" by senior management. A qualified heavyweight project manager is a prerequisite to an effective heavyweight team structure.

Team Member Responsibilities—Heavyweight team members have responsibilities beyond their usual functional assignment. As illustrated in Exhibit 5, these are of two primary types. Functional hat responsibilities are those accepted by the individual core team member as a representative of his or her function. For example, the core team member from marketing is responsible for ensuring that appropriate marketing expertise is brought to the project, that a marketing perspective is provided on all key issues, that project sub-objectives dependent on the marketing function are met in a timely fashion, and that marketing issues that impact other functions are raised proactively within the team.

But each core team member also wears a team hat. In addition to representing a function, each member shares responsibility with the heavyweight

Exhibit 5. Responsibilities of Heavyweight Core Team Members

Functional Hat Accountabilities

- Ensuring functional expertise on the project

- Representing the functional perspective on the project

- Ensuring that subobjectives are met that depend on their function
- Ensuring that functional issues impacting the team are raised pro-actively within the team

Team Hat Accountabilities

- Sharing responsibility for team results

- Reconstituting tasks and content

- Establishing reporting and other organizational relationships

- Participating in monitoring and improving team performance

- Sharing responsibility for ensuring effective team processes

- Examining issues from an executive point of view (Answering the question, "Is this the appropriate business response for the company?")

- Understanding, recognizing, and responsibly challenging the boundaries of the project and team process

project manager for the procedures followed by the team, and for the overall results that those procedures deliver. The core team is accountable for the success of the project, and it can blame no one but itself if it fails to manage the project, execute the tasks, and deliver the performance agreed upon at the outset.

Finally, beyond being accountable for tasks in their own function, core team members are responsible for how those tasks are subdivided, organized, and accomplished. Unlike the traditional functional development structure, which takes as given the subdivision of tasks and the means by which those tasks will be conducted and completed, the core heavyweight team is given the power and responsibility to change the substance of those tasks to improve the performance of the project. Since this is a role that core team members do not play under a lightweight or functional team structure, it is often the most difficult for them to accept fully and learn to apply. It is essential, however, if the heavyweight team is to realize its full potential.

The Executive Sponsor—With so much more accountability delegated to the project team, establishing effective relationships with senior management requires special mechanisms. Senior management needs to retain the ability to guide the project and its leader while empowering the team to lead and act, a responsibility usually taken by an executive sponsor—typically

the vice president of engineering, marketing, or manufacturing for the business unit. This sponsor becomes the coach and mentor for the heavyweight project leader and core team, and seeks to maintain close, ongoing contact with the team's efforts. In addition, the executive sponsor serves as a liaison. If other members of senior management—including the functional heads—have concerns or inputs to voice, or need current information on project status, these are communicated through the executive sponsor. This reduces the number of mixed signals received by the team and clarifies for the organization the reporting and evaluation relationship between the team and senior management. It also encourages the executive sponsor to set appropriate limits and bounds on the team so that organizational surprises are avoided.

Often the executive sponsor and core team identify those areas where the team clearly has decision-making power and control, and they distinguish them from areas requiring review. An electronics firm that has used heavyweight teams for some time dedicates one meeting early on between the executive sponsor and the core team to generating a list of areas where the executive sponsor expects to provide oversight and be consulted; these areas are of great concern to the entire executive staff and team actions may well raise policy issues for the larger organization. In this firm, the executive staff wants to maintain some control over:

- resource commitment—head count, fixed costs, and major expenses outside the approved contract book plan;
- pricing for major customers and major accounts;
- potential slips in major milestone dates (the executive sponsor wants early warning and recovery plans);
- plans for transitioning from development project to operating status,
- thorough reviews at major milestones or every three months, whichever occurs sooner;
- review of incentive rewards that have company-wide implications for consistency and equity; and
- cross-project issues such as resource optimization, prioritization, and balance.

Identifying such areas at the outset can help the executive sponsor and the core team better carry out their assigned responsibilities. It also helps other executives feel more comfortable working through the executive sponsor, since they know these "boundary issues" have been articulated and are jointly understood.

The Necessity of Fundamental Change

Compared to a traditional functional organization, creating a team that is "heavy"—one with effective leadership, strong problem-solving skills and the ability to integrate across functions—requires basic changes in the way

development works. But it also requires change in the fundamental behavior of engineers, designers, manufacturers, and marketers in their day-to-day work. An episode in a computer company with no previous experience with heavyweight teams illustrates the depth of change required to realize fully these teams' power.[2]

Two teams, A and B, were charged with development of a small computer system and had market introduction targets within the next twelve months. While each core team was co-located and held regular meetings, there was one overlapping core team member (from finance/accounting). Each team was charged with developing a new computer system for their individual target markets but by chance, both products were to use an identical, custom-designed microprocessor chip in addition to other unique and standard chips.

The challenge of changing behavior in creating an effective heavyweight team structure was highlighted when each team sent this identical, custom-designed chip—the "supercontroller"—to the vendor for pilot production. The vendor quoted a 20-week turnaround to both teams. At that time, the supercontroller chip was already on the critical path for Team B, with a planned turnaround of 11 weeks. Thus, every week saved on that chip would save one week in the overall project schedule, and Team B already suspected that it would be late in meeting its initial market introduction target date. When the 20-week vendor lead time issue first came up in a Team B meeting, Jim, the core team member from engineering, responded very much as he had on prior, functionally structured development efforts: because initial prototypes were engineering's responsibility, he reported that they were working on accelerating the delivery date, but that the vendor was a large company, with whom the computer manufacturer did substantial business, and known for its slowness. Suggestions from other core team members on how to accelerate the delivery were politely rebuffed, including one to have a senior executive contact their counterpart at the vendor. Jim knew the traditional approach to such issues and did not perceive a need, responsibility, or authority to alter it significantly.

For Team A, the original quote of 20-week turnaround still left a little slack, and thus initially the supercontroller chip was not on the critical path. Within a couple of weeks, however, it was, given other changes in the activities and schedule, and the issue was immediately raised at the team's weekly meeting. Fred, the core team member from manufacturing (who historically would not have been involved in an early engineering prototype), stated that he thought the turnaround time quoted was too long and that he would try to reduce it. At the next meeting, Fred brought some good news: through discussions with the vendor, he had been able to get a commitment that pulled in the delivery of the supercontroller chip by 11 weeks! Furthermore, Fred thought that the quote might be reduced even further by a phone call from one of the computer manufacturer's senior executives to a contact of his at the vendor.

Two days later, at a regular Team B meeting, the supercontroller chip again came up during the status review, and no change from the original schedule was identified. Since the finance person, Ann, served on both teams and had been present at Team A's meeting, she described Team A's success in reducing the cycle time. Jim responded that he was aware that Team A had made such efforts, but that the information was not correct, and the original 20-week delivery date still held. Furthermore, Jim indicated that Fred's efforts (from Team A) had caused some uncertainty and disruption internally, and in the future it was important that Team A not take such initiatives before coordinating with Team B. Jim stated that this was particularly true when an outside vendor was involved, and he closed the topic by saying that a meeting to clear up the situation would be held that afternoon with Fred from Team A and Team B's engineering and purchasing people.

The next afternoon, at his Team A meeting, Fred confirmed the accelerated delivery schedule for the supercontroller chip. Eleven weeks had indeed been clipped out of the schedule to the benefit of both Teams A and B. Subsequently, Jim confirmed the revised schedule would apply to his team as well, although he was displeased that Fred had abrogated "standard operating procedure" to achieve it. Curious about the differences in perspective, Ann decided to learn more about why Team A had identified an obstacle and removed it from its path, yet Team B had identified an identical obstacle and failed to move it at all.

As Fred pointed out, Jim was the engineering manager responsible for development of the supercontroller chip; he knew the chip's technical requirements, but had little experience dealing with chip vendors and their production processes. (He had long been a specialist.) Without that experience, he had a hard time pushing back against the vendor's "standard line." But Fred's manufacturing experience with several chip vendors enabled him to calibrate the vendor's dates against his best-case experience and understand what the vendor needed to do to meet a substantially earlier commitment.

Moreover, because Fred had bought into a clear team charter, whose path the delayed chip would block, and because he had relevant experience, it did not make sense to live with the vendor's initial commitment, and thus he sought to change it. In contrast, Jim—who had worked in the traditional functional organization for many years—saw vendor relations on a pilot build as part of his functional job, but did not believe that contravening standard practices to get the vendor to shorten the cycle time was his responsibility, within the range of his authority, or even in the best long-term interest of his function. He was more concerned with avoiding conflict and not roiling the water than with achieving the overarching goal of the team.

It is interesting to note that in Team B, engineering raised the issue, and, while unwilling to take aggressive steps to resolve it, also blocked others' attempts. In Team A, however, while the issue came up initially through engineering, Fred in manufacturing proactively went after it. In the case

of Team B, getting a prototype chip returned from a vendor was still being treated as an "engineering responsibility," whereas in the case of Team A, it was treated as a "team responsibility." Since Fred was the person best qualified to attack that issue, he did so.

Both Team A and Team B had a charter, a contract, a co-located core team staffed with generalists, a project leader, articulated responsibilities, and an executive sponsor. Yet Jim's and Fred's understanding of what these things meant for them personally and for the team at the detailed, working level was quite different. While the teams had been through similar training and team startup processes, Jim apparently saw the new approach as a different organizational framework within which work would get done as before. In contrast, Fred seemed to see it as an opportunity to work in a different way—to take responsibility for reconfiguring tasks, drawing on new skills, and reallocating resources, where required, for getting the job done in the best way possible.

Although both teams were "heavyweight" in theory, Fred's team was much "heavier" in its operation and impact. Our research suggests that heaviness is not just a matter of structure and mechanism, but of attitudes and behavior. Firms that try to create heavyweight teams without making the deep changes needed to realize the power in the team's structure will find this team approach problematic. Those intent on using teams for platform projects and willing to make the basic changes we have discussed here, can enjoy substantial advantages of focus, integration, and effectiveness.

References

1. See Kim B. Clark and Takahiro Fujimoto, *Product Development Performance* (Boston, MA: Harvard Business School Press, 1991).
2. Adapted from a description provided by Dr. Christopher Meyer, Strategic Alignment Group, Los Altos, CA.