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Avoid costly 11th-hour project dilemmas by preparing for change

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When faced with the dilemma of accepting reduced market potential or a late, over-budget project, managers are often stuck. Here the authors suggest a “flexible” approach for executing projects in the face of uncertainty.

Many firms approach product development with the notion that thorough planning will eliminate the need for wasteful mid-project changes, thus following the mantra to “do it right or do it over.” But often in our turbulent world, circumstances change late in the project, and then you face an unpleasant dilemma. You can proceed as planned, accepting the reduced market potential of a product that no longer meets customer needs as well as it could. Or you can decide to alter the project in accordance with the new information, suffering the usual penalty of a slipped schedule or a blown project budget. In short, your choice is to do it wrong or to do it over.

This article explores this dilemma and offers a way to resolve it by using tools and methods that prepare for mid-project changes. Contrary to most managers’ expectations of slippery schedules and blown budgets when projects change, this flexible approach makes projects more predictable in the face of uncertainty.

Mid-project change is fairly common, actually. We interviewed a group of product development professionals from many companies, and not one of them had any difficulty in recalling a couple of projects that had faced a late project change. Most of these examples incurred large budget overruns or schedule delays. In fact, we would go so far as to claim that if you are not experiencing late-project

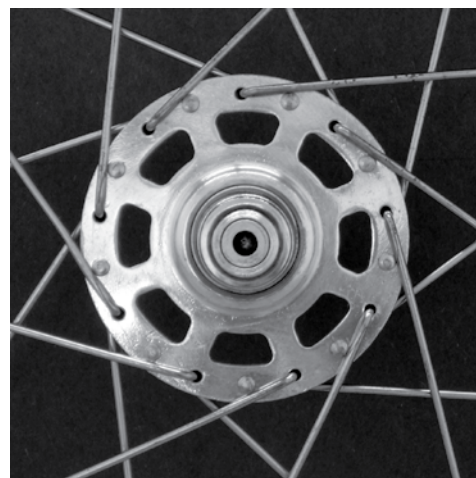
changes, you are probably not innovating to the extent that your company’s senior management would like to see. Five years ago, Robert Cooper showed in *Visions* that new-product innovation had declined seriously over the preceding 14 years,¹ and another report demonstrates that this trend continues to the present.²

Product development methodologies are built on the tacit assumption that detailed planning before starting development will eliminate wasteful mid-project changes. Moorman and Miner analyzed 13 marketing textbooks and found that they all prescribed a plan-first, follow-the-plan approach.³ In other words, follow-the-plan is how product developers are trained—and often rewarded—so it is not surprising that they face a dilemma when confronted with evidence that a change in plans would result in a better product.

Illustrative example: Bicycle hub design

Your company designs and manufactures mechanical components for bicycles and you are embarking on a project to design a new hub for a spoked wheel. The important engineering work is in the bearings, the seals, and the quick-release mechanism, but the flanges (see Exhibit 1) are a controversial style issue. The flange design task consumes about 35 percent of the design budget.

Exhibit 1: Bike Hub Styles



Spoked bicycle hubs can be of narrow (left) or wide (right) flange design.

SOURCE: Preston Smith, New Product Dynamics.

Exhibit 2: Original Plan for Bike Hub

	Project expense	Schedule	Unit mfg. cost
Hub development (narrow flange)	\$100,000.00	3 mo.	\$7.00

You estimate the narrow flange hub will cost \$100,000 and take three months to develop.

SOURCE: The Authors

Narrow flanges are lighter and have lower manufacturing cost, but many bike aficionados believe that wide flanges improve torsional stiffness. Engineers on the team favor the narrow format for its technical merit, while marketing prefers the wide flange for its customer appeal.

Technical considerations win out, and you finalize the plan with narrow flanges. Exhibit 2 shows your plan budget and schedule.

Two months into the project, marketing is preparing with distributors for market launch and discovers that distributors strongly prefer the wide flange: the narrow-flange hub will not be competitive. *You've tripped on the do it wrong or do it over dilemma.* Should you follow the original plan and accept disappointing profits or change the plan and incur significant budget, schedule, and cost overruns?

In this case, you decide to redesign the flange. Project outcomes will differ significantly from your original plan (see Exhibit 3).

Resolving the dilemma

Flexible product development is the application of agile software development principles to non-software product development. Flexibility offers a way to prevent this dilemma by anticipating the need for change and planning the project to reduce the impact of change. Here are some tools to approach a project flexibly: The first step to dealing with uncertainty is simply acknowledging that perfect planning does not completely eliminate the need for change and that not all change is wasteful. In this example, not changing to the wide flange will severely limit profit.

It's a persistent misperception that mid-project change is always the result of poor planning, but when it's time to start the project, a perfect plan may not be realistic. Learning about innovative technology and understanding fast-moving customer requirements may cause mid-project changes that you can't control. Acknowledging the need for change allows for uncertainties, so you can work to resolve them without costly disruption.

In this example, freezing the flange decision before starting development did not remove uncertainty, it only obscured the potential for change until it became very costly.

Of course, not all aspects of a project will be uncertain, and "uncertainty" should not become an excuse for weak planning. But for significant uncertainties, freezing the plan around your current best guesses creates the potential for costly surprises later in the project.

Identify the uncertainties

Identify uncertainties—generally areas where your knowledge is incomplete—during the planning phase. It is best to use a variety of approaches here to catch all the major uncertainties by looking at your project from various angles. First, consider areas where there is controversy among the team. For the bike hub project, for instance, it should have been a red flag that flange width was an area of uncertainty that might change later.

Then start probing areas where your knowledge is weak. Perhaps you are entering a new customer segment with an existing product, so you don't understand well how the product will be used or what customer expectations will be. Maybe you will be manufacturing or marketing the product in a region that is new to you. Or it might be that you are working with a new technology for which standards are not yet firm.

You will never become perfect at identifying all the uncertainties. Some are simply unknowable. But you can improve by conducting project retrospectives at the end of each project. Get the project team together and ask:

- What changed during the project with unfortunate consequences?
- Did we know about this possibility of change early in the project?
- If so, did we take steps to understand it better or keep our options open? If not, why not?
- If not, could we have foreseen it early in the project? How would we have done that?

By using a process like this retrospectively on every project, over time you will sharpen your acuity for detecting changes while you can prepare for them.

Define your options

If you have done a thorough job of listing uncertainties, you will probably have more than you can pursue. Narrow your list to the most likely and most damaging changes that might occur—a list short enough to tackle.

Then, for each one, define the options you need to keep open until you obtain more information or understand it better. Keeping options open can be expensive if carried too long. There is usually what we call a last responsible moment for each option,⁴ which is the time at which the cost of keeping it open rises substantially. Determine the last responsible moment for each option and insert it into your project schedule. Then, using the steps below as you proceed, create a plan to keep the option open until it starts becoming too costly to maintain. If you have dealt with your identified uncertainties well, when an option's last responsible moment arrives, you should be in good position to close it, because you have been collecting information about it.

Design for uncertainty

Once you know the areas of uncertainty—the areas where change is likely to occur—often you can alter the product design to minimize the effect of a change. For example, in the very early days of the IBM PC (before they had hard drives, if you can remember that far back), IBM recognized the need for storage but wasn't sure how it would evolve. One possibility was a cassette tape. So the very early PCs had a cassette port. It was seldom used and was removed when the first hard drives appeared, but it kept an option open during a period of uncertainty.

Exhibit 3: Modified Plan for Bike Hub

	Project expense	Schedule	Unit mfg. cost
Sunk project costs	\$70,000.00	2 mo.	
Redesign with wide flange	\$100,000.00	3 mo.	\$10.00
Project outcome	\$170,000.00	5 mo.	\$10.00
Variance from plan	\$70,000.00	2 mo.	\$3.00

Redesigning the flange will incur significant expense and schedule overruns.

SOURCE: The Authors

Exhibit 4: Flexible Plan for Bike Hub

	Project expense	Schedule	Unit mfg. cost
Prototype and circulate both styles	\$5,000.00	*	0
Develop hub with chosen flange style	\$100,000.00	3 mo.	\$7–10
Project outcome	\$105,000.00	3 mo.	\$7–10
Variance from original plan	\$5,000.00	0 mo.	\$3.00 max

Recognizing and dealing with uncertainty reduces 11th-hour crises and reduces variance in project outcomes. * Not on critical path.

SOURCE: The Authors

Another design option available is to arrange your product architecture to “fence in” parts of the design that are likely to change so that when they change, they do not disrupt other parts of the design. This is usually done by creating an interface so that you need change only what lies inside the interface. IBM did this on the PC with uncertain memory, video, and printer options by using expansion slots, and the expansion slot architecture carries forward today to fence in the hardware most likely to change in a PC. The bike hub team could have used this principle to fence in the uncertain flange area while completing design and testing of the hub’s core.

It can also be effective to do the opposite, as Toyota does, by fencing in the areas where you cannot afford change in order to protect them.⁵

Accelerate learning

You’ve identified key options to hold open and are designing the product to minimize the disruption of change. Now it’s important to close these options quickly by accelerating learning. This means conducting early learning experiments and front-loading prototyping. Learning experiments differ from verification testing significantly: A good learning experiment should be just as likely to succeed as to fail because the goal is learning. An experiment to prove that a concept will work is a verification test, not a learning experiment.⁶

Similarly, front-loaded prototyping should aim to explore possibilities, not to verify a design. It’s important to define what you want to learn from the prototype and then mock up the salient elements of the product as quickly and as cheaply as you can. Front-loaded prototyping is fast and inexpensive, without sacrificing the quality of the learning it produces.

A flexible approach

In the example of the hub design, the eleventh-hour flange dilemma left you with two costly choices: Should you accept disappointing sales or blow the project budget and schedule? A flexible approach (keeping the flange decision open until you understood it better) would have eliminated the dilemma and decreased potential variance in outcomes. That flexibility decreases variance

is counterintuitive to plan-minded new-product leaders.

Let’s turn the clock back and start the project anew. You recognize the flange decision as an important uncertainty because of the engineering/marketing disagreement, so you need to start the project with the flange decision open. You realize that you don’t need to decide on the flange for the first month if you design the other parts of the hub to be independent of the flange.

During that first month, you can take inexpensive prototypes to distributors to get their opinions and resolve the decision before it appears on the schedule’s critical path.

Exhibit 4 shows the project plan, including the additional expenses for the prototypes.

Compare Exhibit 4 with Exhibit 3. With the flexible approach in Exhibit 4, the total variance from the original plan is only \$5,000 and zero months compared to \$70,000 and two months in Exhibit 3. In fact, the variance of \$5,000 in Exhibit 4 is the cost of flexibility. This is an insurance premium that limits the potential \$70,000 and two-month cost of making a late project change.

This is typical of product development in uncertain or turbulent environments. Dealing openly with uncertainty rather than obscuring it with frozen plans makes projects more predictable and greatly reduces the risk of costly do-it-wrong-or-do-it-over dilemmas. ■

Endnotes

1. Robert G. Cooper, “Your NPD Portfolio May Be Harmful to Your Business’s Health,” *Visions* XXIX no. 2 (April 2005): 22–26.
2. James P. Andrew, et al., *Innovation 2010* (Boston: The Boston Consulting Group, 2010), <http://www.bcg.com/documents/file42620.pdf> (accessed May 20, 2010).
3. Christine Moorman and Anne S. Miner, “The Convergence of Planning and Execution: Improvisation in New Product Development,” *Journal of Marketing* LXII no. 3 (July 1998): 1–20.
4. Preston G. Smith, *Flexible Product Development* (San Francisco: Jossey-Bass, 2007) 154–158.
5. Preston G. Smith, *Flexible Product Development* (San Francisco: Jossey-Bass, 2007) 65–66.
6. Preston G. Smith, *Flexible Product Development* (San Francisco: Jossey-Bass, 2007) 89.