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Chapter

35

Concurrent Product-Development Teams

Preston G. Smith

Biographical Sketch . . .

Preston G. Smith, as a principal with the consultancy New Product Dynamics, has specialized in rapid product development for nearly 20 years and has helped dozens of companies in 20 countries to adopt the techniques described in this chapter. His book *Developing Products in Half the Time* and his article “Leading Dispersed Teams” have been instrumental in helping many teams to bring their new products to market faster and more effectively. Preston has also served 20 years as an engineer and manager in both small and large companies. He holds an engineering Ph.D. from Stanford University and is a Certified Management Consultant.

Despite the lip service paid to teams in recent years, many product-development teams fail to live up to expectations, actually performing more poorly than their members would have on their own. This chapter addresses concurrent product-development teams, which are among the most demanding of teams due the innovative nature of their task and the need for true commitment across organizational boundaries. Concurrent development is intended to develop simultaneously both the product and its manufacturing process while maintaining a true life-cycle perspective from conception to disposal, including awareness of quality, cost, schedule, and user requirements.

Although other types of projects often do not have such demanding team requirements, managers of other projects can learn from concurrent development teams, even though they may not choose to employ all of their features.

Earmarks of Effective Teams

The reader should note the relationship between Chapter 20, Building a High Performance Team and this chapter on Concurrent Product-Development Teams.

Effective concurrent-development teams typically exhibit the following characteristics:

- They include no more than ten members.
- Members choose to serve on the team.
- Members serve from the beginning to the end of the project.
- Members participate on the team full time.
- Members report solely to the team leader, and the leader reports to general management.
- Key functions—at least marketing, engineering, and manufacturing—are included on the team.
- Members are co-located within conversational distance of each other.

Few teams achieve all these characteristics, but teams that work well satisfy many of them and know where they fall short on the others so they can compensate. Let's consider each of these characteristics.

A small team (fewer than ten) strengthens commitment and eases communication. Not only is it difficult to communicate in a large group, but it is also difficult to accommodate everyone's opinion and reach agreement. Note that the requirement for full-time membership naturally keeps the team small. If size is still a problem, the techniques of incremental innovation or product architecture can be used to divide the work among smaller teams, as discussed in Chapter 8 of Smith and Reinertsen.¹

A few organizations are able to arrange for most members to join the team of their choice, but this is an impractical constraint for most organizations. Clearly, this improves motivation. Consequently, at a minimum, ensure that no team members are on a team with whose objectives they do not agree, because disagreement between an individual's goals and the team's goals greatly destroys motivation to achieve team objectives.

End-to-end continuity overcomes the communication and accountability gaps that follow from passing the project "over the wall" to the next group. Full-time involvement also clarifies accountability while simultaneously clearing people's slates so that they can concentrate heavily on this one project.

Reporting relationships are crucial because to make fast, cross-functional business decisions, the team must regard itself as an empowered business unit, not just a group of functional representatives or a band of engineers.

Being co-located is another technique that greatly accelerates and raises the reliability of communication and decision-making. I cover this important topic in detail later.

Each organization will have different difficulties in satisfying the characteristics that will make the team effective, but the biggest difficulties often

provide the greatest opportunity for improvement. Therefore, consider even the characteristics that present the greatest challenge if you wish to make substantial improvement.

TEAMS VERSUS GROUPS

Team is an overused term in business today, so it has lost its meaning. Have you ever contacted a business to be told, “Our customer service team will consider your request and contact you”? This is how they avoid responsibility for acting. Sending your request to this “team” is as good as killing it.

Katzenbach and Smith² take the term *team* quite seriously, and we can learn from them. As shown in Figure 35–1, they distinguish three types of teams. The simplest is the effective group, and this is where most teams are today. They apply the basic skills of effective meetings, action items, and representation from various functions. Such teams are easy to initiate and maintain, but they provide little performance boost.

Next, Katzenbach and Smith define a single-leader discipline, which is what many companies employ when they need more performance than an effective group can provide. In the single-leader discipline, the leader makes the decisions, usually after consulting with team members, and the leader is responsible for the team’s performance.

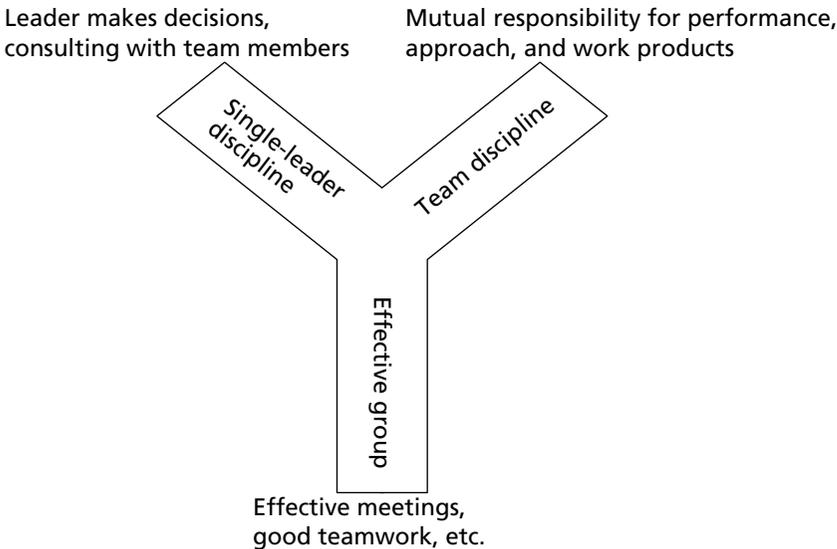


Figure 35–1 Three Team Options. The team discipline option provides the most powerful performance, but it requires significant effort to arrange. In contrast, the effective group is easy to set up but provides little performance gain. The single-leader discipline is in between

Adapted from *The Discipline of Teams* by Jon R. Katzenbach and Douglas K. Smith; © 2001 by Jon R. Katzenbach and Douglas K. Smith. Used with permission of Jon R. Katzenbach, Senior Partner of Katzenbach Partners LLC

Finally, there is the team discipline, in which the team holds itself mutually accountable for results. Work products, such as the project's work-breakdown structure, are considered jointly owned by the team, and team leadership is likely to shift as the project progresses. Members' responsibilities may shift as well as the project's demands shift. No member of the team can fail, because only the team can fail.

The team discipline can provide a high level of performance, but it is also demanding in setup and maintenance. It can be uncomfortable for its members because they become responsible for each other's shortcomings and cannot isolate their specific responsibilities. This arrangement can be very powerful, and it fits many concurrent development projects well, because of their innovative and cross-functional demands. However, few concurrent development groups have taken this step so far.

TEAMS AND MEETINGS

Teams often become associated with meetings. Some teams form to solve problems or make specific decisions. For these teams, the team's work can be done in meetings. However, a development team's job is to do things, such as design, analysis, customer visits, prototype building, and testing. These tasks are not done in meetings. So if team members think of their roles as holding meetings, little will get done, people will arrive at meetings unprepared, and progress will be slow. A development team should not define itself through its meetings, but rather as a group that completes the value-added tasks that breathe life into a new product.

Staffing a Team

Often, the team leader and the project manager are the same person. These two roles fit well together, and they provide some latitude in choosing a title that reflects the desired emphasis. The title should answer the following questions: Are we looking for leadership or management? Is the object of this attention the project or the team?

It is when the project manager and the team leader are different people that difficulties can arise. If the project manager reports to the team leader and has little authority, this role can degrade into one of an administrator. The project manager keeps the schedule and budget up to date but has little power to take action on the information he or she maintains. On the other hand, sometimes an executive who spends little time with the team holds the team leader role. Then there is an ineffective absentee-landlord situation.

The choice of team leader is the most important one management will make in the life of the project. A project to develop even a simple new product will have to overcome many obstacles because of the product's innovative nature. A weak leader will be unable to deal with the hurdles, so management will be drawn in, which simply is a slow way to run a project.

Rapid progress depends on a readily available leader/manager with a can-do attitude who takes charge when difficulties arise. A part-time project manager or team leader is not sufficient. If management assigns anyone to the project full-time, it should be the leader.

The team leader should be considered first as a general manager, not a functional expert. The real skill needed is to integrate the marketing, engineering, manufacturing, and other departmental viewpoints into a solid business direction. If the leader is viewed as, say, primarily an engineer, then functional managers of marketing and other departments will feel obliged to get involved to protect their interests. This outside managerial involvement undermines the very advantage that a cross-functional team can provide, which is fast, effective action on cross-functional issues.

TEAM-LEADER SKILLS

Two groups of essential skills underlie this general management capability: product-vision skills and people skills. A popular definition of leadership is the ability to transform vision into results. If this is the case, then to get a winning new product to market, the leader must have a broad, integrated, and focused vision of the product and be able to communicate this vision to others.

The need for people skills is probably obvious, but most of these skills stem from innate ability or long-term development; seldom can they be trained in as needed. Such skills include the ability to do the following:

- Incorporate diverse views, especially from quieter people or on unpopular subjects.
- Resolve conflict.
- Develop members' skills and their confidence in them.
- Intrinsically motivate members.
- Move ahead with little or unclear authority.
- Obtain the human and other resources needed.
- Protect the team from outside distractions.
- Maintain a relaxed atmosphere under stressful conditions and employ humor effectively.

Clearly, the leader needs a working knowledge of the technologies and other professional disciplines involved in the project, but in-depth knowledge can get in the way by encouraging micromanagement. The team will also need conventional project-management skills, such as an ability to run effective meetings, schedule and monitor progress, draft and manage a budget, and comply with the corporate procedures regarding product development. Such skills are usually secondary in importance and can be learned on the job when necessary. The practice that many companies have of always selecting team leaders from a certain department, such as engineering, simply places a misguided restriction on the search for a good leader. Engineers do not have a corner on the crucial vision or people skills.

TEAM MEMBERS

Effective team members have qualities remarkably like those of good leaders, according to Kelley.³ In particular, members should be self-starters who can work without supervision. Another essential attribute is a willingness to think independently and support contrary views when necessary. Group-think is particularly destructive in a close-knit team whose job is to innovate.

In selecting members, the leader naturally makes sure to incorporate the key disciplines and professional skills—the so-called hard skills. However, there is another set of critical soft skills that is just as important to have available within the team. These skills include problem-solving, idea-generation, conflict-resolution, and negotiation. Perform a crosscheck to ensure that such skills are available from someone on the team, in addition to the hard skills they contribute.

HEAVY EARLY STAFFING

A common mistake made in staffing a team is not getting key players on board soon enough. Early staffing can be weak as new members finish prior commitments so that they can join the team. The team then gets off to a shaky and slow start, which puts it in a catch-up situation from the outset. When the late members do join, they are at a disadvantage because they have not participated in the preparatory activities and early decisions. And the team is at a disadvantage too, as they have not bought into critical early decisions the team has made. These decisions include the product's definition, team work methods, and project schedule and deliverables.

For concurrent development, late arrival of downstream players, such as those from manufacturing or field service, simply perpetuates a situation in which products are not designed for manufacturability or serviceability. The only way to break this repeating cycle of unmanufacturable products is to have the downstream functions involved at the outset.

THE POWER OF GENERALISTS

Ever since Frederick W. Taylor and Henry Ford, U.S. industry has encouraged labor specialization. In many cases, this is with good reason. Individuals feel good and can command better pay by doing something specific a bit better than others. In addition, organizational design is cleaner because one can put people in definite pigeonholes and put precise labels on the organization chart.

Unfortunately, specialists create a host of problems on a product-development team. It is difficult to keep them gainfully occupied full time on the project, so they come and go from the project as it needs their specific expertise. This creates scheduling, availability, and delay problems, which ultimately stretch the schedule. The specialists often feel little commitment to the project at hand. They are unlikely to understand well the project objectives, such as the product attributes the customer values most. Nor are they apt to comprehend how their work must fit with downstream activities, such as manufacturing, distribution, and promotion.

Thus, on balance, a development team can move faster and produce products that satisfy customers better by using a few generalists working full time throughout the project. Clearly, there is a limit to how far one can go with generalists, because a company's competitive edge often depends on the distinct competencies that specialists provide. Yet most firms would be much better served by shifting toward generalists on development teams. Ultimately, this requires favoring generalists through recruiting, compensation, training, recognition, and promotion. Until these long-term measures create more generalists, team leaders should seek generalists—or those willing to try wearing different hats—when recruiting team members.

Note that such generalists fit perfectly with the team discipline style suggested in connection with Figure 35-1 for the highest level of team performance.

OUTSIDE DEVELOPMENT PARTNERS

Many companies, especially automobile manufacturers, are providing substantial roles for suppliers on their concurrent-development teams. Supplier involvement is important in three situations. First is when the supplier's lead time is long or unpredictable, which can delay the whole project. Second is when the supplier's ability to manufacture the parts reliably and with high yields depends on the design that the team supplies. Third is when the supplier holds a special knowledge of a product technology that is critical to success.

In these cases, a supplier should be a substantial member of the team. The critical item to manage here is getting the supplier personnel involved early, when they can contribute to shaping the critical early decisions that will add value to the product. It is virtually impossible to get the supplier involved too early. Once the supplier is on board, project managers should keep in touch with that person on an ongoing basis (weekly), even when there are no important issues to discuss. This will keep the project manager up to date on the supplier's workload and thus the supplier's ability to respond when needed by the team.

Substantial supplier involvement means that the supplier spends time on-site with the team, often co-located. Clearly, the supplier should receive equitable compensation for this, perhaps with upfront payments for his or her time, rather than having compensation amortized in the piece-part price later. This type of in-depth involvement carries its price, so project managers will want to select carefully the few suppliers whose contribution will warrant this special treatment.

Some firms have pushed beyond involving suppliers to include other product-development organizations that develop specific portions of the product for them. The same type of early, ongoing involvement is needed here. In addition, the project will be much easier to manage if the portions of the product developed by others are cleanly separable via the product's architecture. For instance, having a development partner responsible for the electrical system of an automobile is a poor choice, because the electrical

system interacts with the rest of the car in a multitude of ways. Outsourcing development of the instrument cluster would be much better, since it has a cleanly definable interface. See Chapter 6 of Smith and Reinertsen for more on this.

MOTIVATING THE TEAM

This is a highly controversial subject with few clear answers. It is also an important subject, for it relates directly to individual and team effectiveness. Following are a few guidelines that apply especially to concurrent engineering teams.

Think beyond financial rewards. Although coffee mugs and T-shirts may have seen their day, there are many other options available to the creative team leader. For example, consider a photo of the team in the annual report, lunch with the executive sponsor, or a holiday weekend.

A preoccupation with financial motivation usually indicates something askew in the basic compensation system that patchwork rewards will not correct. People deserve fair compensation for the work done regardless of whether they are on a team.

Project managers should think carefully about the change in behavior they desire and plan motivation and rewards to encourage it. For example, recognizing individuals, only the team leader, or a core part of the team does not encourage teamwork.

Project managers should not depend heavily on rewards or other types of extrinsic motivation for obtaining results. There are just too many ways in which they can backfire. People will resist attempts to be controlled by rewards or money. Kohn⁴ provides plenty of evidence against the use of extrinsic motivators.

Organizing the Team

Although there are as many types of organizational structures as there are organizations, most of them fall somewhere on a spectrum from a functional organization (Figure 35-2) in which each person reports to a functional manager to the separate team (Figure 35-3), in which individuals involved in the project report directly to the team leader, who in turn reports to a general manager. Between these two extremes lie a range of options (matrix organizations) in which an individual reports simultaneously to a functional manager and a team leader. They are characterized by whether they are more like Figure 35-2 or Figure 35-3, that is, whether the functional bonds or the team bonds are stronger. See Chapter 16.

ORGANIZATIONAL OPTIONS

Each of these forms has its strengths and weaknesses. The functional form is popular in industry because it has provided functional strength and expertise for years. However, in the functional form, communication and

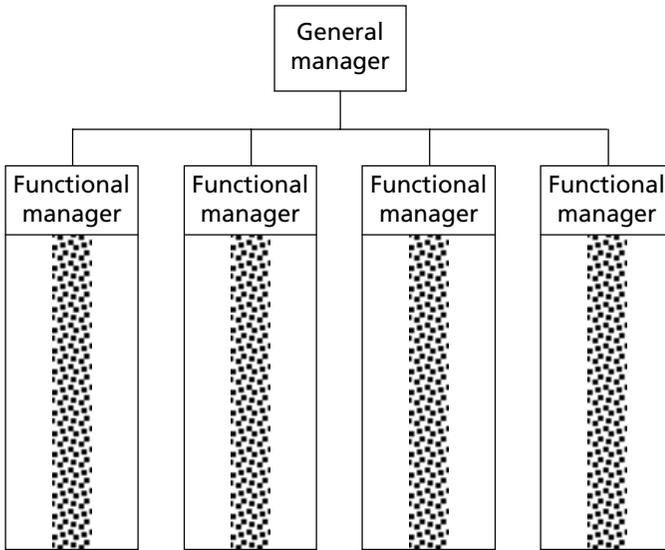


Figure 35-2 A Functional Organization, in Which All Individuals Are in Functional Departments, Which in Turn Report to a General Manager. For product development, the functions might be engineering, marketing, purchasing, and finance

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decision-making tend to flow through the functional heads. This simply is not very effective for the heavy load of cross-functional communication entailed in concurrent development. Decisions are made both better and faster with a more horizontal form, as the horizontal conduit in Figure 35-3 suggests.

Consequently, there is no one best form, and the one to use depends on the prime objectives of the particular project. Some projects developing highly innovative products can benefit greatly from the horizontal flow prevalent in the more autonomous forms. They are willing to tolerate the shortcomings of poorer functional coherence. For example, they may allow designers on every project team to select a different type of fastener, which ultimately causes factory complications. In contrast, for a more routine product-upgrade project, the balance can be completely different, which suggests a more functional organizational form. The most effective teams design their organization to fit the job rather than just adopting the company standard.

Once you select your organizational form, you should identify its weaknesses and be sensitive to them. For example, if you choose the separate team and proliferation of fasteners is likely to be a problem, put some type of fastener standards or coordinating mechanism in place to deal with this weakness.

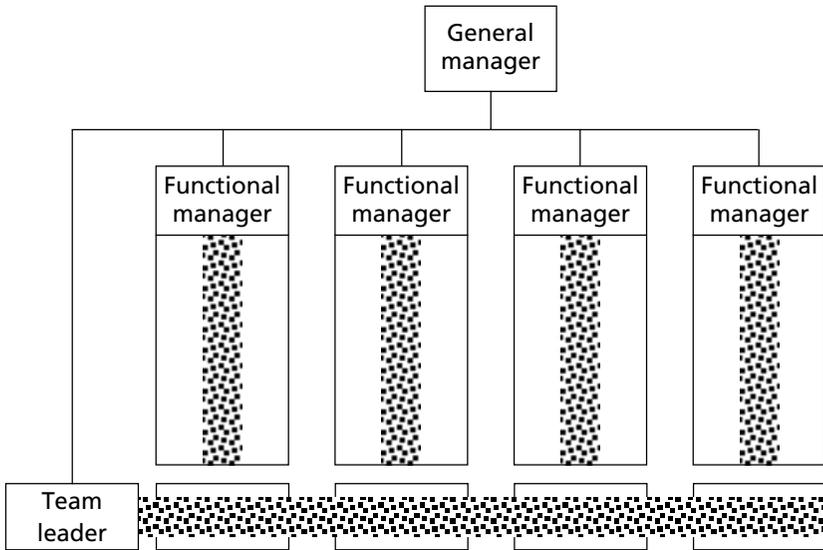


Figure 35-3 A Separate Team Organization, in Which Members of the Team All Report Directly to a Team Leader. There may be several of these teams, and their members are drawn from the functions for the duration of the project

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As companies remove layers from their hierarchies, they generally move toward more horizontal forms, which is generally in the right direction for development teams. However, this shift is not likely to be fast enough for the needs of an innovative development project. Thus, a concurrent development team may be in the position of pioneering new organizational forms in a company.

CO-LOCATION AND DISPERSED TEAMS

Most organizations pay a great deal of attention to the organizational structure issues just covered. Just as important—but generally receiving far less attention—is the geographical structure of the team, that is, exactly where its members are located.

Cross-functional communication, problem-solving, and decision-making are essential core activities in concurrent development. There are two ways to facilitate these activities: by organization or by location. Two individuals in the same department, even if they are not located together, are more likely to talk to each other. And two people located together are more likely to talk, even if they report to different bosses.

Locating the team close together is called co-location. We have found it to be a very powerful enabler of successful teams. To be most effective, three characteristics are highly desirable:

- All members should be co-located, including engineering, marketing, manufacturing, purchasing, and any others who play a key role.
- They should all be located within earshot—roughly 10 meters (30 feet).
- Line-of-sight arrangement should be used (partitions below seated eye level).

The oft-cited research of Allen⁵ (see his Chapter 8) supports this strict interpretation.

Although Allen's research is often cited to encourage teams to co-locate, we have found that this is a very personal thing, so the research is not convincing. The strongest evidence for co-locating comes from those who have actually done it. They unanimously appreciate its power to enhance communication. There is no substitute for the way it clarifies and speeds up communication. However, those who have not experienced it can cite countless reasons why it will not work. Therefore, I strongly encourage you to give it a serious test following the three bullets above.

Notice that I did not say that co-location was enjoyable—only highly effective. There are some real difficulties in implementing it, including

- Lack of sufficient open floor space
- Concerns about distractions or lack of privacy
- Functional bosses worried about losing control of “their” people
- Perceived lack of status
- Lack of a permanent office home

Consequently, even if you do successfully co-locate a team and they agree on its value, you will have to watch that co-location doesn't gradually revert to a more comfortable arrangement.

Since the 1990s, another blow has been struck against co-location: the availability of many electronic communication tools: e-mail, faxes, voicemail, phone conferencing, Internet conferencing, shared databases, and videoconferencing. Some people call this “virtual” co-location, but I consider these tools only as aids to communication that sometimes help but often hinder real communication, especially the type of complex, full-bodied communication that is often characteristic of concurrent development. For example, phone tag, a byproduct of voicemail—and its e-mail equivalent—is not a way to make fast, effective decisions when collaboration is needed.

In addition to the availability of such tools, other business trends have caused teams to disperse geographically: offshore manufacturing, global markets, acquisition of operations in other regions, and relocation out of expensive areas or into ones that are more pleasant. Consequently, highly dispersed team membership has become an obstacle for today's product-development teams. Smith and Blanck⁶ discuss several things you can do to make the most of a dispersed team, including:

- Don't give up on co-location but apply as many of its characteristics as you can by using partial co-location.

- If the team can get together at any point during the project, try hard to do it at the beginning, for many reasons.
- Establish jointly agreed-to protocols for effectively using tools such as e-mail.
- Through training, sensitize your team to its cultural differences (national, organizational, and functional differences in values, styles, and approaches)
- Pay attention and object when you see your team being dispersed even further.

ESTABLISHING THE TEAM'S AUTHORITY

Most of the approaches and techniques suggested above are aimed at improving communication and decision-making within the team, which is vital for concurrent development. However, there is one more, often-overlooked item that needs careful attention: how much and what kinds of authority does the team have to operate? Without clarity here, time will be lost as issues are resolved, and the team is likely to be reluctant to move in areas where management believes the team does have authority.

Table 35–1 shows a sampling of the areas of authority exercised by someone in an organization developing a typical product.

Before using this list, adapt it to your development system, adding and deleting items to suit your organization and changing the terminology to your terms. This list is useful in two ways. First, recognize that management, the team, or some perhaps vague combination has authority in each of these areas. It behooves you to clarify in advance who has authority in each area. Second, the team can use this as a prompt list to identify those few areas where it does not have authority now but would greatly benefit from having such authority. Then it can approach management to obtain this type of authority. Note that more authority for the team is not necessarily better, because with each item of authority comes responsibility and extra work.

You can also provide team authority on a more global level. One approach is by using development agreements between the team and management. As explained in Chapter 14 of Smith and Reinertsen, these are essentially contracts between the team and management that specify the team's and management's authority and obligations in a mutually binding way. For instance, the agreement might state that the team shall deliver a product with a certain five features and at a certain unit cost by March 15, whereas management shall make a certain number of employees and an R&D lab available full time from September 1 to March 15.

A similar and more recent approach is the bounding box, essentially a management-by-exceptions technique in which certain critical parameters of the project, such as profit margin, project budget, product-performance level, and launch date, are negotiated as the bounding box. Then the team is free to move ahead unimpeded as long as it stays within the box. Management regularly checks that the team remains within bounds, and it is

Table 35-1 Areas of Authority

Financial Control	Manage outside contractors
Prepare project expense budget	Select vendors and suppliers
Modify project expense budget	Manage vendors and suppliers
Prepare project capital budget	Operational Control
Modify project capital budget	Select product features
Use project capital budget	Modify product features
Authorize travel	Determine product architecture
Pay for manufacturing variances	Set reuse objectives
Establish delegation limits	Make reuse decisions
Cancel project	Make design outsourcing decisions
Management of People	Prepare project schedule
Prepare staffing plan	Modify project schedule
Modify staffing plan	Select development location
Select team members	Determine layout of team work area
Hire team members	Determine agenda of team meetings
Remove team members	Select development methods
Evaluate team member performance	Modify development methods
Determine team member compensation	Select engineering tools
Determine team member bonuses	Select test procedures
Provide recognition to team members	Modify test procedures
Management of External Relationships	Determine test criteria
Select key business partners	Set documentation standards
Manage key business partners	Select manufacturing site
Select key technology partners	Select manufacturing processes
Manage key technology partners	Set quality standards
Select outside contractors	Set manufacturing yield targets
	Set management reporting requirements

Copyright © 2003, Reinertsen & Associates. Derived 7/21/03 from Figure 6-4 of *Managing the Design Factory* by Donald G. Reinertsen. The Free Press, 1997.

also the team's responsibility to notify management quickly if it finds that it is leaving the box. If the team leaves the box, then a management review considers whether the project should continue, and if so, the box's limits are reset. One parameter that must be determined, according to company's tolerance for risk, is the margin the team is allowed around the perimeter of the box. If it is set too tightly, then out-of-bounds reviews occur frequently, but if it is set too loosely, the team can wander far from the goal before being detected. Typically, margins are set looser for more experienced teams and for projects with a lower level of risk, in other words, with teams that management is more comfortable letting run on their own.

Another consideration is the interplay that bounding box may have with any phased development process used, such as the stages-and-gates process described by Cooper.⁷ At a minimum, bounding box is an effective way for management to monitor progress between gate reviews without meddling in the team's business. In more powerful implementations, the bounding box replaces the reviews at the end of the phases, and the team runs through much or all of the project without management reviews as long as it remains within the box. In this case, the team maintains a great deal of authority while the project meets its objectives without delay for reviews.

Bounding box is likely to work best if the organization is able to cleverly set only a few boundaries that focus attention on critical success factors for the project, rather than dozens of secondary factors that—while seemingly beneficial—may distract the team and management from the essence of project success. For instance, the Hewlett-Packard team developing HP's first DeskJet printer was given three boundaries for the project: letter-quality printing, prints on regular copier paper, and priced under U.S. \$1000.

Conclusion

Teams vary greatly in their performance capability, and projects vary greatly in their need for a high-performance team. Higher performance can be costly when it is not needed. Concurrent-development teams often benefit from employing the more powerful types described in this chapter, and the chapter may also be helpful to those wishing to increase the performance of teams for other applications.

I have provided a broad variety of tools and approaches. Keep the objective and special characteristics of your project in mind as you select the tools and approaches to apply. This implies that there is no universal way of setting up a team; it all depends on what you want to achieve and under what circumstances. Don't be afraid to experiment with different techniques on different projects until you find ones that work for you. Whatever you use will have to fit your organization's culture—although you can shift this to an extent—so the “right” solution for you will be different than the “right” one for another organization, even for the same project.

ENDNOTES

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- 3 Kelley, Robert E. In praise of followers. *Harvard Business Review* 66(6):142–148
- 4 Kohn, Alfie. *Punished by Rewards*. Boston: Houghton Mifflin, 1993
- 5 Allen, Thomas J. *Managing the Flow of Technology*. Cambridge, MA: MIT Press, 1977
- 6 Smith, Preston G. and Blanck, Emily L. From experience: leading dispersed teams. *Journal of Product Innovation Management* 19(4):294–304
- 7 Cooper, Robert G. *Winning at New Products*, 3rd Edition. Cambridge, MA: Perseus, 2001

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