

Controlling the Product Creation Process

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Pressure to be first to market with the right products is nothing new. Companies that rely on new product introductions for growth and prosperity have always known that ill-conceived products and lost development time cost them heavily in missed sales targets, lost revenues, postponed profits, and wasted development resources. What *is* new is that the stakes are now much higher than they used to be. Product technologies are increasing in sophistication and complexity, while product lifecycles are shrinking and competition intensifying, dramatically raising the costs and risks of new product development.

In response, many companies are abandoning the traditional functional approach to new product development in favor of new models that integrate teamwork and concurrent engineering. While the new models offer tremendous benefits in terms of both speed and quality, they can also cause considerable upheaval, frustration, and strife. The question is how to bring the process under effective control.

In the functional approach, projects were divided into segments and assigned sequentially to the relevant functional areas (e.g., Marketing, Research, or Engineering). Each functional manager retained primary responsibility for his or her project segment, even though a project administrator typically coordinated the work and handed the project over to the next function in the chain after each segment was completed.

In the new approach, sometimes referred to as project matrix management,¹ projects are self-contained and project leaders are responsible for completing them by meeting preset targets. The leader contracts resources from the various functional areas, organizes the work flow, and makes technical decisions.

Functional managers may recognize the need for this new approach, but they also feel uncomfortable about it. They ask, „Won't the weakening of the functional line of authority undermine the functional excellence of my organization? How will I measure individual accountability if all the work is done in teams? How can I contain the risk of wasted efforts, when all tasks proceed in parallel?“

Even project leaders sometimes have these reservations. Managing a large-scale project with a cross-functional team under intense quality, time, and budget pressures is a daunting task. Constant interference from worried management adds to the burden, and high-caliber project leaders willing to take on the challenge are hard to come by.

Fortunately, an effective control process for new product development can ease the worries of both functional managers and project leaders. Effective control of the product creation process has two aspects: steering *individual* development projects through milestones and supervising the entire *portfolio* of ongoing and planned development projects.

What Is a Milestone?

Based on unfortunate experience in your own company, you may be tempted to associate a milestone with a border crossing point, where obnoxious officials check whether travelers carry the right passport. A more apt metaphor for the role milestones play in effective project steering is a mountain-climbing team's nightly bivouac. At the end of each day, the team meets to determine whether the day's goals have been met, review the next day's task, anticipate problems along the road, and check and repair equipment. Occasionally, team members radio down to the base camp for provisions, medical assistance, weather forecasts, or advice. The difference in the two is that a border crossing point is viewed as an obstacle to progress whereas a bivouac is viewed as a welcomed, productive portion of the journey.

Your company is almost certain to have project milestones. You should check whether they stand the following climb tests:

- Does a project plan explicitly identify all milestone events? Does it stipulate how and when they will occur?
- Are the deliverables for each milestone clearly defined in advance? Are go/no-go decisions made at milestone progress reviews?
- Is the experience of senior staff used at the reviews to anticipate and evaluate problems in meeting deliverables at future milestones?
- Are projects redirected to fill the gaps detected at a milestone, or are projects allowed to proceed even when requirements are only partially fulfilled?
- Do both the project leader and the project client participate at each milestone? Are the requirements from *all* functional areas addressed at each milestone?

If your company fails one or more of these quality tests, we recommend that you carefully assess opportunities for making the control process more effective. Milestones must be viewed not as obstacles to progress (i.e., border crossings) but as critical elements in achieving progress (i.e., bivouacs). Milestones can be a powerful tool, provided that the milestone structure, the milestone deliverables, and the milestone review process are accurately defined.

Defining the Milestone Structure

The first step in using milestones is to create a uniform, natural, and balanced milestone structure.

Creating a Uniform Structure. Although project leaders could define unique milestones for each development project, a uniform, companywide milestone structure has the following advantages:

- A common vocabulary facilitates communication. For example, if a project leader says that a project has just passed milestone M4, everybody involved would know the status of the project.
- A standard framework of milestone deliverables reduces project start-up time. The project leader does not have to invent a framework for every project, and team members do not have to learn multiple frameworks.
- A consistent definition allows internal benchmarking. For example, the company can track its progress in reducing lead time by project phase, or it can compare the performances of different projects.

Although milestone structures generally should conform to a uniform framework, different project categories may require different milestone structures.

Establishing Natural Phases. To define the phases in the milestone structure, project leaders should look for natural breaks. These may occur at points in which:

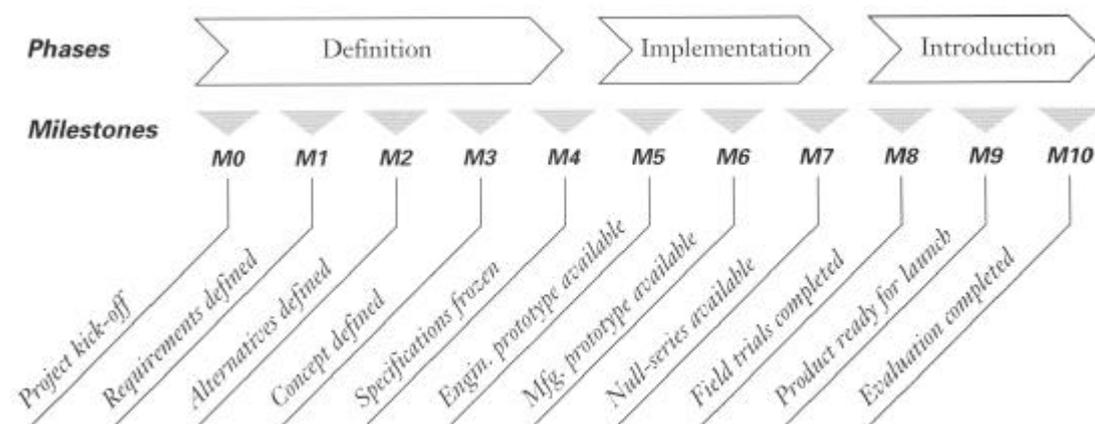
- *Functions change.* A product development project is cross-functional from start to finish. Nevertheless, some functions are more heavily involved in one phase than in another. For example, marketing is heavily involved in the early phases and manufacturing engineering in the later phases.
- *Tangible deliverables are available.* Prototypes are clear indicators of project progress. For engineered products, for example, prototypes vary from „works like“ breadboards to „works like, looks like“ engineering models to „works like, looks like, made like“ production prototypes.
- *Resource decisions are made.* Development resources must be allocated and investments in tooling or manufacturing equipment approved.

Exhibit 1 shows a milestone structure for a manufacturer of made-to-order capital equipment with three phases and 11 milestones. In the definition phase, the team develops a product concept and demonstrates its feasibility. In the implementation phase, it produces detail designs, builds and tests prototypes, and manufactures the null-series. In the introduction phase, it prepares for distribution, then launches the product, ramps up production, and reviews sales performance.

Achieving Balance. Traditional milestone structures often are unbalanced, with many milestones for the implementation phase but almost none for the definition and introduction phases. Exhibit 2 shows both the original and revised milestone structure of the capital equipment manufacturer.

Exhibit 1

Sample Milestone Structure



The lack of milestones in the definition phase reflects management's tradition of concentrating on a process only when authorization for large amounts of money is requested. In product development, this occurs when manufacturing tools and process equipment are ordered. As long as development is confined to paperwork and brainwork, management stays away.

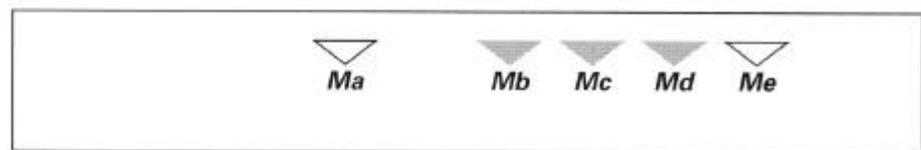
As Exhibit 3 shows, such behavior is misdirected. The financial impact of making the wrong decision in the definition phase (e.g., misinterpretation of lifestyle trends, poor technology choices, wrongly assessed competitor strategies) can be enormous. Milestones in the definition phase help draw management attention to these important decisions.

Similarly, milestones for following up product performance after launch are often absent. Responsibility is too quickly handed to the line organization; little feedback reaches the team that originally designed the product. Milestones after product launch help overcome this shortcoming. Some companies maintain milestones throughout a product's life cycle.

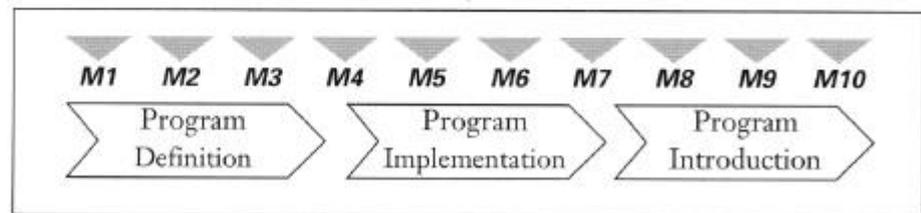
Exhibit 2

Original and Revised Milestone Structure

**Original
project
milestone
structure**



**Revised
project
milestone
structure**



Defining the Milestone Deliverables

After the milestone structure is defined, the content of each milestone must be determined. This is a two-step process. First, the main functions that contribute to the project must be identified. Marketing, engineering, and manufacturing are common to most industries. Other functions depend on the business; for example, order handling is used in the made-to-order equipment business.

In the second step, *the* specific deliverables that correspond to each milestone must be defined. The deliverables should be tangible (e.g., a competitor analysis, a drawing, a prototype, or test results, but not a sales release). The deliverables should not be so detailed that they constrain the project. One of the strengths of a milestone-based rather than a task-based product creation process is that it allows project flexibility and opportunities for the project team to innovate.

Exhibit 4 shows the milestone approach adopted by a manufacturer of engineered products. Three differences between the original and revised approach stand out. First, the range of functions that must contribute to project progress is widened considerably. Second, each function must contribute to each milestone, even those functions that will provide most of their work effort only later in the project. For example, the sales function should contribute the pricing strategy for the new product already at the concept feasibility milestone, even though work on promotional literature will start much later in the process.

The third difference relates to the presentation of project progress at a milestone. Originally, it was left entirely to the project leader's discretion what would be discussed at the upcoming review meeting. In the revised scheme, it is clear to both project leader and reviewers what deliverables are expected at each milestone. For example, one deliverable expected from the engineering function at the product definition milestone is a quality function deployment analysis.

Exhibit 3

Focus of Management Attention

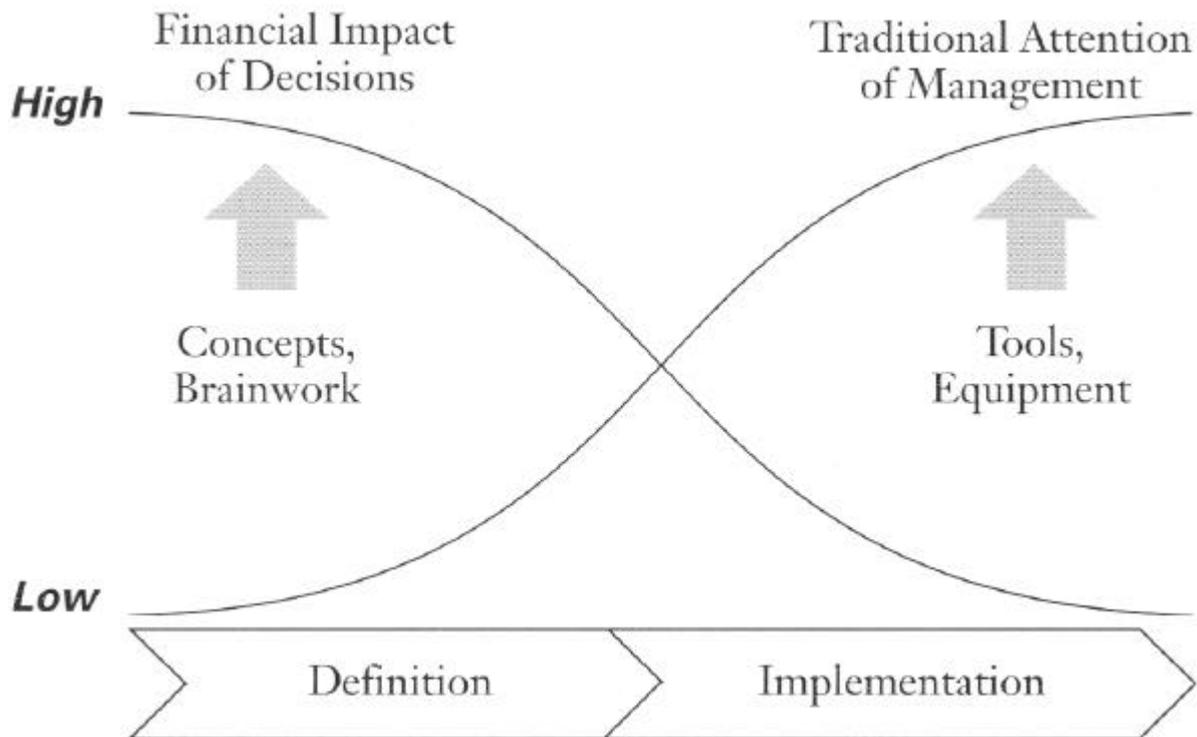
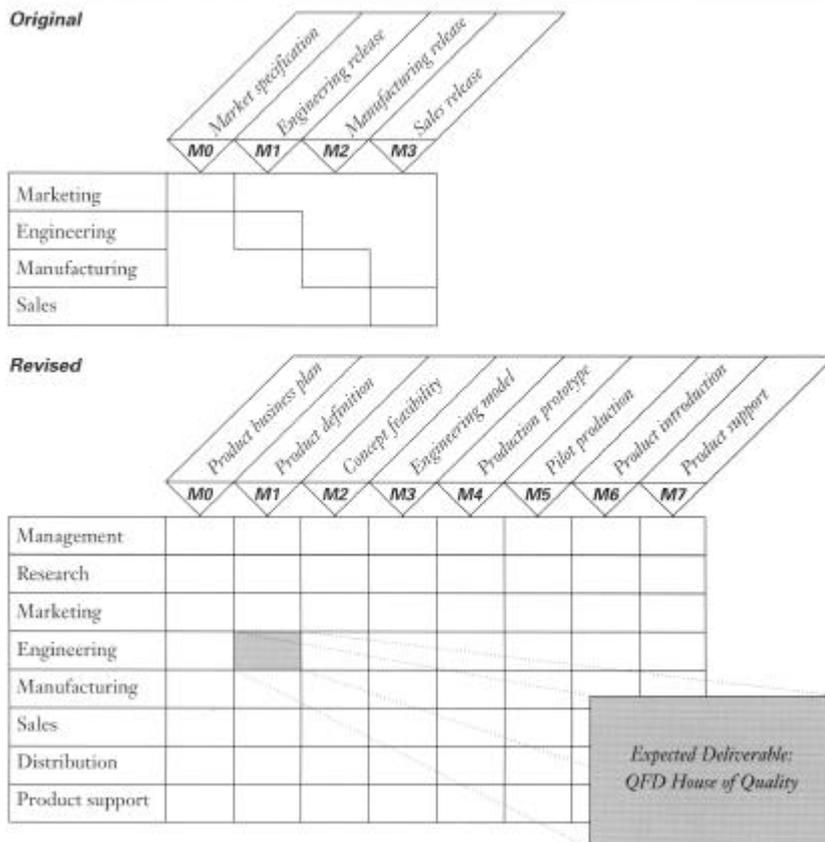


Exhibit 4

Milestone Approach by Manufacturer of Engineered Products



Defining the Review Process

To make the milestone structure operational, an effective review process must be defined. The structure of review boards, the participants' problem-anticipation behavior, and the tools for managing a review must contribute to more effective decision making.

A Streamlined Board Structure. Most companies have far too many boards and committees to steer and supervise the product creation process. These boards often are a source of frustration. As one board proves ineffective, another one is added, eventually leading to a monstrous construction in which more time is spent on resolving communication conflicts between the boards than on controlling the product creation process itself. Exhibit 5 shows the boards involved in controlling the product creation process at a transportation equipment manufacturer. These boards had vague and overlapping responsibilities, and they operated mostly in reactive mode, with insufficient input from the local market organizations. A zero-based rethinking of the approach led to the streamlined structure shown in Exhibit 6.

Exhibit 5

Original Board Structure at Manufacturer of Transportation Equipment

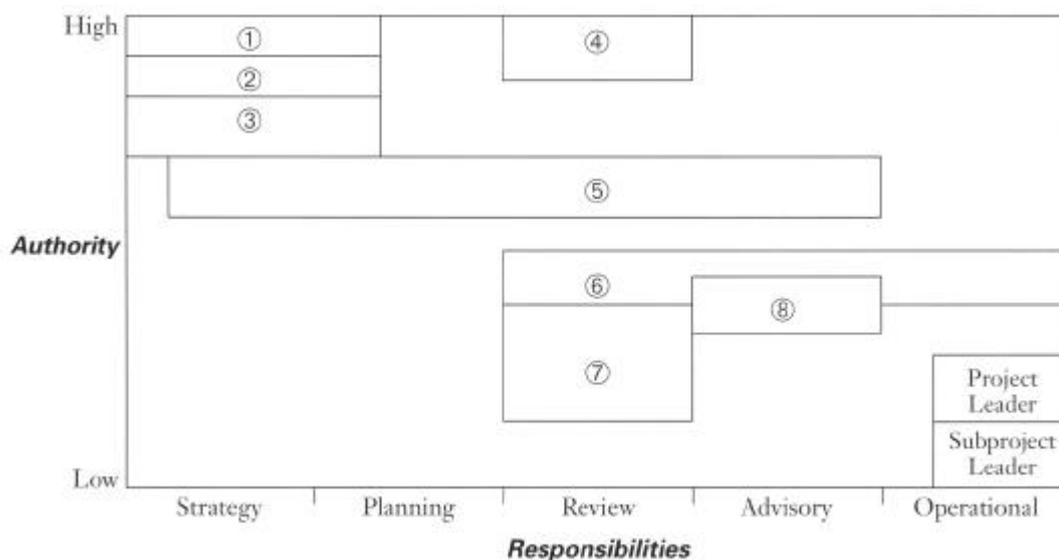
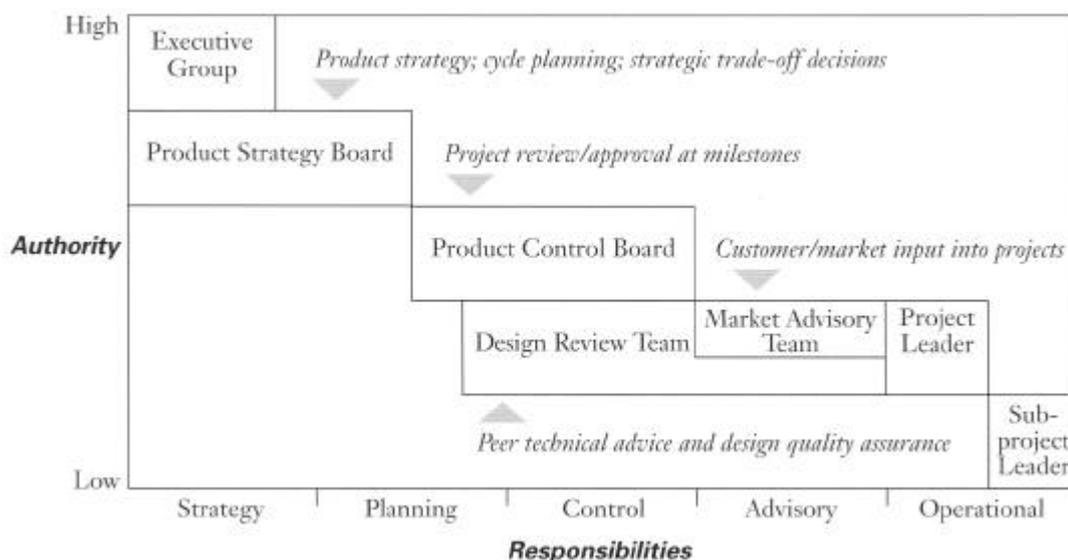


Exhibit 6

Revised Board Structure



Controlling product creation involves a broad range of product decisions. On one hand, there are product strategy and planning questions, such as which segments to compete in, how to compete, what products to launch, and when to launch them. On the other hand, there are decisions as to whether each product development project passes its individual milestones.

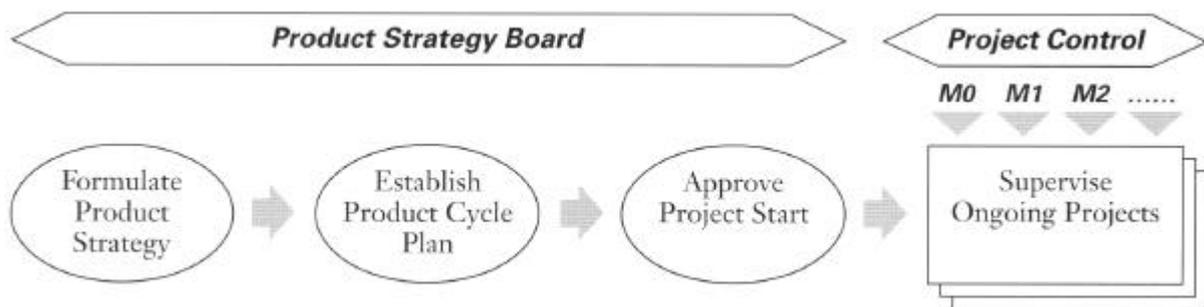
These two types of decisions require different perspectives, experience, and knowledge. Therefore, the same board should not deal with both. A product strategy board should handle the product strategy and planning issues, and a project control board should supervise projects at each milestone, as shown in Exhibit 7.

Problem Anticipation. Project teams often view milestone reviews as a burden, leaving them with added tasks yet without clear direction. Managers who have technical backgrounds tend to use reviews as an opportunity to reengineer and second-guess the project team, rather than to evaluate progress objectively, provide guidance for future tasks, and deal with potential obstacles.

As a result, projects are often allowed to continue without fully satisfying the specified milestone deliverables. An effective review process results in a uniform milestone progression of all functions, as shown in Exhibit 8. A skewed profile betrays an „engineering-driven“ project, a „market-driven“ project, etc.

Exhibit 7

New Product Development Boards



Tools for Facilitating Decision Making. Exhibit 9 shows, in a simplified way, a tool used by an electronics manufacturer to stimulate useful problem-anticipating behavior. Prior to each milestone, the project team analyzes the variance between the actual and specified deliverables and systematically charts the implications of the various actions for resolving these variances. The actual milestone review meeting can then be used to make trade-offs, resolve conflicts, and decide on the best course of action.

Benefits of an Effective Control Process

Defining the milestone structure, deliverables, and review process takes time. It also requires goodwill, because many project leaders are averse to planning, which they consider difficult and time-consuming. The only sure thing about plans, they think, is that they never come out anyway. In addition, who wants to commit and be held accountable? An effective control process helps overcome these objections.

Planning and Controlling Progress. The milestone structure and deliverables provide the project leader an easy-to-use and time-saving checklist for developing a project time-and-resource plan at kick-off. First, the deliverables suggest which tasks the team must complete to move from one milestone to the next. Second, they enable the project leader to predict time and resource requirements for each task. As each milestone passes, the project leader checks whether the team adhered to the original plan to produce the deliverable within the projected time and resources. If not, the leader learns why (e.g., because of unforeseen tasks or underbudgeted resources).

Anticipating Problems. At each milestone, the project leader revisits and possibly adapts the initial plan, identifying any problems in meeting future milestones. The leader must ask the project control board to resolve uncertainties that are beyond the leader's authority. Typical examples include resource conflicts between project leaders or disagreements between a project leader and a functional line manager about the need to adhere to a standard.

Exhibit 8

Uniform Milestone Progression

	M0	M1	M2	M3	M4	M5	M6	M7
Management	Complete	Complete	Complete	Started				
Research	Complete	Complete	Complete	Started				
Marketing	Complete	Complete	Complete	Started				
Engineering	Complete	Complete	Complete	Started				
Manufacturing	Complete	Complete	Complete	Started				
Sales	Complete	Complete	Complete	Started				
Distribution	Complete	Complete	Complete	Started				
Product support	Complete	Complete	Complete	Started				

-  Complete
-  Started
-  Completed at risk
-  Proceeding at risk

Exhibit 9

Variations and Actions

Variations	Resolution Actions				Resolution Actions	Project Requirements			
	Limited circuit redesign	4-layer PCB design	DFM change	PCB consolidation		Time to market	Development cost	Risk	Product cost
Hardware/software performance issues	++	+			Limited circuit redesign	-	-	+	-
EMC hardening not achieved	+	++			4-layer PCB design	-	-	++	--
DFM objectives not satisfied			++	++	DFM change	--	-	+	+
Reliability requirements not achieved	++	-	+	++	PCB consolidation	--	-		+

Encouraging Cross-Functional Work. Early participation of all relevant functions in a project improves the effectiveness of new product development. For example, manufacturing should not wait until the technical release to get involved: they too should have the opportunity to influence the product requirements and specifications. Early participation is ensured by defining the deliverables at the initial milestones correspondingly. For example, milestone M1's deliverable could include a description of manufacturing constraints, and milestone M2's could include an evaluation of preliminary design sketches by manufacturing. Well-designed milestones encourage concurrent engineering.

Balancing Autonomy With Supervision. Project leaders find management's continuous and arbitrary interference in a project demotivating and disruptive. Management, on the other hand, is justifiably concerned about project progress. Milestones offer a balance between the desire for autonomy and the need for supervision.

If the milestones occur regularly and are well defined, they reassure both sides that management can limit its involvement to the milestone events. Between milestones, the project team can be trusted to handle its own responsibilities.

The Senior Management Agenda

It is worth assessing how effectively your company controls the product creation process. Are milestones balanced across the duration of projects? Have deliverables been defined precisely? Is the review process fluid? In addition, you may need to overcome a common misconception about control: milestones are not an administrative burden imposed by senior managers eternally worried about the team's capability to deliver, but a self-help tool without which a team can feel hopelessly lost. Ultimately, the mountain-climbing team and the base camp are jointly responsible for the success of a climb.

¹ For a full description, see Erik W. Larson and David H. Gobeli, „Matrix Management: Contradictions and Insights,“ *California Management Review*, Volume XXIX, Number 4, summer 1987.

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