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Project Management: The View from 30,000 Feet

Do your most
demanding projects
contribute *least* to your
company's strategy?

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Collection Overview

Has your company's project management run amok? Are more than half your biggest projects failing outright? And are other large initiatives running months behind schedule, stuck in seemingly permanent logjams? Are you particularly frustrated by projects whose myriad tasks were executed flawlessly—but still don't deliver the expected results? Worse, do you suspect that projects consuming the *most* resources have the *least* connection to your company's strategy?

Such chaos describes many companies—but that's little comfort. The key is to understand the myopia causing these disasters. Most companies deal with projects individually—pushing each through the pipeline as quickly and cost-effectively as possible. But this approach doesn't help you make vital big-picture decisions: "What *mix* of projects would be best for our organization?" "How do we allocate scarce resources to the most strategically important projects?" "How can we roll out large initiatives more confidently?"

To view project management from 30,000 feet, apply these techniques:

- Achieve the right *blend* of project types—including breakthrough, platform, and derivative products; R&D efforts; partnerships.
- Eliminate strategically irrelevant initiatives.
- Replace *project* management with *process* management—unplugging bottlenecks, smoothing out workloads, and getting products to market faster.
- Build small projects into large initiatives early—to deliver fast, measurable payoffs and iron out problems before they doom the effort.

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by Steven C. Wheelwright and Kim B. Clark

Begin ascending to 30,000 feet by creating an **aggregate project plan**—an analysis of the blend of project types that best supports your company's strategy. Select from these types: *derivative* (incremental changes such as new product packaging or no-frills versions), *breakthrough* (major changes that create entirely new markets), *platform* (fundamental improvements to existing products), *research and development*, and *alliances and partnerships*. Include projects from every category—though platforms may offer the greatest competitive advantage.

Estimate resources needed for each project type. Based on *available* resources, how many projects of each type can your company support? Eliminate any that don't reinforce your strategy. For many companies, these constitute the lion's share.

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After identifying your strategic project mix, streamline and accelerate project completion by applying **process management** principles. Draw a *processing network model* showing all departments involved in project development, tasks they perform, and information flows among departments. Determine how many types of projects each department handles, what resources they have available, and how many iterations project tasks generally require.

Analyze your findings, watching for surprises—such as groups above full utilization or widely varying workloads. Improve balance between resources and workloads, for example, by automating bottlenecked steps, limiting the number of projects under way simultaneously, and reducing the number of "urgent" projects, which can derail ongoing work.

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by Nadim F. Matta and Ronald N. Ashkenas

Even when you focus resources on strategically relevant projects and streamline their management, long-term initiatives carry risks: *white space* (planners leave gaps by failing to anticipate all required activities), *execution* (teams don't implement designated activities properly), and *integration* (teams execute tasks flawlessly but fail to knit project pieces together upon completion).

Manage these risks with **rapid-results initiatives**: small projects that quickly deliver mini-versions of the big project's end results. In addition to enabling team members to generate quick payback, rapid-results initiatives transform the way teams work by creating a sense of urgency and eliminating time wasted on interorganizational bickering.

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Included with this full-text *Harvard Business Review* article:

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A list of related materials, with annotations to guide further exploration of the article's ideas and applications

Creating Project Plans to Focus Product Development

The Idea in Brief

Could anything *else* go wrong with your company's product development efforts? You're running out of money. Products are late. Panicked team leaders are cutting corners. Most alarming, people are squandering scarce resources on "the squeakiest wheels" rather than tackling *strategically* important products.

How to halt the chaos? Approach product development more systematically—with an **aggregate project plan**. No single project can define your firm's future; rather, the *set* of projects does. An aggregate project plan helps you manage your company's project mix and allocate scarce resources shrewdly. It categorizes projects based on their contribution to your firm's competitive strategy and the resources they consume. And it highlights gaps in your development pipeline.

After building an aggregate project plan, most companies eliminate the lion's share of their existing projects—freeing up resources for their most strategically valuable efforts.

The Idea in Practice

To build your aggregate project plan:

Classify existing projects according to five categories. Each category entails different degrees of product and manufacturing change. The greater the degree of change, the more resources the project consumes.

- **Derivative:** incremental changes to existing products such as cheaper, no-frills versions, new packaging, or more efficient manufacturing. Relatively few resources needed.
- **Breakthrough:** major changes that create entirely new product categories and markets. Significant resources needed.
- **Platform:** fundamental improvements in cost, quality, and performance over previous generations of products. Though these projects entail more extensive changes than derivatives—and less than breakthroughs—they require considerable upfront effort from numerous functions. Offering significant competitive leverage and the potential to increase market penetration, they should form the core of your aggregate project plan.

► **Example:**
 Sony dominated the personal audio system market with 200+ Walkman models based on three platforms. The models offered something tailored to every niche, distribution channel, and competitor's product.

- **Research and development:** creation of new materials and technologies that eventually translate into commercial developments. These projects compete with commercial efforts for resources. However, a close relationship between R&D and commercial projects is essential for a balanced project mix and smooth conversion of ideas into products.

- **Alliances and partnerships:** relationships formed with other companies to pursue any type of project. Many companies fail to include them in their project planning or to provide them with enough resources.

Estimate the average time and resources needed for each project type based on past experiences. For example, how many engineering months does each project type typically require?

Identify your existing resource capacity.

Determine the desired mix of projects. Include some from every category needed to support your overall corporate strategy, paying special attention to platforms.

► **Example:**
 Scientific-instrument maker PreQuip strategically allocated 50% of its resources to platform, 20% to derivative, and 10% each to R&D and partnership projects.

Estimate the number of projects your existing resources can support. Allocate available resources according to your strategic product mix.

Decide which projects to pursue.

► **Example:**
 PreQuip reduced its number of development projects from 30 to 11 (3 derivatives, 1 breakthrough, 3 platforms, 3 R&D, and 1 partnership). Fewer projects meant more work got done; more work meant more products. The company's commercial development productivity improved threefold.

With an “aggregate project plan,” companies map out and manage a set of strategic development projects.

Creating Project Plans to Focus Product Development

by Steven C. Wheelwright and Kim B. Clark

The long-term competitiveness of any manufacturing company depends ultimately on the success of its product development capabilities. New product development holds hope for improving market position and financial performance, creating new industry standards and new niche markets, and even renewing the organization. Yet few development projects fully deliver on their early promises. The fact is, much can and does go wrong during development. In some instances, poor leadership or the absence of essential skills is to blame. But often problems arise from the way companies approach the development process. They lack what we call an “aggregate project plan.”

Consider the case of a large scientific instruments company we will call PreQuip. In mid-1989, senior management became alarmed about a rash of late product development projects. For some months, the development budget had been rising even as the number of completed projects declined. And many of the projects in the development pipeline no longer

seemed to reflect the needs of the market. Management was especially troubled because it had believed its annual business plan provided the guidance that the marketing and engineering departments needed to generate and schedule projects.

To get to the root of the problem, the chief executive first asked senior managers to compile a list of all the current development projects. They discovered that 30 projects were under way—far more than anticipated, and, they suspected, far more than the organization could support. Further analysis revealed that the company had two to three times more development work than it was capable of completing over its three-year development planning horizon. (See the chart “PreQuip’s Development Predicament: Overcommitted Resources.”)

With such a strain on resources, delays were inevitable. When a project ran into trouble, engineers from other projects were reassigned or, more commonly, asked to add the crisis project to their already long list of active projects. The

more projects they added, the more their productivity dropped. The reshuffling caused delays in other projects, and the effects cascaded. Furthermore, as deadlines slipped and development costs rose, project managers faced pressure to cut corners and compromise quality just to keep their projects moving forward.

The senior management team also discovered that the majority of PreQuip's development resources—primarily engineers and support staff—was not focused on the projects most critical to the business. When questioned, project leaders admitted that the strategic objectives outlined in the annual business plan had little bearing on project selection. Instead, they chose projects because engineers found the technical problems challenging or because customers or the marketing department requested them. PreQuip had no formal process for choosing among development projects. As long as there was money in the budget or the person making the request had sufficient clout, the head of the development department had no option but to accept additional project requests.

Many engineers were not only working on noncritical projects but also spending as much as 50% of their time on nonproject-related work. They responded to requests from manufacturing for help with problems on previous products, from field sales for help with customer problems, from quality assurance for help with reliability problems, and from purchasing for help with qualifying vendors. In addition to spending considerable time fixing problems on previously introduced products, engineers spent many hours in "information" and "update" meetings. In short, they spent too little time developing the right new products, experimenting with new technologies, or addressing new markets.

PreQuip's story is hardly unique. Most organizations we are familiar with spend their time putting out fires and pursuing projects aimed at catching up to their competitors. They have far too many projects going at once and all too often seriously overcommit their development resources. They spend too much time dealing with short-term pressures and not enough time on the strategic mission of product development.

Indeed, in most organizations, management directs all its attention to individual projects—

it micromanages project development. But no single project defines a company's future or its market growth over time; the "set" of projects does. Companies need to devote more attention to managing the set and mix of projects. In particular, they should focus on how resources are allocated between projects. Management must plan how the project set evolves over time, which new projects get added when, and what role each project should play in the overall development effort.

The aggregate project plan addresses all of these issues. To create a plan, management categorizes projects based on the amount of resources they consume and on how they will contribute to the company's product line. Then, by mapping the project types, management can see where gaps exist in the development strategy and make more informed decisions about what types of projects to add and when to add them. Sequencing projects carefully, in turn, gives management greater control of resource allocation and utilization. The project map also reveals where development capabilities need to be strong. Over time, companies can focus on adding critical resources and on developing the skills of individual contributors, project leaders, and teams.

Finally, an aggregate plan will enable management to improve the way it manages the development function. Simply adding projects to the active list—a common practice at many companies—endangers the long-term health of the development process. Management needs to create a set of projects that is consistent with the company's development strategies rather than selecting individual projects from a long list of ad hoc proposals. And management must become involved in the development process before projects get started, even before they are fully defined. It is not appropriate to give one department—say, engineering or marketing—sole responsibility for initiating all projects because it is usually not in a position to determine every project's strategic worth.

Indeed, most companies—including PreQuip—should start the reformation process by eliminating or postponing the lion's share of their existing projects, eventually supplanting them with a new set of projects that fits the business strategy and the capacity constraints. The aggregate project plan provides a framework for addressing this difficult task.

Steven C. Wheelwright and **Kim B. Clark** are both professors of business administration at the Harvard Business School, where they teach technology and operations management. This article is taken from their book, *Revolutionizing Product Development: Quantum Leaps in Speed, Efficiency, and Quality*, published by The Free Press in April 1992.

How to Map Projects

The first step in creating an aggregate project plan is to define and map the different types of development projects; defining projects by type provides useful information about how resources should be allocated. The two dimensions we have found most useful for classifying are the degree of change in the product and the degree of change in the manufacturing process. The greater the change along either dimension, the more resources are needed.

Using this construct, we have divided projects into five types. The first three—derivative, breakthrough, and platform—are commercial development projects. The remaining two categories are research and development, which is the precursor to commercial development, and alliances and partnerships, which can be either commercial or basic research. (See the chart “Mapping the Five Types of Development Projects.”)

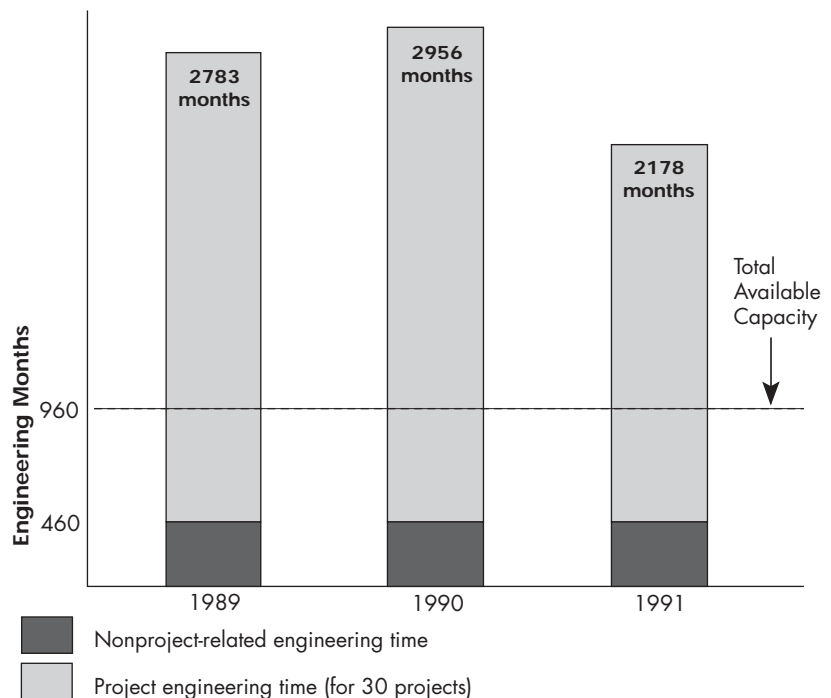
Each of the five project types requires a

unique combination of development resources and management styles. Understanding how the categories differ helps managers predict the distribution of resources accurately and allows for better planning and sequencing of projects over time. Here is a brief description of each category.

Derivative projects range from cost-reduced versions of existing products to add-ons or enhancements for an existing production process. For example, Kodak’s wide-angle, single-use 35mm camera, the Stretch, was derived from the no-frills Fun Saver introduced in 1990. Designing the Stretch was primarily a matter of changing the lens.

Development work on derivative projects typically falls into three categories: incremental product changes, say, new packaging or a new feature, with little or no manufacturing process change; incremental process changes, like a lower cost manufacturing process, improved reliability, or a minor change in materials used, with little or no product change; and

PreQuip’s Development Predicament: Overcommitted Resources



PreQuip had 960 engineering months each year to allocate to development work. But combining the time it would take to keep its current 30 projects on schedule with the time engineers spent doing nonproject development work, the company found it had overcommitted its development resources for the next three years by a factor of three.

incremental changes on both dimensions. Because design changes are usually minor, incremental projects typically are more clearly bounded and require substantially fewer development resources than the other categories. And because derivative projects are completed in a few months, ongoing management involvement is minimal.

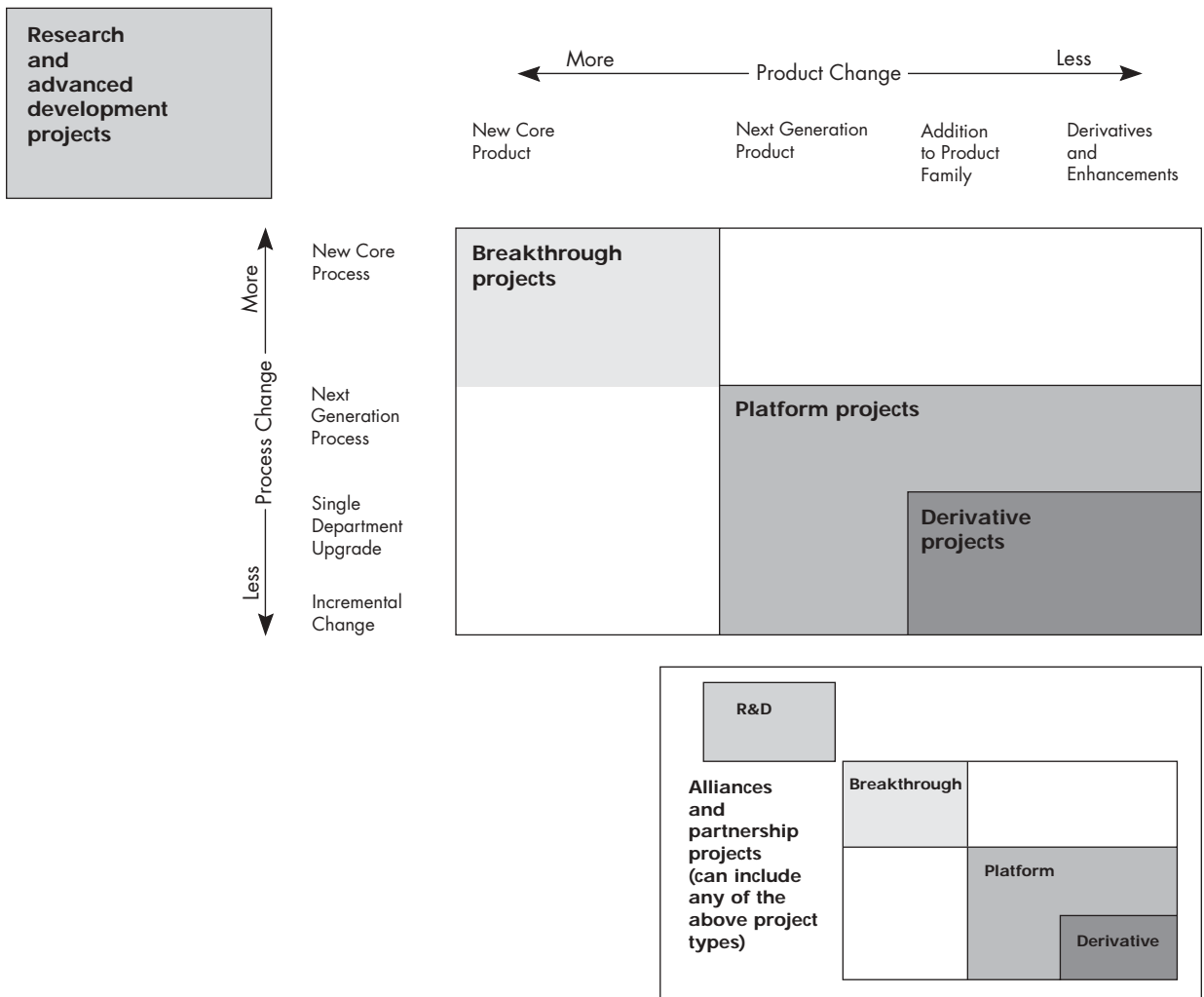
Breakthrough projects are at the other end of the development spectrum because they involve significant changes to existing products and processes. Successful breakthrough projects establish core products and processes that differ fundamentally from previous generations. Like compact disks and fiber-optics cable, they create a whole new product category that can define a new market.

Because breakthrough products often incor-

porate revolutionary new technologies or materials, they usually require revolutionary manufacturing processes. Management should give development teams considerable latitude in designing new processes, rather than force them to work with existing plant and equipment, operating techniques, or supplier networks.

Platform projects are in the middle of the development spectrum and are thus harder to define. They entail more product and/or process changes than derivatives do, but they don't introduce the untried new technologies or materials that breakthrough products do. Honda's 1990 Accord line is an example of a new platform in the auto industry: Honda introduced a number of manufacturing process and product changes but no fundamentally new technologies. In the computer market, IBM's PS/2 is a

Mapping the Five Types of Development Projects



personal computer platform; in consumer products, Procter & Gamble's Liquid Tide is the platform for a whole line of Tide brand products.

Well-planned and well-executed platform products typically offer fundamental improvements in cost, quality, and performance over preceding generations. They introduce improvements across a range of performance dimensions—speed, functionality, size, weight. (Derivatives, on the other hand, usually introduce changes along only one or two dimensions.) Platforms also represent a significantly better system solution for the customer. Because of the extent of changes involved, successful platforms require considerable upfront planning and the involvement of not only engineering but also marketing, manufacturing, and senior management.

Companies target new platforms to meet the needs of a core group of customers but design them for easy modification into derivatives through the addition, substitution, or removal of features. Well-designed platforms also provide a smooth migration path between generations so neither the customer nor the distribution channel is disrupted.

Consider Intel's 80486 microprocessor, the fourth in a series. The 486 introduced a number of performance improvements; it targeted a core customer group—the high-end PC/workstation user—but variations addressed the needs of other users; and with software compatibility between the 386 and the 486, the 486 provided an easy migration path for existing customers. Over the life of the 486 platform, Intel will introduce a host of derivative products, each offering some variation in speed, cost, and performance and each able to leverage the process and product innovations of the original platform.

Platforms offer considerable competitive leverage and the potential to increase market penetration, yet many companies systematically under-invest in them. The reasons vary, but the most common is that management lacks an awareness of the strategic value of platforms and fails to create well-thought-out platform projects. To address the problem, companies should recognize explicitly the need for platforms and develop guidelines for making them a central part of the aggregate project plan.

Research and development is the creation of

the know-how and know-why of new materials and technologies that eventually translate into commercial development. Even though R&D lies outside the boundaries of commercial development, we include it here for two reasons: it is the precursor to product and process development; and, in terms of future resource allocation, employees move between basic research and commercial development. Thus R&D projects compete with commercial development projects for resources. Because R&D is a creative, high-risk process, companies have different expectations about results and different strategies for funding and managing it than they do for commercial development. These differences can indeed be great, but a close relationship between R&D and commercial development is essential to ensure an appropriate balance and a smooth conversion of ideas into products.

Alliances and partnerships, which also lie outside the boundaries of the development map, can be formed to pursue any type of project—R&D, breakthrough, platform, or derivative. As such, the amount and type of development resources and management attention needed for projects in this category can vary widely.

Even though partnerships are an integral part of the project development process, many companies fail to include them in their project planning. They often separate the management of partnerships from the rest of the development organization and fail to provide them with enough development resources. Even when the partner company takes full responsibility for a project, the acquiring company must devote in-house resources to monitor the project, capture the new knowledge being created, and prepare for the manufacturing and sales of the new product.

All five development categories are vital for creating a development organization that is responsive to the market. Each type of project plays a different role; each requires different levels and mixes of resources; and each generates very different results. Relying on only one or two categories for the bulk of the development work invariably leads to suboptimal use of resources, an unbalanced product offering, and eventually, a less than competitive market position.

PreQuip's Project Map

Using these five project types, PreQuip set

Most companies should start reforming their development process by eliminating the lion's share of existing projects.

about changing its project mix as the first step toward reforming the product development process. It started by matching its existing project list to the five categories. PreQuip's product line consisted of four kinds of analytic instruments—mass spectrometers, gas and liquid chromatographs, and data handling and processing equipment—that identified and isolated chemical compounds, gases, and liquids. Its customers included scientific laboratories, chemical companies, and oil refineries—users that needed to measure and test accurately the purity of raw materials, intermediate by-products, and finished products.

PreQuip's management asked some very basic questions in its attempt to delineate the categories. What exactly was a breakthrough product? Would a three-dimensional graphics display constitute a breakthrough? How was a platform defined? Was a full-featured mass spectrometer considered a platform? How about a derivative? Was a mass spectrometer with additional software a derivative?

None of these questions was easy to answer. But after much analysis and debate, the management team agreed on the major characteristics for each project type and assigned most of PreQuip's 30 projects to one of the five categories. The map revealed just how uneven the distribution of projects had become—for instance, less than 20% of the company's projects were classified as platforms. (See the chart "Before: PreQuip's Development Process Was Chaotic....")

Management then turned its attention to those development projects that did not fit into any category. Some projects required substantial resources but did not represent breakthroughs. Others were more complicated than derivative projects but did not fall into PreQuip's definition of platforms. While frustrating, these dilemmas opened managers' eyes to the fact that some projects made little strategic sense. Why spend huge amounts of money developing products that at best would produce only incremental sales? The realization triggered a reexamination of PreQuip's customer needs in all product categories.

Consider mass spectrometers, instruments that identify the chemical composition of a compound. PreQuip was a top-of-the-line producer of mass spectrometers, offering a whole series of high-performance equipment with all the latest features but at a significant price pre-

mium. While this strategy had worked in the past, it no longer made sense in a maturing market; the evolution of mass spectrometer technology was predictable and well defined, and many competitors were able to offer the same capabilities, often at lower prices.

Increasingly, customers were putting greater emphasis on price in the purchasing decision. Some customers also wanted mass spectrometers that were easier to use and modular so they could be integrated into their own systems. Others demanded units with casings that could withstand harsh industrial environments. Still others required faster operating speeds, additional data storage, or self-diagnostic capabilities.

Taking all these customer requirements into account, PreQuip used the project map to rethink its mass spectrometer line. It envisaged a single platform complemented with a series of derivative products, each with a different set of options and each serving a different customer niche. By combining some new product design ideas—modularity and simplicity—with some features that were currently under development, PreQuip created the concept of the C-101 platform, a low-priced, general-purpose mass spectrometer. In part because of its modularity, the product was designed to be simpler and cheaper to manufacture, which also helped to improve its overall quality and reliability. By adding software and a few new features, PreQuip could easily create derivatives, all of which could be assembled and tested on a single production line. In one case, a variant of the C-101 was planned for the high-end laboratory market. By strengthening the casing and eliminating some features, PreQuip also created a product for the industrial market.

Mapping out the new mass spectrometer line and the three other product lines was not painless. It took a number of months and involved a reconceptualization of the product lines, close management, and considerable customer involvement. To provide additional focus, PreQuip separated the engineering resources into three categories: basic R&D projects; existing products and customers, now a part of the manufacturing organization; and commercial product development.

To determine the number of breakthrough, platform, derivative, and partnered projects that could be sustained at any time, the company first estimated the average number of en-

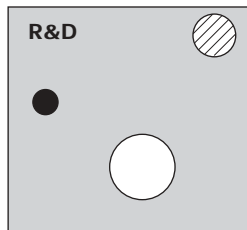
gineering months for each type of project based on past experience. It then allocated available engineering resources according to its desired mix of projects; about 50% to platform projects, 20% to derivative projects, and 10% each to breakthrough projects and partnerships. PreQuip then selected specific projects, confident that it would not overallocate its resources.

In the end, PreQuip canceled more than two-thirds of its development projects, including some high-profile pet projects of senior managers. When the dust had settled in mid-1990, PreQuip had just eleven projects: three platforms, one breakthrough, three deriva-

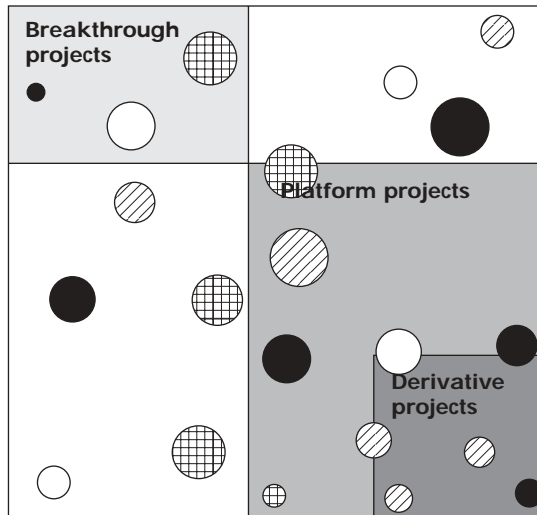
tives, one partnership, and three projects in basic R&D. (See the chart “...After: PreQuip’s Development Process Was Manageable.”)

The changes led to some impressive gains: between 1989 and 1991, PreQuip’s commercial development productivity improved by a factor of three. Fewer projects meant more actual work got done, and more work meant more products. To avoid over-committing resources and to improve productivity further, the company built a “capacity cushion” into its plan. It assigned only 75 full-time-equivalent engineers out of a possible 80 to the 8 commercial development projects. By leaving a small percent of development capacity uncommitted, PreQuip

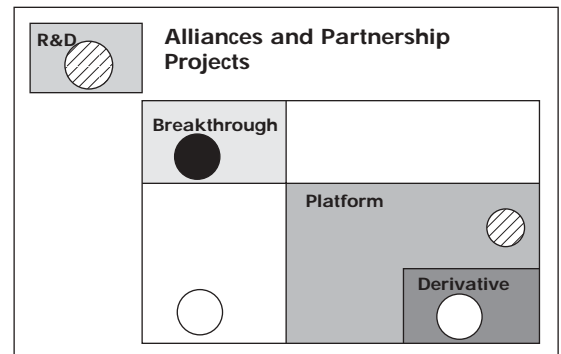
Before: PreQuip’s Development Process Was Chaotic. . .



Each circle represents a PreQuip development project; the size correlates to the amount of development resources the project requires.



- Mass spectrometers
- ◌ Liquid chromatographs
- ⊕ Gas chromatographs
- Data processing and handling products



was better prepared to take advantage of unexpected opportunities and to deal with crises when they arose.

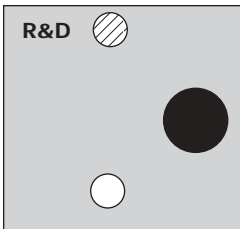
Focus on the Platform

PreQuip’s development map served as a basis for reallocating resources and for rethinking the mix of projects. Just as important, however, PreQuip no longer thought about projects in isolation; breakthrough projects shaped the new platforms, which defined the derivatives. In all four product lines, platforms played a particularly important role in the development strategy. This was not surprising considering the maturity of PreQuip’s indus-

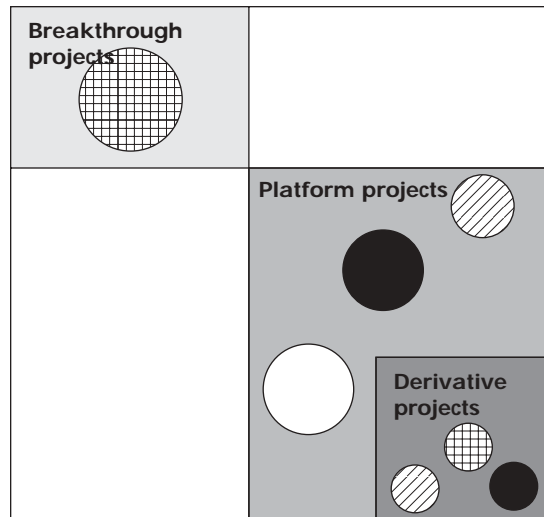
try. For many companies, the more mature the industry, the more important it is to focus on platform projects.

Consider the typical industry life cycle. In the early stages of growth, innovative, dynamic companies gain market position with products that have dramatically superior performance along one or two dimensions. Whether they know it or not, these companies employ a breakthrough-platform strategy. But as the industry develops and the opportunity for breakthrough products decreases—often because the technology is shared more broadly—competitors try to satisfy increasingly sophisticated customers by rapidly making incremental im-

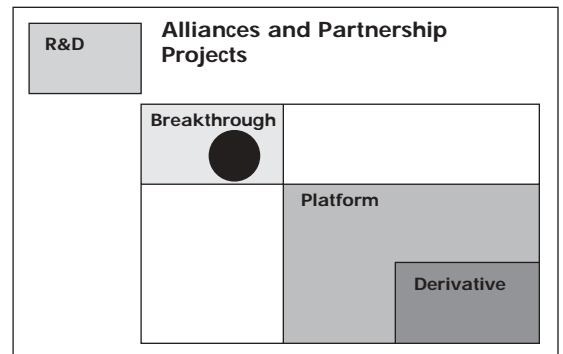
...After: PreQuip’s Development Process Was Manageable



By mid-1990, PreQuip had reduced the number of development projects, including R&D, from 30 to 11, all well defined and strategically positioned within the 5 project types.



- Mass spectrometers
- ◌ Liquid chromatographs
- ◌ Gas chromatographs
- Data processing and handling products



improvements to existing products. Consciously or not, they adopt a strategy based on derivative projects. As happened with PreQuip, this approach ultimately leads to a proliferation of product lines and overcommitment of development resources. The solution lies in developing a few well-designed platform products, on each of which a generation of products can be built.

In the hospital bed industry, for example, companies that design, manufacture, sell, and service electric beds have faced a mature market for years. They are constantly under pressure to help their customers constrain capital expenditures and operating costs. Technologies are stable and many design changes are minor. Each generation of product typically lasts 8 to 12 years, and companies spend most of their time and energy developing derivative products. As a result, companies find themselves with large and unwieldy product lines.

In the 1980s, Hill-Rom, a leading electric-bed manufacturer, sought a new product strategy to help contain costs and maintain market share. Like other bed makers, its product development process was reactive and mired in too many low-payoff derivative projects. The company would design whatever the customer—a single hospital or nursing home—wanted, even if it meant significant commitments of development resources.

The new strategy involved a dramatic shift toward leveraging development and manufacturing resources. Hill-Rom decided to focus on hospitals and largely withdraw from the nursing home segment, as well as limit the product line by developing two new platform products—the Centra and the Century. The Centra was a high-priced product with built-in electronic controls, including communications capabilities. The Century was a simpler, less complex design with fewer features. The products built off each platform shared common parts and manufacturing processes and provided the customer with a number of add-on options. By focusing development efforts on two platforms, Hill-Rom was able to introduce new technologies and new product features into the market faster and more systematically, directly affecting patient recovery and hospital staff productivity. This strategy led to a less chaotic development cycle as well as lower unit cost, higher product quality, and more satisfied customers.

For companies that must react to constant

changes in fashion and consumer tastes, a different relationship between platform and derivative projects makes sense. For example, Sony has pioneered its “hyper-variety” strategy in developing the Walkman: it directs the bulk of its Walkman development efforts at creating derivatives, enhancements, hybrids, and line extensions that offer something tailored to every niche, distribution channel, and competitor’s product. As a result, in 1990, Sony dominated the personal audio system market with over 200 models based on just three platforms.

Platforms are critical to any product development effort, but there is no one ideal mix of projects that fits all companies. Every company must pursue the projects that match its opportunities, business strategy, and available resources. Of course, the mix evolves over time as projects move out of development into production, as business strategies change, as new markets emerge, and as resources are enhanced. Management needs to revisit the project mix on a regular basis—in some cases every six months, in others, every year or so.

Steady Stream Sequencing: PreQuip Plans Future Development

Periodically evaluating the product mix keeps development activities on the right track. Companies must decide how to sequence projects over time, how the set of projects should evolve with the business strategy, and how to build development capabilities through such projects. The decisions about changing the mix are neither easy nor straightforward. Without an aggregate project plan, most companies cannot even begin to formulate a strategy for making those decisions.

PreQuip was no different. Before adopting an aggregate project plan, the company had no concept of project mix and no understanding of sequencing. Whenever someone with authority had an idea worth pursuing, the development department added the project to its active list. With the evolution of a project plan, PreQuip developed an initial mix and elevated the sequencing decision to a strategic responsibility of senior management. Management scheduled projects at evenly spaced intervals to ensure a “steady stream” of development projects. (See the chart “PreQuip’s Project Sequence.”)

A representative example of PreQuip’s new

Sony pioneered the “hyper-variety” strategy—its 200 Walkman models are based on only three platforms.

strategy for sequencing projects is its new mass spectrometer, or C series. Introduced into the development cycle in late 1989, the C-101 was the first platform conceived as a system built around the new modular design. Aimed at the middle to upper end of the market, it was a versatile, modular unit for the laboratory that incorporated many of the existing electro-mechanical features into the new software. The C-101 was scheduled to enter manufacturing prototyping in the third quarter of 1990.

PreQuip positioned the C-1/X, the first derivative of the C-101, for the industrial market. It had a rugged casing designed for extreme environments and fewer software features than the C-101. It entered the development process about the time the C-101 moved into manufacturing prototyping and was staffed initially with two designers whose activities on the C-101 were drawing to a close.

Very similar to the C-1/X was the C-1/Z, a unit designed for the European market; the C-1/X team was expanded to work on both the C-1/X and the C-1/Z. The C-1/Z had some unique software and a different display and packaging but the same modular design. PreQuip's marketing

department scheduled the C-101 to be introduced about 6 months before the C-1/X and the C-1/Z, thus permitting the company to reach a number of markets quickly with new products.

To leverage accumulated knowledge and experience, senior management assigned the team that worked on the C-1/X and the C-1/Z to the C-201 project, the next-generation spectrometer scheduled to replace the C-101. It too was of a modular design but with more computer power and greater software functionality. The C-201 also incorporated a number of manufacturing process improvements gleaned from manufacturing the C-101.

To provide a smooth market transition from the C-101 to the C-201, management assigned the remainder of the C-101 team to develop the C-101X, a follow-on derivative project. The C-101X was positioned as an improvement over the C-101 to attract customers who were in the market for a low-end mass spectrometer but were unwilling to settle for the aging technology of the C-101. Just as important, the project was an ideal way to gather market data that could be used to develop the C-201.

PreQuip applied this same strategy across

PreQuip's Project Sequence

Project Type	Development Resources Committed at Mid-1990 (% of Total Engineering Time)	Project Description	Project Number	Sequencing	
				1990	1991
R&D	(Separate)	Advanced pump Electronic sensors Software	RD-1 RD-2 RD-3		
Breakthrough	12.5%	Fully automated self-diagnostic system for gas chromatograph	BX-3		
Platform	52.5	Liquid chromatograph Gas chromatograph Mass spectrometer Data processing and handling equipment	A series B series C series D series		
Derivative	18.75	Liquid chromatograph Gas chromatograph Mass spectrometer Data processing and handling equipment	A series B series C series D series		
Partnership	10.0	Medical/chemical diagnostic system	VMH		

the other three product categories. Every other year it planned a new platform, followed by two or three derivatives spaced at appropriate intervals. Typically, when a team finished work on a platform, management assigned part of the team to derivative projects and part to other projects. A year or so later, a new team would form to work on the next platform, with some members having worked on the preceding generation and others not. This steady stream sequencing strategy worked to improve the company's overall market position while encouraging knowledge transfer and more rapid, systematic resource development.

An Alternative: Secondary Wave Planning

While the steady stream approach served PreQuip well, companies in different industries might consider alternative strategies. For instance, a "secondary wave" strategy may be more appropriate for companies that, like Hill-Rom, have multiple product lines, each with their own base platforms but with more time between succeeding generations of a particular platform.

The strategy works like this. A development team begins work on a next-generation platform. Once the company completes that project, the key people from the team start work on another platform for a different product family. Management leaves the recently introduced platform on the market for a couple of years with few derivatives introduced. As that platform begins to age and competitors' newer platforms challenge it, the company refocuses development resources on a set of derivatives in order to strengthen and extend the viability of the product line's existing platform. The wave of derivative projects extends the platform life and upgrades product offerings, but it also provides experience and feedback to the people working on the product line and prepares them for the next-generation platform development. They receive feedback from the market on the previous platform, information on competitors' platform offerings, and information on emerging market needs. Key people then bring that information together to define the next platform and the cycle begins again, built around a team, many of whose members have just completed the wave of derivative products.

A variation on the secondary wave strategy,

one used with considerable success by Kodak, involves compressing the time between market introduction of major platforms. Rather than going off to work on another product family's platform following one platform's introduction, the majority of the development team goes to work immediately on a set of derivative products. This requires a more compressed and careful assessment of the market's response to the just-introduced platform and much shorter feedback loops regarding competitors' products. If done right, however, companies can build momentum and capture significant incremental market share. Once the flurry of derivative products has passed, the team goes to work on the next-generation platform project for the same product family.

Before 1987, Kodak conducted a series of advanced development projects to explore alternative single-use 35mm cameras—a roll of film packaged in an inexpensive camera. Once used, the film is processed and the camera discarded or recycled. During 1987, a group of Kodak development engineers worked on the first platform project which resulted in the market introduction and volume production of the Fling 35mm camera in January 1988. (The product was later renamed the Fun Saver.) As the platform neared completion, management reassigned the front-end development staff to two derivative projects: the Stretch, a panoramic, double-wide image version of the Fling, and the Weekend, a waterproof version.

By the end of 1988, Kodak had introduced both derivative cameras and was shipping them in volume. True to the definition of a derivative, both the Stretch and the Weekend took far fewer development resources and far less time than the Fling. They also required less new tooling and process engineering since they leveraged the existing automation and manufacturing process. The development team then went to work on the next-generation platform product—a Fun Saver with a built-in flash.

No matter which strategy a company uses to plan its platform-derivative mix—steady stream or secondary wave—it must have well-defined platforms. The most advanced companies further improve their competitive position by speeding up the rate at which they introduce new platforms. Indeed, in a number of industries we've studied, the companies that introduced new platforms at the fastest rate were usually able to capture the greatest market

share over time.

In the auto industry, for example, different companies follow quite different sequencing schedules, with markedly different results. According to data collected in the late 1980s, European car companies changed the platform for a given product, on average, every 12 years, U.S. companies every 8 years, and Japanese companies every 4 years. A number of factors explain the differences in platform development cycles—historical and cultural differences, longer development lead times, and differences in development productivity.¹

In both Europe and the United States, the engineering hours and tooling costs of new products were much higher than in Japan. This translated into lower development costs for Japanese car makers, which allowed faster payback and shorter economic lives for all models. As a consequence, the Japanese could profitably conduct more projects and make more frequent and more extensive changes than both their European and U.S. competitors and thus were better positioned to satisfy customers' needs and capture market share.

The Long-Term Goal: Building Critical Capabilities

Possibly the greatest value of an aggregate project plan over the long-term is its ability to shape and build development capabilities, both individual and organizational. It provides a vehicle for training development engineers, marketers, and manufacturing people in the different skill sets needed by the company. For instance, some less experienced en-

gineers initially may be better suited to work on derivative projects, while others might have technical skills more suited for breakthrough projects. The aggregate project plan lets companies play to employees' strengths and broaden their careers and abilities over time.

Thinking about skill development in terms of the aggregate project plan is most important for developing competent team leaders. Take, for instance, an engineer with five years of experience moving to become a project leader. Management might assign her to lead a derivative project first. It is an ideal training ground because derivative projects are the best defined, the least complex, and usually the shortest in duration of all project types. After the project is completed successfully, she might get promoted to lead a larger derivative project and then a platform project. And if she distinguishes herself there and has the other required skills, she might be given the opportunity to work on a breakthrough project.

In addition to creating a formal career path within the sphere of development activities, companies should also focus on moving key engineers and other development participants between advanced research and commercial development. This is necessary to keep the transfer of technology fresh and creative and to reward engineers who keep their R&D efforts focused on commercial developments.

Honda is one company that delineates clearly between advanced research and product development — the two kinds of projects are managed and organized differently and are approached with very different expectations. Development engineers tend to have broader skills, while researchers' are usually more specialized. However, Honda encourages its engineers to move from one type of project to another if they demonstrate an idea that management believes may result in a commercially viable innovation. For example, Honda's new lean-burning engine, introduced in the 1992 Civic, began as an advanced research project headed by Hideyo Miyano. As the project moved from research to commercial development, Miyano moved too, playing the role of project champion throughout the entire development process.

Besides improving people's skills, the aggregate project plan can be used to identify weaknesses in capabilities, improve development

Eight Steps of an Aggregate Project Plan

- 1 Define project types as either breakthrough, platform, derivative, R&D, or partnered projects.
- 2 Identify existing projects and classify by project type.
- 3 Estimate the average time and resources needed for each project type based on past experience.
- 4 Identify existing resource capacity.
- 5 Determine the desired mix of projects.
- 6 Estimate the number of projects that existing resources can support.
- 7 Decide which specific projects to pursue.
- 8 Work to improve development capabilities.

processes, and incorporate new tools and techniques into the development environment. The project plan helps identify where companies need to make changes and how those changes are connected to product and process development.


As PreQuip developed an aggregate project plan, for example, it identified a number of gaps in its capabilities. In the case of the mass spectrometer, the demand for more software functionality meant PreQuip had to develop an expertise in software development. And with an emphasis on cost, modularity, and reliability, PreQuip also had to focus on improving its industrial design skills.

As part of its strategy to improve design skills, the company introduced a new computer-aided design system into its engineering department, using the aggregate project plan as its guide. Management knew that one of the platform project teams was particularly adept with computer applications, so it chose that project as the pilot for the new CAD system. Over the life of the project, the team's proficiency with the new system grew. When the project ended, management dispersed team members to other projects so they could train other engineers in using the new CAD system.

As PreQuip discovered, developing an aggregate project plan involves a relatively simple and straight-forward procedure. But carrying it out—moving from a poorly managed collection of ad hoc projects to a robust set that matches and reinforces the business strategy—requires hard choices and discipline.

At all the companies we have studied, the

difficulty of those choices makes imperative strong leadership and early involvement from senior management. Without management's active participation and direction, organizations find it next to impossible to kill or postpone projects and to resist the short-term pressures that drive them to spend most of their time and resources fighting fires.

Getting to an aggregate project plan is not easy, but working through the process is a crucial part of creating a sustainable development strategy. Indeed, while the specific plan is extremely important, the planning process itself is even more so. The plan will change as events unfold and managers make adjustments. But choosing the mix, determining the number of projects the resources can support, defining the sequence, and picking the right projects raise crucial questions about how product and process development ought to be linked to the company's competitive opportunities. Creating an aggregate project plan gives direction and clarity to the overall development effort and helps lay the foundation for outstanding performance. 

1. Based on research by Kim B. Clark and Takahiro Fujimoto. See their article, "The Power of Product Integrity," HBR November–December 1990, p. 107.

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Creating Project Plans to Focus Product Development

Further Reading

ARTICLES

[The Return Map: Tracking Product Teams](#)

by Charles H. House and Raymond L. Price
Harvard Business Review
January–February 1991
Product no. 91106

These authors add another piece to the puzzle of systematic allocation of key resources—particularly time—to strategically important projects. They focus on the **return map**, a graphic representation of the time and money required from each development group to ensure a project's success. The return map provides an overarching goals and measures—shifting teams' focus from “Who is responsible?” to “What needs to get done?” and helping people set priorities. It also forces teams to estimate and re-estimate the time and money required to complete their tasks and grasp the impact of their actions on overall project success.

The map shows the company's investment in product development; the returns from that investment; and the elapsed time to develop the product, introduce it, and achieve the expected returns. It also depicts *break-even time* (the point at which product sales generate sufficient profit to pay back the initial development investment), *time to market*, and the *return factor* (profit dollars divided by investment dollars at a specific point in time after a product has moved into manufacturing and sales).

[Bringing Discipline to Project Management](#)

by Jeffrey Elton and Justin Roe
Harvard Business Review
March–April 1998
Product no. 98203

In this review of Eliyahu Goldratt's book *Critical Chain*, the authors take a closer look at the challenges of strategically prioritizing and allocating the corporate resources needed to complete several projects simultaneously. They apply Goldratt's **theory of constraints**, which emphasizes removing bottlenecks over trying to improve each step in the process.

Every project has two bottlenecks: 1) *the critical path*, the series of tasks determining the minimum time needed to complete the project, and 2) *scarce resources* needed by tasks on and off the critical path *and* by other projects (e.g., computer-assisted design software that's bogged down with many different jobs). Paying close attention to a project's bottlenecks enables managers to estimate where the pressure points are likely to arise and better manage these sources of risk.

The authors believe that the theory of constraints applies best to individual projects. They also argue that senior managers must take a broader corporate perspective in managing a portfolio of projects.

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IDEAS AT WORK

Getting the Most out of Your Product Development Process

by Paul S. Adler, Avi Mandelbaum, ViêN Nguyen,
and Elizabeth Schwerer

Included with this full-text *Harvard Business Review* article:

19 [Article Summary](#)

The Idea in Brief—*the core idea*

The Idea in Practice—*putting the idea to work*

20 [Getting the Most out of Your Product Development Process](#)

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A list of related materials, with annotations to guide further exploration of the article's ideas and applications

Getting the Most out of Your Product Development Process

The Idea in Brief

Despite meticulous planning, are your company's product development projects stuck in seemingly permanent logjams, running months behind schedule? If so, you may be viewing product development as a list of individual projects. But product development is a complex *process* that can be streamlined and accelerated.

To get your new offerings to market more quickly, you need to know how many projects your company can handle—which means attending to employees' and departments' capacities and workloads. And that requires a strategic view of your *entire* product development process—not just individual projects'.

By replacing project management with **process management**, you exploit similarities across project tasks through standardization and continuous improvement—without destroying creativity. You also relieve bottlenecks, finish projects faster, and smooth out workloads. Results? A 30%–50% reduction in time to market.

The Idea in Practice

To apply process management to your firm's product development:

Draw a processing network model showing all departments involved in product development, all tasks they perform, and information (blueprints, test results, verbal authorizations) flowing among departments.

Notice how most projects reside simultaneously in several departments in various stages of completion (e.g., engineering and technical services are working on a prototype, while marketing completes its plan). The model enables you to see the “forest” (the high-level view of your product-development process) rather than just the “trees” (individual projects).

Circulate a process questionnaire to all product developers, asking about **projects** (“How many types of projects does your group handle?”), **resources** (“How many hours do people in your group work every week?”), and **processes** (“How many iterations does each task require in a project of average complexity?”). Analyze your company's development experience over the past few years. Summarize results in a Resources and Requirements table and determine each department's capacity constraints.

Create a utilization profile comparing each department's available hours per year with hours required by project tasks and other activities, such as administration. Look for surprises—a large share of the workweek consumed by non-project work, groups above full utilization, groups with widely varying workloads. You'll begin to see why many projects seem to take forever.

Build a computer simulation model predicting how long projects will take to complete. Using data from the preceding steps, quantify variations across types of projects in their sequence of tasks, number of task iterations, and

rate of new project starts. Analyze the resulting average-completion-time graphs. For example, perhaps 10% of new products (regardless of their complexity) take 140+ weeks to complete. Watch for projects with *low* market potential that are consuming the lion's share of management time and energy.

Improve balance between resources and workload, for example, by:

- adding resources to bottlenecked departments
- automating bottlenecked steps
- limiting the number of projects under way simultaneously
- starting new projects only when resources are available
- reducing the number of urgent projects that interrupt work
- documenting best practices to reduce new projects' setup time and decrease variation in time to perform similar tasks.

Calculate each idea's costs and benefits, identifying investments that will generate the biggest payoffs.

Implement changes, reporting results on a trial basis and fine-tuning as needed.

► **Example:**

ConnectCo, an electrical-connectors producer, trimmed its project portfolio from 32 to 22 ongoing projects—completing 30% more projects than its annual average. It also accepted only eight *new* projects that year—60% less than usual. Results? Average development cycle time decreased 35%, and team members pinpointed hidden bottlenecks, skill shortages, and best-practice template inadequacies.

The lessons of lean manufacturing can help companies develop new products faster.

IDEAS AT WORK

Getting the Most out of Your Product Development Process

by Paul S. Adler, Avi Mandelbaum, ViêN Nguyen,
and Elizabeth Schwerer

Process management has revolutionized manufacturing. Companies around the world have reduced cycle times in their factories by studying each step in the manufacturing process and fluctuations in workloads for ways to reduce variation and eliminate bottlenecks. The product development process can be streamlined in much the same way.

Indeed, we argue that general managers who need to know how many projects their development organizations can handle—and how quickly those projects can deliver new products to market—must think in terms of managing a process. Most managers, however, think of product development simply as a list of projects rather than as a complex operation with a given capacity and workload.

The initial reaction of many managers to the suggestion that product development could benefit from a process management approach is, “Product development is not manufacturing. It is mainly knowledge work. The tasks are not nearly as repeatable as they are in manufacturing, and standardizing the work would

kill creativity.” Yes and no. Each development project involves unique challenges that require unique solutions. But there is a lot of work in product development and in many other kinds of knowledge work that is not unique. Many tasks and sequences of tasks are the same across projects. Process management exploits those similarities through standardization and continuous improvement—without destroying creativity.

During the past eight years, we have studied a dozen companies that have started to apply process management to product development, including Raychem, Motorola, Harley-Davidson, Hewlett-Packard, General Electric, AT&T, Ford, General Motors, and NEC. These pioneers have made three discoveries. First, projects get done faster if the organization takes on fewer at a time. Second, investments to relieve bottlenecks yield disproportionately large time-to-market benefits. Third, eliminating unnecessary variation in workloads and work processes eliminates distractions and delays, thereby freeing up the organization to

focus on the creative parts of the task. The result: Business units that embraced this approach reduced their average development times by 30% to 50%.

Process management is a particularly effective way to reduce the congestion that plagues organizations that undertake many projects at once and share staff and equipment across those projects. The typical project-management approach to product development, however, obscures the overall process. Consider the experience of a major computer-equipment manufacturer that we studied. To minimize the number of iterations, or rework cycles, in development projects, management had created cross-functional concurrent-engineering teams to identify and solve problems rapidly and early. But the development organization tackled so many projects at the same time that key people from engineering, marketing, and manufacturing found themselves working on five or even ten projects at once. To make matters worse, project managers tried to force their own projects ahead by commandeering resources, which delayed other projects even more. As a result, critical people in the development organization were unable to juggle the many demands despite 60-hour workweeks, and most projects ran late.

To avert such logjams, a large manufacturer of electronic components went beyond creating cross-functional teams and drew up an aggregate plan for all development projects. The plan ranked proposed projects by their strategic importance, taking into account the nature of each project (breakthrough, platform, derivative) and a rough estimate of the resources each would require. The company used this analysis to reduce and focus its portfolio of projects. Nonetheless, most projects continued to run months behind schedule, and the plan did not help managers understand why: At each stage of development, engineers had to wait for support technicians to run critical tests of prototypes. Although there were enough technicians to support the average workload, the actual workloads were uneven, and, as a result, the technicians often had long backlogs.

An aggregate project plan is a valuable tool for winnowing out marginal projects and focusing a company's development effort on strategic priorities. Such a plan can also help ensure that the organization does not take on more projects than it can complete—a surpris-

ingly common problem. (See Steven C. Wheelwright and Kim B. Clark, "Creating Project Plans to Focus Product Development," HBR March–April 1992.) But project plans are only a first step toward faster development. To take the next, much bigger step, managers need to think of product development as a production process in which projects move through the knowledge-work equivalent of a job shop. This process view helps managers identify and solve congestion problems caused by mismatches between the workload of each subunit in the development organization and its capacity to handle that workload.

A process view can also help managers eliminate excessive variability in workloads, another cause of congestion. Variable workloads usually arise because an organization takes on new projects whenever good market or technical opportunities present themselves. As a result, in some months many projects start, and in others none do—a pattern that can create bottlenecks at crucial points in the development process. We have seen instances in which managers thought they were being prudent when the number of projects that they had assigned to the development organization required it to operate at about 90% of its capacity. If they had looked more closely at the variation in the total workload, however, they would have found that behind this annual average lay week-to-week fluctuations ranging from 80% to 150%. If those managers had reduced their planned average utilization rate to 80%, they could have reduced development times by 30% or more.

Finally, a process management approach can help reduce variability in the way specific jobs are executed. The benefits from eliminating rework cycles and abnormally long steps are often disproportionately large because those sources of variability delay not only the project in question but all projects under way.

Some development organizations try to avoid congestion by relying on autonomous, or dedicated, project teams, each of which works on one project at a time and has all the resources it requires. Such teams are common in software development, for example. But this approach is expensive because it means duplicating rather than sharing resources. In addition, congestion can still arise within such projects, especially if the project-staffing plan underestimates the amount of rework that the

Paul S. Adler is an associate professor of management and organization at the University of Southern California's School of Business Administration in Los Angeles. **Avi Mandelbaum** is a professor on the faculty of industrial engineering and management at the Technion in Haifa, Israel. **Viên Nguyen** is the Robert N. Noyce Assistant Professor of Management Science at the Massachusetts Institute of Technology's Sloan School of Management in Cambridge. **Elizabeth Schwerer** is a Ph.D. candidate at Stanford University in Palo Alto, California, and an instructor at Columbia University's Graduate School of Management in New York City.

team ends up having to perform.

The ConnectCo Case

To illustrate the steps a company can take to put a process management approach into action, we have created a case study of a fictitious company we call ConnectCo, a composite of several companies we have studied. For competitive reasons, those organizations requested that we not release the details of their product development processes.

ConnectCo, a producer of electrical connectors and adapters for industrial use, was under pressure to accelerate its development cycle after losing several potential contracts to a Japanese competitor with much faster product development. The principal charge of Con-

nectCo's product development group was creating new products, but it also undertook smaller product-line extensions and supported products already on the market. ConnectCo's development projects were not very complex. They usually involved one development engineer, one technician, and the support of several other groups. However, the company undertook many projects, and customers often demanded changes in performance standards.

ConnectCo had revamped its development process several years earlier. Management had established a formal product-development procedure specifying the activities necessary at each phase of development. The development organization had instituted cross-functional teams and implemented a planning process to

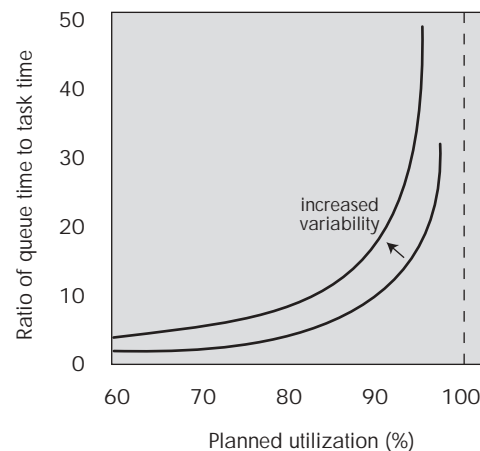
Congestion in Operations and Product Development

To: Steve G., Bernice W., Mike J., and Bill S.

From: Mark E.

Re: Faster development time

In our manufacturing plant, the lead time of a job is the sum of two components: the amount of processing time that the job requires and the amount of time it spends waiting for machines to become available. The time spent waiting at each machine increases with three factors: the planned utilization of the machine, the variability of the workload assigned to that machine, and the variability of the machine's processing capability. The graph and the equation show how these factors interact.



$$\frac{\text{queue time}}{\text{task time}} = \frac{1}{2} \times \left(\frac{\text{workload}}{\text{variability}} + \frac{\text{process}}{\text{variability}} \right) \times \frac{\text{planned utilization}}{1 - \text{planned utilization}}$$

If our products have to move through several backlogged workstations and if some tasks need rework, little wonder that our plant, which was operating at 90% utilization with high workload and high process variability, often needed to quote lead times nearly 20 times the actual processing requirements.

In product development, work centers are people rather than machines; workload variability is the variability in the number and type of projects taken on; and process variability is the variability in the amount of time and the number of iterations needed to complete tasks. If the number of projects we start implies a planned workload of 90% to 95% of capacity (which it usually does, even when we want to leave a cushion) and if the organization experiences both workload and process variability (which it certainly does), then it is hardly surprising that our project completion times are more than five times the critical-path prediction.

achieve a balance between the types and numbers of projects it undertook and the available staff.

Despite those measures, Mark Epstein, ConnectCo's general manager, still felt that he did not really know how many projects his development organization should undertake. The formal development procedure helped him predict the amount of work that each project would require. On that basis, the organization did not seem to be taking on too many projects. But Epstein lacked a tool for predicting when those projects would be completed. No matter how much extra time he allowed for unforeseen contingencies, more than half of the projects scheduled for completion each year remained unfinished. Some projects spent years in limbo. Recently, the development department had started to use project-planning software, and Epstein had been dismayed to discover that the average development time was more than five times the critical-path time: the minimum time—not accounting for delays or rework—that the company estimated a project required.

Why did ConnectCo's projects take so long? Epstein asked his development manager, Steve Gilles, to make a list of recent projects and categorize them by difficulty and duration. Not entirely to their surprise, Gilles and Epstein found that technical difficulty was not a good predictor of time to market. One product-extension project, the adapter AD325, had required only two person-months of work and yet had taken more than two years to get to market. A much larger, more innovative project, the AD3500, had been completed in less than a year.

The AD3500 team had been led by a young

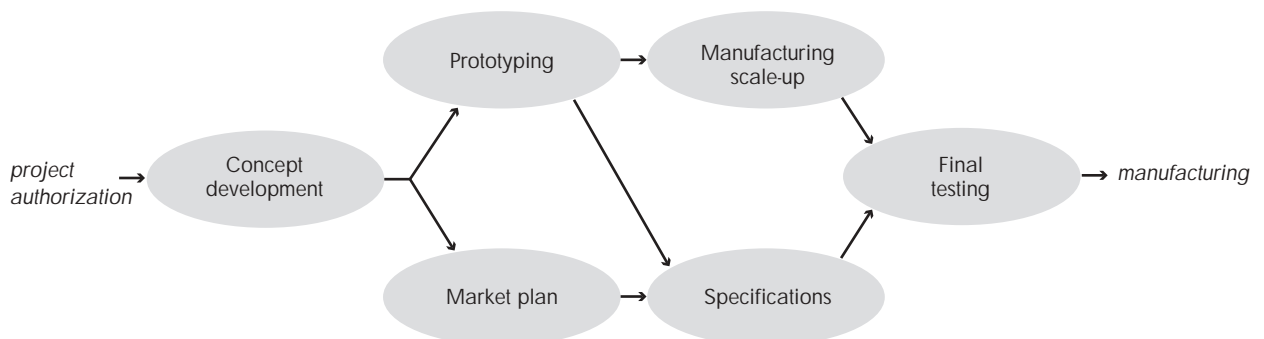
engineer, Laura Murphy, who had proved herself to be an energetic and creative leader. To push her project ahead of the others, however, Murphy had needed very sharp elbows, and there had been complaints that the concentration of ConnectCo's resources on the AD3500 had slowed down other projects. Epstein concluded that the complaints reflected a real problem that ConnectCo had encountered many times before—and not only in development.

Developing a Processing Network Model

Epstein remembered seeing similar lead-time problems in his manufacturing organization. A consultant had helped ConnectCo develop a process-simulation model of the flow of products through the plant floor. The model, which took into account variability in orders and in processing times, showed that products usually spent the bulk of their time in a queue for equipment rather than being processed. It demonstrated to ConnectCo's managers why planning high levels of equipment utilization led to congestion and how expediting urgent jobs added variability and thus delays to an already stressed system.

Epstein sent a memorandum to his management team explaining how similar problems were causing the delays in product development. (See the exhibit "Congestion in Operations and Product Development.") Epstein and Gilles then set up a cross-functional process-improvement task force to build a model of the development process like the one created for manufacturing. To send the message that management considered the effort vitally important, Epstein and Gilles selected Murphy to

The Project Flowchart



head the task force.

The task force began by developing a conventional project flowchart that showed the six major tasks in the company's formal development procedure. (See "The Project Flowchart.") The group quickly realized that because the chart didn't identify the organization's resources, it would not reveal which were overutilized. Using the manufacturing model as a template, the task force came up with a new representation. (See "The Processing Network Model.") The network model shows that five departments contribute to the product development effort: engineering, marketing, technical services, specifications, and manufacturing engineering. Each department is responsible for several activities. For example, engineers are responsible for concept development, prototypes, final testing, and support and administrative activities. The lines connecting the departments show how test results, specifications, blueprints, verbal authorizations, and other information flow between them.

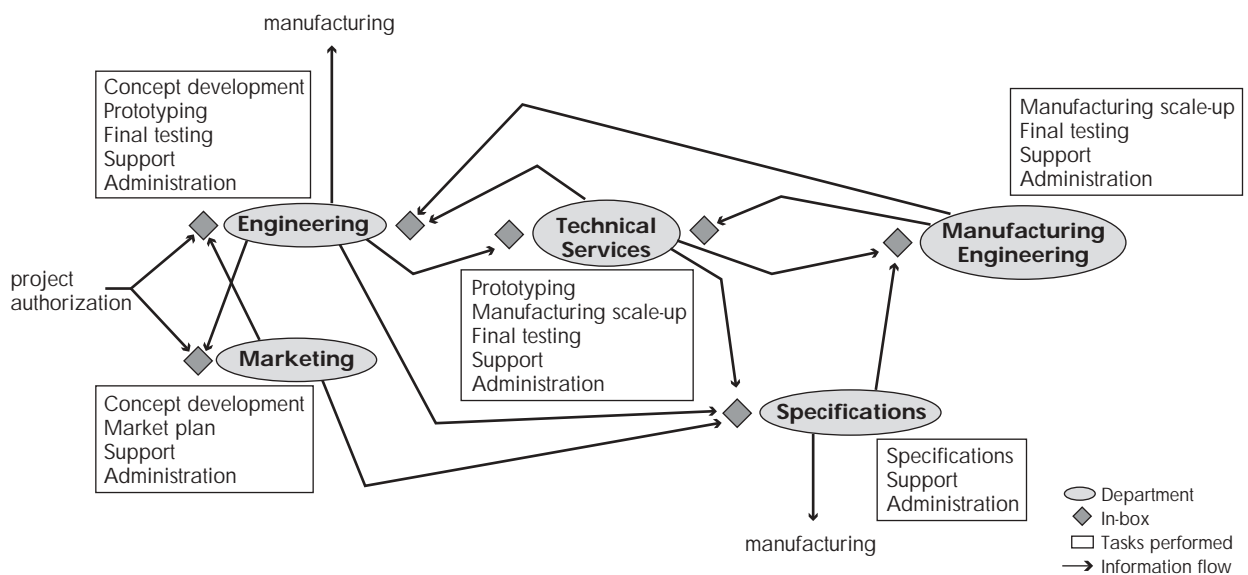
Unlike the project flowchart, the processing network model reminds managers that projects usually reside simultaneously in several departments in various phases of completion. For example, engineering and technical services may be working on a prototype for a project while marketing is completing its plan. Furthermore, each department in the organiza-

tion usually has more than one task queued in its in-box. On a given day, a technician may find requests to perform qualification testing and manufacturing scale-up for three or more projects. Such a model can also help managers see the numerous iterations that can occur in a project.

Instead of showing only the trees (the individual projects), the network model reveals the forest (the structure of the process). Epstein challenged the task force to build a quantitative simulation model that would help the company identify and assess various improvement options. New personal-computer software packages, he pointed out, have made it relatively easy to create such simulation models.

The members of the task force set about collecting the requisite data using a questionnaire for all the participants in the development process. (See "The Process Questionnaire.") The participants were able to answer some of the questions easily, such as how many people were in their particular group. Answering other questions, however, required a new perspective. These questions included "How many different types of projects does your group handle?" and "Within each project type, how many iterations are required to perform each task in a project of average complexity?" In tracking ConnectCo's development activity, the company's management-control system had focused on individual projects and people, not on

The Processing Network Model



the kind of process-oriented information required in the questionnaire. To help the participants complete the questionnaire, the task force organized a series of workshops with people from each group to analyze ConnectCo's development experience over the preceding three or four years. The task force summarized the results in the "Resources and Requirements" table.

The task force now had the raw material it needed to determine the capacity constraints of each department. To this end, the task force estimated the planned utilization of each group by comparing the group's available hours per year with the hours required by project tasks (the product of the average person-hour requirements per project and the number of projects per year) and by other activities such as administration and support. The results of this capacity analysis are shown in the "Utilization Profile," which compares the rate at which the organization can develop products with the rate at which projects start.

The members of the task force were surprised by what they found. They had not been aware of the share of the average workweek that nonproject work was consuming. More important, they learned that several groups were near or above full utilization. Engineers, for example, were scheduled for an average utilization of more than 104%. When variations in project demands and in workload were added

to the picture, it became obvious why some projects took forever.

The utilization profile raised other interesting questions. For example, although no one doubted that the technicians were overloaded, the data showed that they had free time. Follow-up discussions with the engineers and the technicians revealed that the technicians were using this time to help out on several engineering tasks, including testing. Managers had not paid much attention to these informal but highly effective practices. The task force members concluded that this sharing of tasks was preventing even longer delays in product development.

Analysis and Options

This first phase of analysis indicated that with a little overtime and some sharing of tasks, the development organization should be able to complete the existing number and mix of projects. But the analysis did not predict how long it would take to complete those projects. To estimate the cycle time for a multistep process like development—especially one that involved as many iterations as ConnectCo's—the task force needed to build the simulation model that Epstein had proposed.

Adapting the approach that the company had taken in the manufacturing study, the task force used the data from the questionnaire to quantify the variation across projects

The Process Questionnaire

Projects

- How many types of projects does your group handle?
- How many new projects of each type does your group undertake each year?
- What tasks are involved in each project type, and is there a specific order in which they must be carried out?

Resources

- To which phases of product development does your group contribute?
- How many people are in your group?
- How many hours do they work in a week?
- What project-related tasks does your group perform?
- What nonproject tasks (administrative and support) does your group perform?
- How many hours does your group spend on each task?

Processes

- For projects of average complexity within each type of project, how many iterations does each task require?
- What is the probability distribution of task processing times and of number of iterations across projects?
- What proportion of projects in each type are easy, intermediate, and complex?
- How does each person decide which project or task to work on next?

in the sequence of tasks, the number of iterations, and the rate of new project starts. Soon the task force had a model simulating the flow of projects through the organization. With some tweaking, the team calibrated the model so that it reflected the general consensus on the distribution of completion times for the two main types of projects. (See the exhibit “ConnectCo’s Historical Project-Completion Times.”)

These graphs highlighted a point that had emerged in the data-collection workshops: While ConnectCo needed to improve its average development time, it also had to do something about inordinately protracted projects. In fully 10% of new product projects, the completion time was more than 140 weeks; and even though extension projects generally required only 365 person-hours, 10% of them took more than 100 weeks. Tracking those projects was a management drain—and an unjustifiable one because they were not particularly difficult or high in market potential.

In a brainstorming session, the task force generated an array of possibilities for reducing development time, which the group then assessed using the simulation model. First, there were many ways in which ConnectCo could reduce the average utilization of the departments where there were bottlenecks. It could add resources to those departments. It could reduce the average number of projects under

way at any time. It could train people in less burdened departments to perform tasks of overburdened departments. It could eliminate unnecessary steps. It could automate steps that had become bottlenecks. And it could reduce mental and physical setup times by improving the content and availability of project documentation.

Second, the organization could reduce the variation in the times required to perform tasks by creating best-practice templates. Expanding the development-procedure manual to include such templates would stimulate the sharing of best practices throughout the organization and would help bring newcomers up to speed more quickly.

Third, the task force considered ways to reduce the variation in the overall workload. Managers could set a limit on the number of projects allowed in the system at any one time. Perhaps development could operate a pull system modeled after the highly effective just-in-time approach used in the manufacturing plant. Under such a system, a new project could be started only when another was completed.

Finally, the company could rethink how it handled urgent projects. Expedited projects interrupted work in progress, resulted in extra setups, and increased variability in the process. Basically, there were two possible solutions: reducing the number of expedited projects or increasing the development organization’s ca-

Resources and Requirements

	Engineering	Technical Services	Marketing	Specifications	Manufacturing Engineering
Full-time equivalents (FTEs)	5	8	3	3	4
Support (hours/week/FTE)	12	8	12	12	12
Administration (hours/week/FTE)	4	2	12	8	18
New Products*					
<i>Average number of projects initiated per year: 10</i>					
Concept development	12 x 4		6 x 4		
Prototyping	20 x 12	20 x 21			
Market plan			180		
Manufacturing scale-up		13 x 18			15 x 6
Specifications				200	
Final testing	30 x 9	25 x 12			10 x 6
Product Extensions*					
<i>Average number of projects initiated per year: 4</i>					
Prototyping	12 x 4	16 x 5			
Manufacturing scale-up		10 x 4			15 x 3
Specifications				8	
Final testing	20 x 3	16 x 3			18 x 2

*Resource requirements for the average project expressed as hours per task times average number of iterations per task.

capacity.

The task force developed some rough cost-benefit calculations for each of its many ideas. The group quantified the benefits of faster development in terms of greater market share and longer product life. The costs associated with each scenario included the direct costs of resources and, in some scenarios, the revenues that the company would forgo over the short term.

Given existing budget pressures, the task force didn't think management would support a proposal to add expensive equipment or people such as engineers—even though the simulation-based calculations suggested that those investments would generate high returns. Instead, the group proposed two relatively modest investments that could have big payoffs. The first was to train technicians so that they could conduct more of the testing performed by engineers, who often took hours to program complex testing procedures. Technicians were already helping out, but with training they could handle most of this programming. The necessary courses were offered both within the company and at the local college.

The second recommendation was to limit the number of new projects under way at any time to 12: nine new products and three extensions. Currently, the company was starting about 14 projects—ten new products and four extensions—a year, but because each took so long to complete, there were often more than 30 projects in the system at once. The simulations showed that if ConnectCo instituted a pull system that allowed only 12 projects to be under way simultaneously, project starts would

probably fall by 10% to 20%, but each project would be completed much faster.

Murphy's task force found that together those two actions would cut average development times for both new and extension products by nearly 40%. Moreover, the time required to complete the worst 10% (the most protracted) of both new-product and product-extension projects would fall considerably. (See the exhibit "Estimated Improvements in Completion Times.")

Like many other companies, ConnectCo had tracked the hours that had been spent on each project each week by each person. But Murphy's task force concluded that those data did not help the company monitor and improve the development process. The group proposed that ConnectCo maintain a battery of new process-oriented measures. Those measures included load (the number of projects in progress each month); resource availability (the development resources available each month, net of administrative and support time); utilization (the monthly utilization level of each department); contribution (the time contributed by each department to each task during the month); process yield (the number of iterations required to complete the task successfully); and process efficiency (the ratio of actual time spent on the task to the minimum possible time as estimated by a critical-path model and best-practice templates).

The efficiency and yield data could be collected for each project on a monthly basis and then aggregated to characterize the degree to which each task was under control. The task force recommended that managers track not

Utilization Profile

	Engineering	Technical Services	Marketing	Specifications	Manufacturing Engineering
Hours per Year					
Available	10,000	16,000	6,000	6,000	8,000
Support	3,000	3,200	1,800	1,800	2,400
Administration	1,000	500	1,800	1,200	3,600
New products	5,980	9,540	2,040	2,000	1,500
Product extensions	432	672	0	32	324
Planned Utilization (%) (100 x hours ÷ available hours)					
Support	30.0	20.0	30.0	30.0	30.0
Administration	10.0	3.1	30.0	20.0	45.0
New products	59.8	59.6	34.0	33.3	18.8
Product extensions	4.3	4.2	0.0	0.5	4.1
Total	104.1	86.9	94.0	83.8	97.9

only averages but also the worst decile in order to keep tabs on the projects in limbo. (See “The Process Reporting Form.”)

Finally, Murphy’s task force proposed that the development-procedure manual be augmented with best-practice templates for each task. Although some variance in a development process is inevitable because of each project’s idiosyncrasies, everyone on the task force had been shocked to discover the degree to which the number of iterations and the time required to carry out a given task varied from project to project.

Decisions Taken

Epstein and his managers were impressed by the cross-functional-training proposal and quickly gave the go-ahead. But they had a harder time accepting the recommended move to a pull system. Going from more than 30 ongoing projects to 12 seemed risky. Although the simulation ultimately convinced them, Epstein was nervous about the transition. He decided to trim the number of ongoing projects to 20 over the next year and then reassess the number for the following year.

To that end, Epstein instituted a more rigorous review process for project proposals and asked his managers to review all projects that were near completion but had stalled. Epstein suspected that although those projects did not require much additional work, many of them had been caught in a vicious circle: Once a

project acquired a reputation for being a problem, it was continually pushed aside by newer projects, especially by those whose leaders had sharp elbows.

Second, the management team set up a new task force charged with incorporating best-practice templates for key tasks into the procedure manual. Epstein resolved that as soon as the new manual was available, project teams would be assessed and rewarded not only for their effectiveness in executing their projects but also for improvements to the templates that they suggested in their postproject reviews.

Finally, management asked the development organization to begin reporting, on a trial basis, the process data recommended by the task force. Epstein reasoned that he would need those data to gauge the effectiveness of the new process-management approach during the coming months.

First Results

During the early days of the task force, some managers and staff in ConnectCo’s development organization had worried that process management would undermine the autonomy they needed. To people engaged in creative, nonrepetitive work, process models, detailed metrics, and process templates sounded like a recipe for regimentation and alienation.

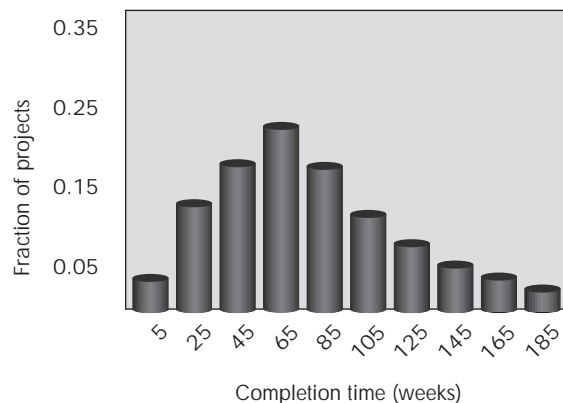
By the time the task force made its recommendations, however, most people had begun

ConnectCo’s Historical Project-Completion Times

New Products

Average completion time: 80 weeks

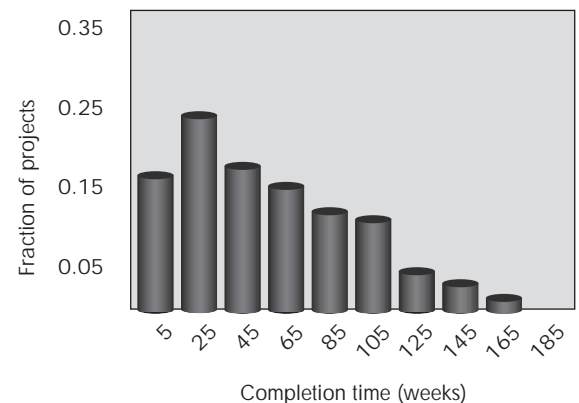
Worst 10% take longer than 140 weeks



Product Extensions

Average completion time: 54 weeks

Worst 10% take longer than 100 weeks



to see process management as an exciting, new way to understand their work. After all, everyone cared about time to market. Moreover, the task force had involved colleagues in the process management effort, and Epstein had committed to using the new process measures for improving processes, not assigning blame.

During the next year, the company trimmed its project portfolio from 32 to 22 ongoing projects. As Epstein had predicted, many projects had been close to completion and could be wrapped up quickly. ConnectCo completed 18 projects that year, almost 30% more than its historical average.

The senior management team was firm in its commitment to take on fewer new projects. In the past, it had accepted projects based on their business attractiveness and then let them sit in the backlog. Now the team adopted a strict rule that no project could start until the required resources were available. As a result, ConnectCo accepted only eight new projects during that year, 60% of its historical average.

The new rules did generate some resistance. Marketing managers feared that strict limits on new projects would stymie their ability to respond to customer demands. Moreover, their bonuses were tied to the value of new contracts. Bill Shaw, the head of marketing, took the latter problem to his staff, and they came up with a new pay system that reduced bonuses in exchange for higher base salaries and established a broader set of performance goals for

determining bonuses.

Like Shaw, Epstein was concerned that turning down too many requests from long-standing customers would weaken those relationships. Now that management had a better grasp of the development organization's capabilities, Epstein decided that in the coming year ConnectCo should take on 11 or so new projects and push for a goal of 16 ongoing projects.

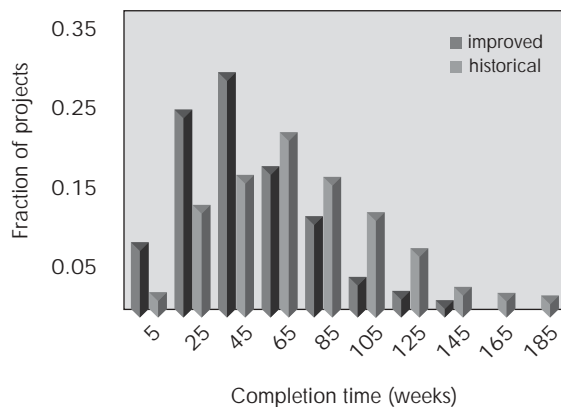
The improved balance between resources and workload alleviated many stresses in the development organization. But some old habits died hard. The queues were indeed shorter, but project leaders were still eager to push their projects to the front of the line. One project in particular became something of a cause célèbre. The project manager, Claire Chen, was working with a customer who was under great time pressure. When Chen tried to accelerate the schedule by pleading with the engineers and technicians, they refused. She appealed to the senior management group and criticized the new approach as dangerously rigid.

In the interest of stabilizing the development process, Murphy's task force had encouraged departments to adopt a first-in, first-out approach to managing their in-boxes. The new plan provided no guidelines for dealing with real emergencies such as Chen's project. The senior managers decided that a refinement was in order: The rule against expediting projects was too rigid. Indeed, now that capacity utilization had been reduced, expedited projects

Estimated Improvements in Completion Times

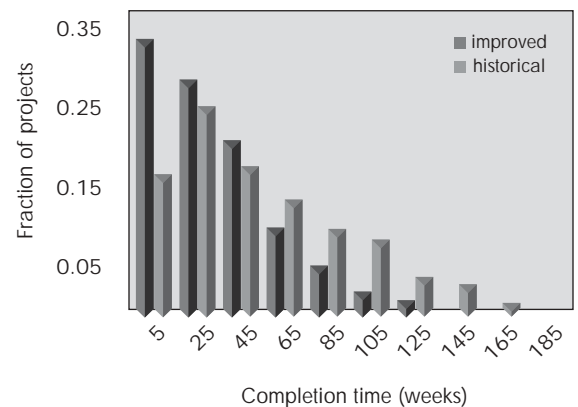
New Products

Average completion time: 51 weeks
Worst 10% take longer than 85 weeks



Product Extensions

Average completion time: 32 weeks
Worst 10% take longer than 60 weeks



The Process Reporting Form

A. Report for Each Project in Progress

Concept Development	Prototyping	Market Plan	Manufacturing Scale-up	Specifications	Final Testing
---------------------	-------------	-------------	------------------------	----------------	---------------

Contributions
 (hours spent this month on each task):
 Engineering
 Technical services
 Marketing
 Specifications
 Manufacturing engineering

Project calendar:
 Date task begun
 Date task completed

B. Summary Report for All Projects (This Month and Year to Date)

Projects

New Products	Product Extensions
--------------	--------------------

YTD project starts
 YTD project completions
 Number of projects in progress

Resources

Engineering	Technical Services	Marketing	Specifications	Manufacturing Engineering
-------------	--------------------	-----------	----------------	---------------------------

Full-time equivalents (FTEs)

Hours spent this month on:
 Support
 Administration
 Total new products
 Total product extensions

Processes

Concept Development	Prototyping	Market Plan	Manufacturing Scale-up	Specifications	Final Testing
---------------------	-------------	-------------	------------------------	----------------	---------------

Efficiency
 (time spent on each task):
 Mean of all projects completed this month
 Mean of all projects completed YTD
 90th percentile of all projects completed YTD

Yield
 (number of iterations required by each task):
 Mean of all projects completed this month
 Mean of all projects completed YTD
 90th percentile of all projects completed YTD

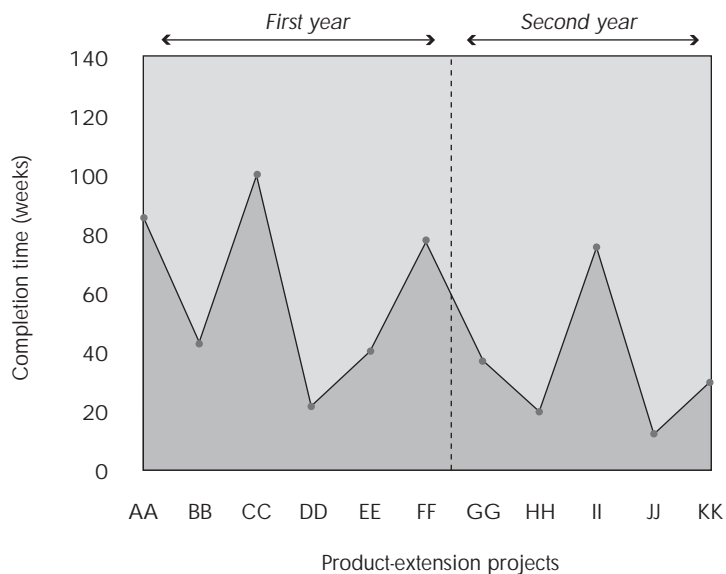
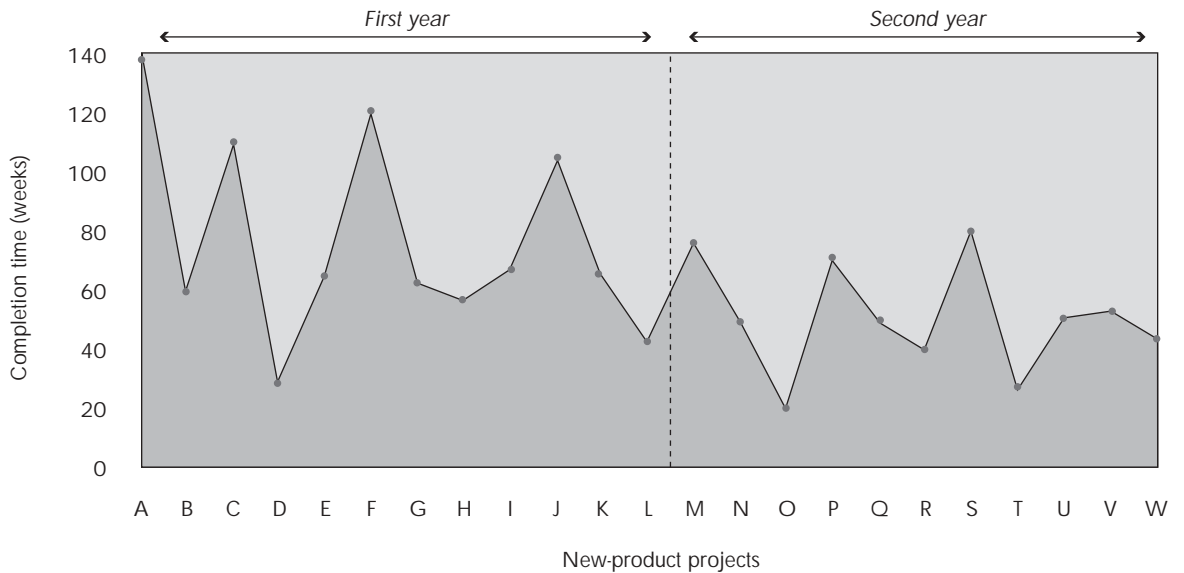
would be less disruptive. But the senior managers had no desire to let the more aggressive project leaders again decide which projects received special treatment. They decided to allow some projects to be designated urgent but mandated that only the senior management team—not project leaders—could confer that status.

The program for training technicians went more smoothly. Most technicians were eager to expand their jobs. There were some rumblings, however, about the need for salary increases commensurate with the new responsibilities. Epstein decided that technicians with broader

skills did deserve higher pay. Some engineers were initially reluctant to relinquish their responsibility for test programming. But since the new division of labor freed up so much of their time, they quickly changed their minds.

This cross-functional-training effort also served as the pilot for creating best-practice templates. Because the engineers had been responsible for the test programming, Gilles asked them to develop a template for translating test parameters into specific test programs. A group of engineers laid out a generic programming process and identified five different testing scenarios that called for slightly differ-


ConnectCo's Results



ent approaches. Over the next three months, the technicians discovered many ambiguities and inconsistencies in the templates. A team of engineers and technicians revised the procedures and eventually produced a 60-page manual, which the technicians found useful. Soon the technicians were adding their own notes and improvements to the manual.

Although some projects were still taking longer than Epstein would have liked, the average development cycle time in the second year was 35% less than the average time before the initiative. (See the exhibit “ConnectCo’s Results.”) Just as the task force had predicted, there were fewer projects in limbo. And by the end of the two years, ConnectCo had only 17 projects under way, down from 32 at the start.

By helping people identify projects that deviated from the averages, the new measurement system helped them deepen their under-

standing of the process. Unusually long or short projects became learning opportunities. Post-project evaluations now pinpointed hidden bottlenecks, skill shortages, and template inadequacies—and the associated improvement opportunities. The company discovered, for example, that some projects were held up for weeks until the plant found time to conduct trial runs. ConnectCo invested in a pilot line in the lab, which ended up saving an additional two months on the average project. Through process management, continuous improvement had come to product development. 

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Getting the Most out of Your Product Development Process

Further Reading

ARTICLES

[Creativity Is Not Enough](#)

by Theodore Levitt
Harvard Business Review
 Republished August 2002
 Product no. 1628

Levitt agrees that process management—an example of what he might call **organizational structure**—can actually support rather than stifle creativity. Applying process management to product development, he would argue, enables you to surmount an all-too-common problem: how to turn creative ideas into *profitable* innovations. Generating ideas (creativity) is one thing; putting them to work (innovation) is quite another. In many companies, great ideas kick around, unused, for years because no one assumed responsibility for converting big talk into bigger action.

Levitt offers several guidelines for improving the innovation process: 1) *Demand responsible presentation of ideas.* Whenever anyone suggests an idea, require him or her to include information on the associated costs, risks, manpower, time, and specific people required to carry it out. 2) *Encourage people to start implementing their ideas.* In large organizations especially, stability, structure, and heft make innovation less risky. New ideas may rock your big corporate boat, but they won't capsize it. 3) *Provide a home for irresponsibly creative people.* Some people simply can't handle implementation. Designate a specialized group whose sole function is to receive these individuals' ideas, work them out, and follow through on the implementation details.

[How Process Enterprises Really Work](#)

by Michael Hammer and Steven Stanton
Harvard Business Review
 November–December 1999
 Product no. 7893

Once you've applied process management to streamline your company's product development, you need to take the critical next step: building management structures that *support* your streamlined processes, transforming your organization into what Hammer and Stanton call a **process enterprise**.

Process enterprises replace turf and hierarchy battles with new approaches to leadership, performance measurement, compensation, and training—all focused on enhancing flexibility and efficiency. To craft a process enterprise, the authors recommend creating a new managerial position: the process owner. Each process owner takes end-to-end responsibility for a particular process—which includes authority over work and budgets. He or she designs the process, measures its performance, and trains the front-line workers who perform it.

Process owners must work differently with each other *and* with the front line. For example, they need to focus on teamwork, negotiate and collaborate, exert influence rather than formal authority, and coach and develop (rather than control) front-line employees.

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BEST PRACTICE

Why Good Projects Fail Anyway

by Nadim F. Matta and Ronald N. Ashkenas

Included with this full-text *Harvard Business Review* article:

35 [Article Summary](#)

The Idea in Brief—*the core idea*

The Idea in Practice—*putting the idea to work*

36 [Why Good Projects Fail Anyway](#)

43 [Further Reading](#)

A list of related materials, with annotations to guide further exploration of the article's ideas and applications

Why Good Projects Fail Anyway

The Idea in Brief

Big projects fail at an astonishing rate—well over half, by some estimates. Why are efforts involving many people working over extended periods of time so problematic? Traditional project planning carries three serious risks:

- **White space:** Planners leave gaps in the project plan by failing to anticipate all the project's required activities and work streams.
- **Execution:** Project team members fail to carry out designated activities properly.
- **Integration:** Team members execute all tasks flawlessly—on time and within budget—but don't knit all the project pieces together at the end. The project doesn't deliver the intended results.

Manage these risks with **rapid-results initiatives**: small projects designed to quickly deliver mini-versions of the big project's end results. Through rapid-results initiatives, project team members iron out kinks early and on a small scale. Rapid-results teams serve as models for subsequent teams who can roll out the initiative on a larger scale with greater confidence. The teams feel the satisfaction of delivering real value, and their company gets early payback on its investments.

The Idea in Practice

Rapid-results initiatives have several defining characteristics:

- **Results oriented**—The initiatives produce measurable payoffs on a small scale.
 - ▶ **Example:** The World Bank wanted to improve the productivity of 120,000 small-scale farmers in Nicaragua by 30% in 16 years. Its rapid-results initiatives included “increase pig weight on 30 farms by 30% in 100 days using enhanced corn seed.”
- **Vertical**—The initiatives include people from different parts of the organization—or even different organizations—who work in tandem within a very short time frame to implement slices of several horizontal—or parallel-track—activities. The traditional emphasis on disintegrated, horizontal, long-term activities gives way to the integrated, vertical, and short-term. The teams uncover activities falling in the white space between horizontal project streams, and properly integrate *all* the activities.
 - ▶ **Example:** Take a companywide CRM project. Traditionally, one team might analyze customers, another select the software, a third develop training programs. When the project's finally complete, though, it may turn out that the salespeople won't enter the requisite data because they don't understand why they need to. Using rapid-results initiatives, a single team might be charged with increasing the revenues of one sales group in one region within four months. To reach that goal, team members would have to draw on the work of all the parallel teams. And they would quickly discover the salespeople's resistance and other unforeseen issues.
- **Fast**—The initiatives strive for results and lessons in less than 100 days. Designed to deliver quick wins, they more importantly change the way teams work. How? The short time frame establishes a sense of urgency

from the start, poses personal challenges, and leaves no time to waste on interorganizational bickering. It also stimulates creativity and encourages team members to experiment with new ideas that deliver concrete results.

Balancing Vertical and Horizontal Activities

Vertical, rapid-results initiatives offer many benefits. But that doesn't mean you should eliminate all horizontal activities. Such activities offer cost-effective economies of scale. The key is to *balance* vertical and horizontal, spread insights among teams, and blend all activities into an overall implementation strategy.

- ▶ **Example:** Dissatisfied with its 8% revenue increase in two years, office-products company Avery Dennison launched 15 rapid-results teams in three North American divisions. After only three months, the teams were meeting their goals—e.g., securing one new order for an enhanced product with one large customer within 100 days. Top management extended the rapid-results process throughout the company, reinforcing it with an extensive employee communication program. As horizontal activities continued, dozens more teams started rapid-results initiatives. Results? \$8 million+ in new sales, and \$50 million in sales forecast by year-end.

When a promising project doesn't deliver, chances are the problem wasn't the idea but how it was carried out. Here's a way to design projects that guards against unnecessary failure.

BEST PRACTICE

Why Good Projects Fail Anyway

by Nadim F. Matta and Ronald N. Ashkenas

Big projects fail at an astonishing rate. Whether major technology installations, post-merger integrations, or new growth strategies, these efforts consume tremendous resources over months or even years. Yet as study after study has shown, they frequently deliver disappointing returns—by some estimates, in fact, well over half the time. And the toll they take is not just financial. These failures demoralize employees who have labored diligently to complete their share of the work. One middle manager at a top pharmaceutical company told us, “I’ve been on dozens of task teams in my career, and I’ve never actually seen one that produced a result.”

The problem is, the traditional approach to project management shifts the project teams’ focus away from the end result toward developing recommendations, new technologies, and partial solutions. The intent, of course, is to piece these together into a blueprint that will achieve the ultimate goal, but when a project involves many people working over an extended period of time, it’s very hard for manag-

ers planning it to predict all the activities and work streams that will be needed. Unless the end product is very well understood, as it is in highly technical engineering projects such as building an airplane, it’s almost inevitable that some things will be left off the plan. And even if all the right activities have been anticipated, they may turn out to be difficult, or even impossible, to knit together once they’re completed.

Managers use project plans, timelines, and budgets to reduce what we call “execution risk”—the risk that designated activities won’t be carried out properly—but they inevitably neglect these two other critical risks—the “white space risk” that some required activities won’t be identified in advance, leaving gaps in the project plan, and the “integration risk” that the disparate activities won’t come together at the end. So project teams can execute their tasks flawlessly, on time and under budget, and yet the overall project may still fail to deliver the intended results.

We’ve worked with hundreds of teams over

the past 20 years, and we've found that by designing complex projects differently, managers can reduce the likelihood that critical activities will be left off the plan and increase the odds that all the pieces can be properly integrated at the end. The key is to inject into the overall plan a series of miniprojects—what we call *rapid-results initiatives*—each staffed with a team responsible for a version of the hoped-for overall result in miniature and each designed to deliver its result quickly.

Let's see what difference that would make. Say, for example, your goal is to double sales revenue over two years by implementing a customer relationship management (CRM) system for your sales force. Using a traditional project management approach, you might have one team research and install software packages, another analyze the different ways that the company interacts with customers (e-mail, telephone, and in person, for example), another develop training programs, and so forth. Many months later, however, when you start to roll out the program, you might discover that the salespeople aren't sold on the benefits. So even though they may know how to enter the requisite data into the system, they refuse. This very problem has, in fact, derailed many CRM programs at major organizations.

But consider the way the process might unfold if the project included some rapid-results initiatives. A single team might take responsibility for helping a small number of users—say, one sales group in one region—increase their revenues by 25% within four months. Team members would probably draw on all the activities described above, but to succeed at their goal, the microcosm of the overall goal, they would be forced to find out what, if anything, is missing from their plans as they go forward. Along the way, they would, for example, discover the salespeople's resistance, and they would be compelled to educate the sales staff about the system's benefits. The team may also discover that it needs to tackle other issues, such as how to divvy up commissions on sales resulting from cross-selling or joint-selling efforts.

When they've ironed out all the kinks on a small scale, their work would then become a model for the next teams, which would either engage in further rapid-results initiatives or roll the system out to the whole organization—but now with a higher level of confidence that the

project will have the intended impact on sales revenue. The company would see an early payback on its investment and gain new insights from the team's work, and the team would have the satisfaction of delivering real value.

In the pages that follow, we'll take a close look at rapid-results initiatives, using case studies to show how these projects are selected and designed and how they are managed in conjunction with more traditional project activities.

How Rapid-Results Teams Work

Let's look at an extremely complex project, a World Bank initiative begun in June 2000 that aims to improve the productivity of 120,000 small-scale farmers in Nicaragua by 30% in 16 years. A project of this magnitude entails many teams working over a long period of time, and it crosses functional and organizational boundaries.

They started as they had always done: A team of World Bank experts and their clients in the country (in this case, Ministry of Agriculture officials) spent many months in preparation—conducting surveys, analyzing data, talking to people with comparable experiences in other countries, and so on. Based on their findings, these project strategists, designers, and planners made an educated guess about the major streams of work that would be required to reach the goal. These work streams included reorganizing government institutions that give technical advice to farmers, encouraging the creation of a private-sector market in agricultural support services (such as helping farmers adopt new farming technologies and use improved seeds), strengthening the National Institute for Agricultural Technology (INTA), and establishing an information management system that would help agricultural R&D institutions direct their efforts to the most productive areas of research. The result of all this preparation was a multiyear project plan, a document laying out the work streams in detail.

But if the World Bank had kept proceeding in the traditional way on a project of this magnitude, it would have been years before managers found out if something had been left off the plan or if the various work streams could be integrated—and thus if the project would ultimately achieve its goals. By that time, millions of dollars would have been invested and much

Nadim F. Matta is a senior partner of Robert H. Schaffer & Associates, a management consulting firm based in Stamford, Connecticut. Prior to joining RHS&A, he worked for USAID and then headed the food distribution program for Save the Children during the civil war in Lebanon. **Ronald N. Ashkenas** is a managing partner of RHS&A. He has written three previous articles for HBR, most recently "Integration Managers: Special Leaders for Special Times" (with Suzanne C. Francis, November–December 2000). The authors can be reached at info@rhsa.com.

Managers expect they can plan for all the variables in a complex project in advance, but they can't. Nobody is that smart or has that clear a crystal ball.

time potentially wasted. What's more, even if everything worked according to plan, the project's beneficiaries would have been waiting for years before seeing any payoff from the effort. As it happened, the project activities proceeded on schedule, but a new minister of agriculture came on board two years in and argued that he needed to see results sooner than the plan allowed. His complaint resonated with Norman Piccioni, the World Bank team leader, who was also getting impatient with the project's pace. As he said at the time, "Apart from the minister, the farmers, and me, I'm not sure anyone working on this project is losing sleep over whether farmer productivity will be improved or not."

Over the next few months, we worked with Piccioni to help him and his clients add rapid-results initiatives to the implementation process. They launched five teams, which included not only representatives from the existing work streams but also the beneficiaries of the project, the farmers themselves. The teams differed from traditional implementation teams in three fundamental ways. Rather than being partial, horizontal, and long term, they were results oriented, vertical, and fast. A look at each attribute in turn shows why they were more effective.

Results Oriented. As the name suggests, a rapid-results initiative is intentionally commissioned to produce a measurable result, rather than recommendations, analyses, or partial solutions. And even though the goal is on a smaller scale than the overall objective, it is nonetheless challenging. In Nicaragua, one team's goal was to increase Grade A milk production in the Leon municipality from 600 to 1,600 gallons per day in 120 days in 60 small and medium-size producers. Another was to increase pig weight on 30 farms by 30% in 100 days using enhanced corn seed. A third was to secure commitments from private-sector experts to provide technical advice and agricultural support to 150 small-scale farmers in the El Sauce (the dry farming region) within 100 days.

This results orientation is important for three reasons. First, it allows project planners to test whether the activities in the overall plan will add up to the intended result and to alter the plans if need be. Second, it produces real benefits in the short term. Increasing pig weight in 30 farms by 30% in just over three

months is useful to those 30 farmers no matter what else happens in the project. And finally, being able to deliver results is more rewarding and energizing for teams than plodding along through partial solutions.

The focus on results also distinguishes rapid-results initiatives from pilot projects, which are used in traditionally managed initiatives only to reduce execution risk. Pilots typically are designed to test a preconceived solution, or means, such as a CRM system, and to work out implementation details before rollout. Rapid-results initiatives, by contrast, are aimed squarely at reducing white space and integration risk.

Vertical. Project plans typically unfold as a series of activities represented on a timeline by horizontal bars. In this context, rapid-results initiatives are vertical. They encompass a slice of several horizontal activities, implemented in tandem in a very short time frame. By using the term "vertical," we also suggest a cross-functional effort, since different horizontal work streams usually include people from different parts of an organization (or even, as in Nicaragua, different organizations), and the vertical slice brings these people together. This vertical orientation is key to reducing white space and integration risks in the overall effort: Only by uncovering and properly integrating any activities falling in the white space between the horizontal project streams will the team be able to deliver its minireult. (For a look at the horizontal and vertical work streams in the Nicaragua project, see the exhibit "The World Bank's Project Plan.")

The team working on securing commitments between farmers and technical experts in the dry farming region, for example, had to knit together a broad set of activities. The experts needed to be trained to deliver particular services that the farmers were demanding because they had heard about new ways to increase their productivity through the information management system. That, in turn, was being fed information coming out of INTA's R&D efforts, which were directed toward addressing specific problems the farmers had articulated. So team members had to draw on a number of the broad horizontal activities laid out in the overall project plan and integrate them into their vertical effort. As they did so, they discovered that they had to

The World Bank's Project Plan

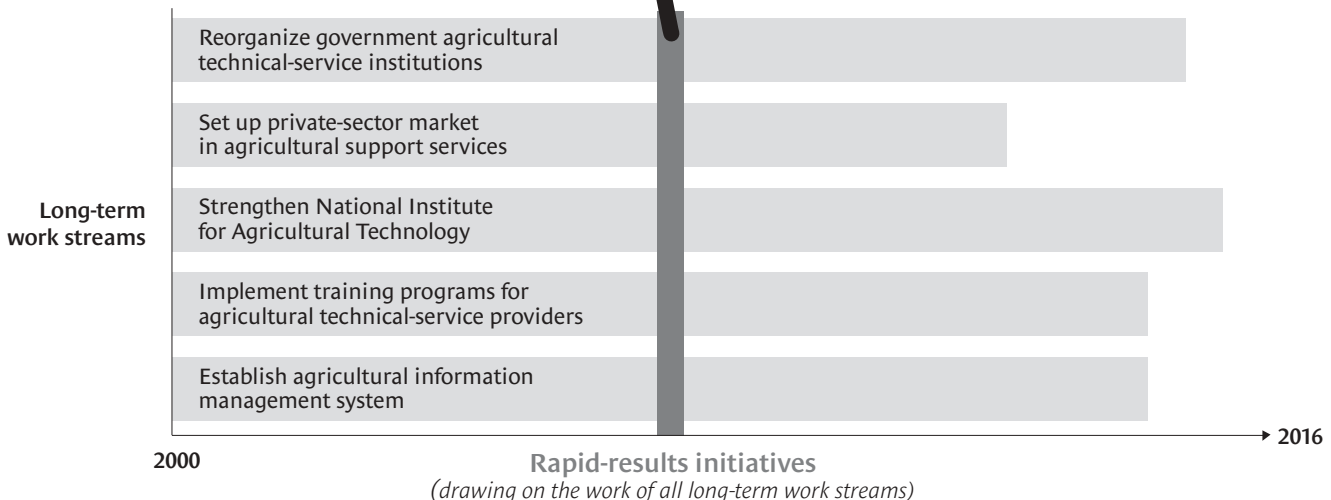
A project plan typically represents the planned activities as horizontal bars plotted over time. But in most cases, it's very difficult to accurately assess all the activities that will be required to complete a complicated long-term project. We don't know what will fall into the white space between the bars. It's also difficult to know whether these activities can be integrated seamlessly at the end; the teams working in isolation may develop solutions that won't fit together. Rapid-results initiatives cut across horizontal activities, focusing on a miniver- sion of the overall result rather than on a set of activities.

Here is a simplified version of the Nicaragua project described in this article. Each vertical team (depicted as a group by the vertical bar) includes representatives from every hori- zontal team, which makes the two types of initiatives mutually reinforcing. So, for example, the horizontal work stream labeled "Set up private-sector market in agricultural support services" includes activities like developing a system of cou- pons to subsidize farmers' purchases. The vertical team es- tablishing service contracts between technical experts and farmers drew on this work, providing the farmers with cou- pons they could use to buy the technical services. This, in turn, drove competition in the private sector, calling on the work that the people on the horizontal training teams were doing—which led to better services.

Rapid-Results Project Objectives
 Five rapid-results teams cut across the original five work streams, each focused on one specific objective:

- **Establish alternative feed.**
 Within 120 days, incorporate an alternative source for pig feed in 15 farms, and establish five purchase agreements.
- **Implement seed distribution.**
 Within 100 days, ensure that 80% of the enhanced corn seed is available to farmers.
- **Establish service contracts.**
 Within 100 days, secure commitments from private-sector experts to provide technical services to 150 farmers.
- **Increase milk production.**
 In 120 days, increase daily milk production from 600 to 1,600 gallons at 60 producers.
- **Increase animal weight and productivity.**
 In 100 days, increase pig weight by 30% and chicken productivity by 20% in 30 farms, using enhanced corn seed.

**Overall Project Objective:
 Improve productivity of 120,000 farmers by 30% in 16 years**



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add activities missing from the original horizontal work streams. Despite the team members' heroic efforts to integrate the ongoing activities, for instance, 80 days into their 100-day initiative, they had secured only half the commitments they were aiming for. Undeterred and spurred on by the desire to accomplish their goal, team members drove through the towns of the region announcing with loudspeakers the availability and benefits of the technical services. Over the following 20 days, the gap to the goal was closed. To close the white space in the project plan, "marketing of technical services" was added as another horizontal stream.

Fast. How fast is fast? Rapid-results projects generally last no longer than 100 days. But they are by no means quick fixes, which imply shoddy or short-term solutions. And while they deliver quick wins, the more important value of these initiatives is that they change the way teams approach their work. The short time frame fosters a sense of personal challenge, ensuring that team members feel a sense of urgency right from the start that leaves no time to squander on big studies or interorganizational bickering. In traditional horizontal work streams, the gap between current status and the goal starts out far wider, and a feeling of urgency does not build up until a short time before the day of reckoning. Yet it is precisely at that point that committed teams kick into a high-creativity mode and begin to experiment with new ideas to get results. That kick comes right away in rapid-results initiatives.

A Shift in Accountability

In most complex projects, the executives shaping and assigning major work streams assume the vast majority of the responsibility for the project's success. They delegate execution risk to project teams, which are responsible for staying on time and on budget, but they inadvertently leave themselves carrying the full burden of white space and integration risk. In World Bank projects, as in most complex and strategically critical efforts, these risks can be huge.

When executives assign a team responsibility for a result, however, the team is free—indeed, compelled—to find out what activities will be needed to produce the result and how those activities will fit together. This approach

puts white space and integration risk onto the shoulders of the people doing the work. That's appropriate because, as they work, they can discover on the spot what's working and what's not. And in the end, they are rewarded not for performing a series of tasks but for delivering real value. Their success is correlated with benefits to the organization, which will come not only from implementing known activities but also from identifying and integrating new activities.

The milk productivity team in Nicaragua, for example, found out early on that the quantity of milk production was not the issue. The real problem was quality: Distributors were being forced to dump almost half the milk they had bought due to contamination, spoilage, and other problems. So the challenge was to produce milk acceptable to large distributors and manufacturers that complied with international quality standards. Based on this understanding, the team leader invited a representative of Parmalat, the biggest private company in Nicaragua's dairy sector, to join the team. Collaborating with this customer allowed the team to understand Parmalat's quality standards and thus introduce proper hygiene practices to the milk producers in Leon. The collaboration also identified the need for simple equipment such as a centrifuge that could test the quality of batches quickly.

The quality of milk improved steadily in the initial stage of the effort. But then the team discovered that its goal of tripling sales was in danger due to a logistics problem: There wasn't adequate storage available for the additional Grade A milk now being produced. Rather than invest in refrigeration facilities, the Parmalat team member (now assured of the quality of the milk) suggested that the company conduct collection runs in the area daily rather than twice weekly.

At the end of 120 days, the milk productivity team (renamed the "clean-milking" team) and the other four teams not only achieved their goals but also generated a new appreciation for the discovery process. As team leader Piccioni observed at a follow-up workshop: "I now realize how much of the overall success of the effort depends on people discovering for themselves what goals to set and what to do to achieve them."

What's more, the work is more rewarding for the people involved. It may seem paradoxical

cal, but virtually all the teams we've encountered prefer to work on projects that have results-oriented goals, even though they involve some risk and require some discovery, rather than implement clearly predefined tasks.

The Leadership Balancing Act

Despite the obvious benefits of rapid-results initiatives, few companies should use them to replace the horizontal activities altogether. Because of their economies of scale, horizontal activities are a cost-efficient way to work. And so it is the job of the leadership team to balance rapid-results initiatives with longer-term horizontal activities, help spread insights from team to team, and blend everything into an overall implementation strategy.

In Nicaragua, the vertical teams drew members from the horizontal teams, but these people continued to work on the horizontal streams as well, and each team benefited from the work of the others. So, for example, when the milk productivity team discovered the need to educate farmers in clean-milking practices, the horizontal training team knew to adjust the design of its overall training programs accordingly.

The adhesive-material and office-product company Avery Dennison took a similar approach, creating a portfolio of rapid-results initiatives and horizontal work streams as the basis for its overall growth acceleration strategy. Just over a year ago, the company was engaged in various horizontal activities like new technology investments and market studies. The company was growing, but CEO Phil Neal and his leadership team were not satisfied with the pace. Although growth was a major corporate goal, the company had increased its revenues by only 8% in two years.

In August 2002, Neal and president Dean Scarborough tested the vertical approach in three North American divisions, launching 15 rapid-results teams in a matter of weeks. One was charged with securing one new order for an enhanced product, refined in collaboration with one large customer, within 100 days. Another focused on signing up three retail chains so it could use that experience to develop a methodology for moving into new distribution channels. A third aimed to book several hundred thousand dollars in sales in 100 days by providing—through a collaboration with three other suppliers—all the parts needed by a

major customer. By December, it had become clear that the vertical growth initiatives were producing results, and the management team decided to extend the process throughout the company, supported by an extensive employee communication campaign. The horizontal activities continued, but at the same time dozens of teams, involving hundreds of people, started working on rapid-results initiatives. By the end of the first quarter of 2003, these teams yielded more than \$8 million in new sales, and the company was forecasting that the initiatives would realize approximately \$50 million in sales by the end of the year.

The Diversified Products business of Zurich North America, a division of Zurich Financial Services, has taken a similarly strategic approach. CEO Rob Fishman and chief underwriting officer Gary Kaplan commissioned and launched dozens of rapid-results initiatives between April 1999 and December 2002. Their overall long-term objectives were to improve their financial performance and strengthen relationships with core clients. And so they combined vertical teams focused on such goals as increasing payments from a small number of clients for value-added services with horizontal activities targeting staff training, internal processes, and the technology infrastructure. The results were dramatic: In less than four years, loss ratios in the property side of the business dropped by 90%, the expense ratio was cut in half, and fees for value-added services increased tenfold.

Now, when you're managing a portfolio of vertical initiatives and horizontal activities, one of the challenges becomes choosing where to focus the verticals. We generally advise company executives to identify aspects of the effort that they're fairly sure will fail if they are not closely coordinated with one another. We also engage the leadership team in a discussion aimed at identifying other areas of potential uncertainty or risk. Based on those discussions, we ask executives to think of projects that could replicate their longer-term goals on a small scale in a short time and provide the maximum opportunity for learning and discovery.

For instance, at Johnson & Johnson's pharmaceutical R&D group, Thomas Kirsch, the head of global quality assurance, needed to integrate the QA functions for two traditionally autonomous clinical R&D units whose people were located around the world. Full integration

Rapid-results initiatives challenge senior leaders to cede control.


was a major undertaking that would unfold over many years, so in addition to launching an extensive series of horizontal activities like developing training standards and devising a system for standardizing currently disparate automated reports, Kirsch also assigned rapid-results teams to quickly put in place several standard operating procedures (SOPs) that cut across the horizontal work streams. The rapid-results teams were focused on the areas he perceived would put the company in the greatest danger of failing to comply with U.S. and European regulations and also on areas where he saw opportunities to generate knowledge that could be applied companywide. There's no science to this approach; it's an iterative process of successive approximation, not a cut-and-dried analytical exercise.

In fact, there are really no "wrong" choices when it comes to deciding which rapid-results initiatives to add to the portfolio. In the context of a large-scale, multiyear, high-stakes effort, each 100-day initiative focused on a targeted result is a relatively low-risk investment. Even if it does not fully realize its goal, the rapid-results initiative will produce valuable lessons and help further illuminate the path to the larger objective. And it will suggest other, and perhaps better-focused, targets for rapid results.

A Call for Humility

Rapid-results initiatives give some new re-

sponsibilities to frontline team members while challenging senior leaders to cede control and rethink the way they see themselves. Zurich North America's Gary Kaplan found that the process led him to reflect on his role. "I had to learn to let go: Establishing challenging goals and giving others the space to figure out what it takes to achieve these...did not come naturally to me."

Attempting to achieve complex goals in fast-moving and unpredictable environments is humbling. Few leaders and few organizations have figured out how to do it consistently. We believe that a starting point for greater success is shedding the blueprint model that has implicitly driven executive behavior in the management of major efforts. Managers expect they will be able to identify, plan for, and influence all the variables and players in advance, but they can't. Nobody is that smart or has that clear a crystal ball. They can, however, create an ongoing process of learning and discovery, challenging the people close to the action to produce results—and unleashing the organization's collective knowledge and creativity in pursuit of discovery and achievement. 

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 February 2003
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[Campaigning for Change](#)

by Larry Hirschhorn
Harvard Business Review
 July 2002
 Product no. 1385

The vertical nature of rapid-results initiatives represents a dramatic shift in organizational structures—something Hirschhorn recommends for managers seeking to move a large initiative forward. Structural shifts constitute what Hirschhorn calls a **political campaign**—a focused effort to create coalitions that will support the initiative's progress.

He also suggests two other types of campaigns that are consistent with rapid-results initiatives: a **marketing campaign** that taps into employees' thoughts and feelings and communicates the initiative's benefits, and a **military campaign** that builds on insurgent initiatives to capture project managers' attention and evoke their passion.

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