

## Can You Afford to Be Innovative?

by Preston G. Smith

Surveys of CEO strategic priorities consistently place innovation near the top.<sup>1</sup> However, innovation is synonymous with change, and lower levels of management, especially seasoned managers, know that change can be expensive and disruptive. In product development, changes late in a project usually mean serious schedule and budget overruns. So top management “talks” of innovation, but do they “walk the talk” when it conflicts with the project schedule and budget measures by which lower levels of management are usually rated?

### EXAMPLE: BICYCLE DESIGN

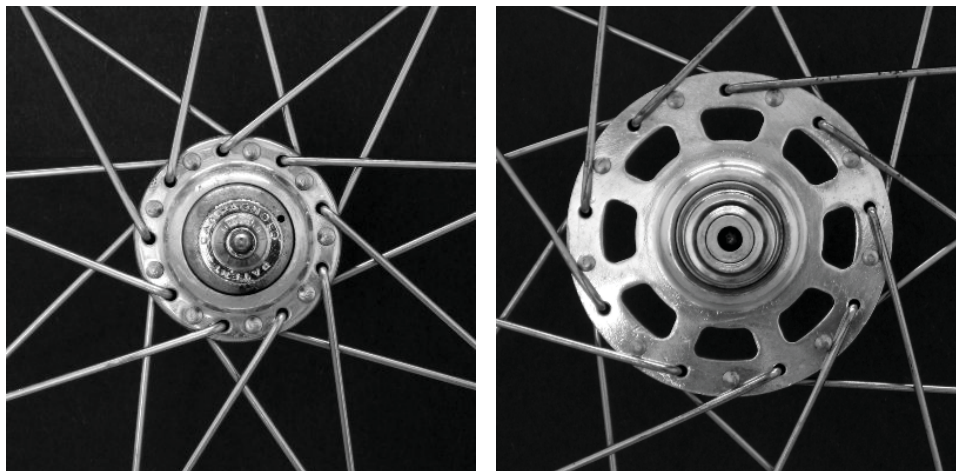
I believe there is a middle ground, a way to embrace the changes that accompany innovation without suffering the associated project penalties. Consider a consumer product. Your company develops and manufactures bicycle components, and you want to design a wheel hub. Most of the engineering effort in this project is in the core of the hub: the bearings, seals, and quick-release

mechanism. However, there are two basic styles of spoked-wheel hubs: narrow and wide flange (see Figure 1). Narrow flanges are advantageous from an engineering perspective because they use less material, which reduces weight and manufacturing cost. However, a strong mythology surrounding bike devotees suggests that wide flanges provide superior torsional stiffness.<sup>2</sup>

Your development team considers this choice, and, heavily weighted with engineers, it decides to use good engineering judgment and proceed with the narrow-flange design. Under these circumstances, Table 1 shows the project outcomes (for simplicity, I ignore tooling investment in these results).

Marketing is concerned about customer acceptance, however, so it discusses the two styles with some bike distributors. They clearly prefer wide flanges, so the team is told to switch to them. You are now two months into the project, so this change will cause a slip in the schedule and cost overruns. See the expected outcomes in Table 2.

This is exactly the situation that managers dread and the one that usually brings them poor performance reviews. It is similar to a situation Apple faced recently with its iPhone 4, wherein engineering judgment diverged from style considerations in the antenna’s design, leading to customer dissatisfaction and poor reviews after the product was launched.<sup>3</sup>



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Figure 1 — Narrow-flange and wide-flange bicycle wheel hubs.

However, there is a more pleasant alternative. The team could have recognized the uncertainty surrounding the flange style and noticed that it didn't have all the information it needed to make a wise choice. At the outset, the team could have built quick prototypes of the two styles (or even faster and cheaper, bought competitive examples of the two styles) and shown them to a sampling of customers. This might have taken two weeks, which could have been done while the engineers started on the bearings and seals so that this customer sampling would not be on the critical path. This more flexible approach would have avoided a late, expensive change. With early prototyping and customer sampling, the expected outcomes are shown in Table 3.

Comparing this view of the project with the previous one, you can see that variance from the plan is much more favorable and is likely to result in a far better performance review for the manager involved, while still allowing for innovation. In fact, this last table is overly pessimistic. Normally, such a project would be scheduled and budgeted to include the prototyping activities, so these would not be considered variances from the

plan. In other words, such variances would normally be listed as zero in this case.

So it is possible to have an innovative product without large schedule or budget risk, but it requires openness to change and preparing for it.

**AGILE SOFTWARE DEVELOPMENT**

The foregoing example involves hardware development, but there is a parallel that is becoming prevalent in software development. Agile software development has become quite popular, often replacing more traditional waterfall methods. Agile is a flexible approach in which plans are not frozen at the project's outset but evolve in short (typically, two-week) iterations as the team learns from its work and from customer feedback. Agile thus accommodates innovation well. However, much of the resistance to agile comes from managers who feel more comfortable with a waterfall approach, in which they have firm project objectives and resource requirements before starting work.

Table 1 — Project Outcomes for Project as Planned

	Project Expense	Schedule	Unit Mfg. Cost
Develop narrow-flange style	\$100,000	3 months	\$7.00
Total	\$100,000	3 months	\$7.00
Variance from plan	\$0	0	\$0

Table 2 — Switch to Wide Flange Spurs Schedule Slippage and Cost Overruns

	Project Expense	Schedule	Unit Mfg. Cost
Sunk cost in narrow-flange design	\$70,000	2 months	\$0
Develop wide-flange design	\$100,000	3 months	\$10.00
Total	\$170,000	5 months	\$10.00
Variance from plan	\$70,000	2 months	\$3.00

Table 3 — More Flexible Approach Avoids Late, Expensive Change

	Project Expense	Schedule	Unit Mfg. Cost
Prototype and circulate both styles	\$5,000	0 months	\$0
Develop preferred flange style	\$100,000	3 months	\$7.00-\$10.00
Total	\$105,000	3 months	\$7.00-\$10.00
Variance from plan	\$5,000	0 months	\$3.00 max

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## THE INSURANCE ANALOGY

A useful way to think about accommodating the change that occurred in the bike hub example is to use an insurance analogy. Consider fire insurance on your house. You have two options, if your mortgage company permits:

1. Don't buy fire insurance and assume the full cost of replacement in the unlikely but possible event of a fire.
2. Buy fire insurance, paying a premium up front each year but avoiding the majority of replacement cost if you do have a fire.

A rational decision regarding this choice depends on your estimate of the likelihood of a fire. If your circumstances make a fire quite unlikely, you might accept the risk and avoid the premiums.

The same applies to innovation in product development. If you are working in a mature area where uncertainty and thus the risk of a change is low — a low-innovation scenario — you would be wise to skip the initial prototyping, investigation, and iteration and simply proceed with what you know the market wants. But if you face uncertainties and there might be project changes later, you would be wiser buying some “insurance” by investing a “premium” in early prototyping, experimentation, or market research. This insurance allows you to be innovative and still be protected from expensive late changes.

## INNOVATING ECONOMICALLY

There is a process for doing this up-front work. First, search through your project in the planning stage for things that might change, which usually coincide with your areas of uncertainty. Any conflict on the team suggests uncertainty. In the bike hub example, the discussion about wide-versus-narrow flanges should have been a red flag to investigate further. Explicitly search through your project, using a checklist, looking for uncertainty. Tailor your checklist to your technology, market position, customer knowledge, and other factors

unique to your business. For example, if you are developing a new communication technology for mobile devices, evolving technical standards might be an uncertainty, or customer expectations regarding signal reliability might be questionable. If your product is mature, but you are moving into new geographic regions for marketing or manufacturing, then you have geographical uncertainties.

Most people can identify more uncertainties than they can process, so the second step is to choose the ones that are especially likely or most potentially disruptive to your project. This is brainstorming. The best approach is to strive for a rich selection of possibilities initially and pare them down later, so that you don't miss any important ones.

Third, starting with your most worrisome uncertainties, determine how you can gain knowledge that will help you take the wisest path regarding that uncertainty. In addition, determine when you will need this information in order to keep the cost of your alternative low. We call this the *last responsible moment* for making a decision before the alternative's cost escalates.<sup>4</sup>

Another approach is to design the product to minimize the cost of change, perhaps by inserting an interface that “fences in” the change so that only a small part of the product would have to be redesigned if this change were to occur. There are many such ways you can arrange the product's architecture to limit the amount of damage that will result from a midproject change.<sup>5</sup>

## CONCLUSION

In summary, I believe you can afford to be innovative, but you can't afford to do it as most companies do, by assuming a single path to success in inherently foggy surroundings and hoping for the best. Instead, buy some insurance; invest relatively little up front to clear the fog and create some alternatives you might need. With this insurance, you are prepared to proceed boldly into innovative territory without suffering large consequences from late changes in your project.

## ENDNOTES

<sup>1</sup>Andrew, James P. et al. "Innovation 2010." The Boston Consulting Group, April 2010, p. 6 ([www.bcg.com/documents/file42620.pdf](http://www.bcg.com/documents/file42620.pdf)).

<sup>2</sup>Brandt, Jobst. *The Bicycle Wheel*. 3rd edition. Avocet, 2002, pp. 61-62.

<sup>3</sup>Kane, Yukari Iwatani, and Niraj Sheth. "Apple Knew of iPhone Issue." *Wall Street Journal*, Vol. CCLVI, No. 13, 16 July 2010, pp. B1-B2.

<sup>4</sup>Smith, Preston G. *Flexible Product Development*. Jossey-Bass, 2007, pp. 154-158.

<sup>5</sup>Smith, Chapter 3. See 4.

## ABOUT THE AUTHOR

Preston G. Smith is a management consultant and trainer specializing in accelerated and flexible development of new products. In his more than 25 years of guiding managers toward more effective development, he has helped to overcome management resistance to such techniques that seem so beneficial on the surface. Mr. Smith is the coauthor of *Developing Products in Half the Time* and *Proactive Risk Management*, as well as author of *Flexible Product Development*. He holds a PhD in engineering from Stanford University and is a Certified Management Consultant. He can be reached at [preston@NewProductDynamics.com](mailto:preston@NewProductDynamics.com).