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BY BARRY JARUZELSKI, RICHARD HOLMAN,
AND OMAR DAUD

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At least half of all product launches fail to live up to companies' expectations. For every four projects that enter development, only one makes it to market, according to a recent study at Georgetown University's McDonough School of Business. Booz & Company found in an earlier study that about 70 percent of the resources spent on new launches are allocated to products that are not successful in the market. Most companies have only themselves to blame. The traditional, gated product design process — what we'll call the first-generation approach — is rigid and linear, locking in customer preferences, potential risks, and other features at the beginning of the process. Lean product development techniques, a second-generation approach that many companies have adopted in recent years, minimize waste and boost efficiency, but they also lock in product attributes too early and limit innovation.

To get more out of new product design, companies need to adopt a third-generation approach: a more agile product development system capable of addressing frequent iterations of multiple design options early in the process, based on continuous testing and highly sophisticated customer-driven design changes. This method, which both encourages flexibility and recognizes the unpredictability of the early stages of product development, ensures that the latter part of the cycle is much

less uncertain, enabling companies to bring more popular products to market at lower cost, and with fewer delays.

Consider, for example, the returns that Apple Inc. has enjoyed from its rapid-fire sequence of products that began with the iPod and its numerous variations, then the iPhone, and finally the iPad — products built using many of the best agile techniques. Apple launched the initial iPod after just six months of development by reusing technology and components that had already been perfected by partners. More recently, Apple was able to significantly upgrade the iPad in only a year, adding a camera, faster processors, and improved battery life, among other features. On a larger industrial scale, there's Oshkosh Defense, a division of the Oshkosh Corporation. In late 2008, the Pentagon issued a request for proposals for a lightweight off-road vehicle that could protect its crew from improvised explosive devices — and that would be ready for production within seven months. Oshkosh used modular parts from existing equipment; tested the design as it was being produced, generating frequent new iterations; and enforced daily meetings among the core team members across numerous functions, aimed at assessing risk and fine-tuning the development plan. Oshkosh handily overtook its competitors, winning a contract that has generated more than US\$2 billion to date.

Barry Jaruzelski

barry.jaruzelski@booz.com
is a partner with Booz & Company in Florham Park, N.J., and is the global leader of the firm's innovation practice. He has spent more than 20 years working with high-tech and industrial clients on corporate and product strategy, product development efficiency and effectiveness, and the transformation of core innovation processes.

Richard Holman

richard.holman@booz.com
is a principal with Booz & Company based in Florham Park, N.J. He is a leader of the firm's innovation practice, specializing in fields with highly engineered products, such as aerospace, industrial, and high tech.

Omar Daud

omar.daud@booz.com
is a senior associate in Booz & Company's innovation practice based in Chicago. His consulting work focuses on product strategy, product development efficiency and effectiveness, and the transformation of core innovation processes for high-tech and industrial clients.

Also contributing to this article were Booz & Company Senior Associates Yogesh Patel and Hussein Sefian.

Of course, Oshkosh's success illustrates the very aspect of this model that stymies many other organizations: Although more flexible and potentially more profitable, this approach appears to be frighteningly chaotic up front. However, companies that have adopted the approach learn quickly that what they initially give up in orderliness they gain in the ability to create products more effectively, skillfully, and intelligently.

Why New Products Fail

Many companies undertake product development in a way that is simply too regimented. The gated model is a carefully choreographed approach that assumes almost perfect information and analysis at the beginning of the process. All too often, however, by the time the product is introduced, customer needs have evolved (or it becomes clear that they weren't fully understood in the first place). Further, when design and technology decisions are made early, so much complexity and risk may be introduced that turning back and reworking aspects of development triggers substantial cost overruns and delays in the final stages. We recently examined 50 projects in the automotive, industrial, and aerospace sectors that used the gated model and found that 80 percent of the projects cost 20 percent more person-hours to launch than was initially forecast.

Yet even when it becomes clear that the original

plan is not valid, managers frequently decide to march on to product launch because of the huge costs already incurred. They might opt, for example, to exclude features or functionalities that, although high-risk, could offer significant returns. Recall the Apple Newton, an early 1990s tablet device that set out to remake personal computing and the way applications were programmed. Because of numerous design and production stutter steps, the Newton that finally saw the light of day failed once its novelty appeal to early adopters wore off. In the end, it was nothing but an overweight PDA whose handwriting recognition feature, in particular, was an overreach that failed to meet customer needs.

Orderly but frequently ineffective, the gated approach has lost some of its luster in recent years. Many companies have replaced it with lean product development, which focuses on eliminating waste and improving speed-to-market. Lean product development has improved project execution efficiency, allowing the best lean-focused companies — for example, United Technologies, General Electric, and Toyota — to launch more projects and products within their budgetary limits. Companies applying lean techniques add continuous touch points with customers so they can test product concepts, prototypes, and features along the development and launch cycle. In so doing, they have reduced cycle time by as much as 30 percent compared

to the gated approach, as well as lowered development costs by as much as 40 percent and achieved dramatic gains in first-time quality.

But lean techniques fall short at the front end of the process. The enhanced efficiency of lean product development is (like the gated model) still highly dependent on early stabilization of requirements, rather than iterating, optimizing, and trading off requirements to get to the winning product design. As a result, whatever innovation there is in this approach tends to be based on safeguarding the status quo rather than being creative — leaving companies exposed to disruptive changes in the market later on.

Agile and Lean

Given these shortcomings, we believe that a new, third-generation process is critical for success: one that applies agile product development techniques at the front end and lean approaches at the back end. Software companies have been the earliest adopters of this process, because they must routinely iterate numerous versions of their programs, and must assess them against customer needs and preferences well before the software is ready for mass release. Without customer codevelopment, a deep knowledge of product integration risks, and extensive testing to eliminate bugs at the beginning of the development cycle, software companies would essentially be operating blind, uncertain of the stability of their products or how they will be received.

The goal of agile product development is to achieve rapid and frequent iterations with multiple design options up front — driven by continuous testing and granular customer analyses — in order to optimize, balance, and prioritize requirements and identify risks earlier. This early stage of the process has four primary characteristics.

1. Rapid, iterative development model. Companies generate multiple concepts, and in a period of weeks, rather than months, test product prototypes with customers. As the results come in, cross-functional product development teams — design, engineering, manufacturing, procurement, and sales and marketing, among others — work together in problem-solving sessions to

produce a blueprint based on customer responses and the new ideas that these responses generate. Frequently, these sessions are held in rooms with paper placed on the walls and scribbled on as new concepts gestate, rather than in more traditional and formal meetings. Toyota calls this approach *oobeya*, or “big room.” An effective approach for implementing this step is to pick an upcoming market opportunity and conduct a front-end pilot, applying rapid iterations to generate and test multiple product options.

2. Modular architecture. By breaking a product concept into modules, companies can give sub-teams the responsibility to work out the best set of solutions for the final design and manufacturing of their part of the project, including interfaces, materials, or potential trouble spots. Armed with this input, design teams reunite the modules to set the plans for the next iteration of the product. It is critical to designate a creative manager to orchestrate this part of the process, and ensure that all contingencies are being discussed and that the activity doesn't devolve into a wasteful and inefficient exercise. The most innovative companies, such as Apple and Google, assign this role to their most talented product managers and systems experts. The auto industry has made good use of modular architecture, allowing carmakers to refresh model lines and introduce new versions of their vehicles while reusing multiple parts, designs, and components from prior iterations. Conducting an “architecture” session to evaluate the modularity shortcomings of current product offerings and generate ways to improve product modularity and flexibility is a must.

3. Early risk identification. As cross-functional teams rapidly iterate and synthesize product ideas and concepts, more often than not the deep dive into the design process reveals potential development risks. With this knowledge, teams can prioritize potential risks and incorporate risk reduction plans — such as focused lead-customer research and early engineering assessments — into the development slate, while scheduling routine test events to verify that risks have been addressed. A major medical device company handled this approach particularly well recently by mandating

that all development plans and contingency tests include rigorous risk management controls, rather than placing risk management activities on a schedule separate from product development. Using this program, the company reduced problems in post-launch product quality and performance by more than 80 percent.

4. Intensive stakeholder and supplier involvement.

Traditionally, companies hold suppliers and the manufacturing function at arm's length until product requirements and concepts have matured. By contrast, the agile front-end approach seeks to gain the input of all stakeholders — customers, partners, suppliers, and sales and manufacturing teams — to critique designs, offer insights, and broadly minimize risk and maximize efficiency up front so that fewer changes need to be made during production or product launch. The best way to do this is to appoint someone on each project team to be a supplier integrator. This person brings suppliers into the development process at critical points while working to understand supplier perspectives and capabilities, thereby enhancing the likelihood that suppliers will meet cost, quality, and scheduling expectations.

Because mature product definition and risk management take place early in the process, the application of lean techniques to the back end minimizes the wasted effort and resources typically expended on product launches. This later stage also has four key characteristics.

1. Reusable platforms and modules. Using the lean approach gives teams the luxury of setting up a development plan that mitigates the need to redesign large parts of the product from scratch in every cycle and iteration. Some product features are designated as necessary but not highly valued by customers; these are then treated as common modules that can be reused over multiple product generations. This approach gives agile development teams the chance to apply most of their resources toward “intelligent customization” of product iterations, adding only those new features and capabilities that customers value most. This not only saves development effort and time, but also increases speed-to-market. Many leading companies maximize reuse by developing common features, parts, and specifications

libraries that are centerpieces of new developer training. In some cases, the libraries are automated and fully integrated into product management systems and IT tools.

2. Just-in-time information and resources. These are bedrocks of traditional lean systems. In product development projects, just-in-time elements take a slightly different cast but ultimately achieve the same ends as they do in manufacturing. For example, several aerospace and industrial companies have begun to form “expert cells” of engineers who can do specialized design and development analytic work on an on-demand or just-in-time basis. Demand/pull lean planning techniques are used to ensure that work packages for development teams from these cells are accomplished on schedule, in turn allowing the core project teams to focus on risk mitigation and customer preferences. Implementation requires development of simple workload forecasts and demand-planning tools that match project demand with available functional skills. This helps companies avoid starving critical projects of necessary resources and unnecessarily deploying resources on less critical tasks.

3. Lean supplier integration. Just as suppliers are intimately involved in the early stages, these partners also collaborate in the detailed development and prelaunch phases. The goal is to identify the most critical product and process features, as well as risk mitigation parameters, while ensuring that supplier partners can meet these benchmarks at a high level of quality. If these so-called critical-to-quality parameters are identified early enough in the process — in the agile stage, for example — they can be moved down the supply chain to avoid costly quality problems and delays in the lean phases. Creating critical-to-quality task teams made up of core development groups and leading suppliers that apply state-of-the-art Six Sigma tools is one way to start developing this capability.

4. Responsive change-control system. Applying the third-generation approach not only dramatically reduces the number of changes that occur during the development life cycle, but also ensures that product alterations do not greatly slow down the overall process. This is accomplished by having a highly responsive

change-control approach in place, backed by the appropriate internal systems and technology. That's a far cry from the norm in many companies, in which change management depends on outdated processes and systems and features ineffective queues for sign-off and approval — a flurry of red tape that erodes speed-to-market. By applying lean analysis and principles, some industrial companies have seen dramatic results: reductions of as much as 75 percent in the time they take to process and approve changes. Change management bottlenecks are eliminated, and time-to-launch targets are maintained. Companies can start by determining how much time elapses between change initiation and change implementation; if it's a month or more, they have an opportunity to cut it down.

Order Out of Chaos

Companies that implement the next-generation product development model enjoy significant returns, well beyond what they could expect with either the gated or the lean approach. However, it's not an easy process. It requires significant behavioral change for most companies, which alone makes rapid transformation unlikely. Success with the agile front-end approach is dependent on a highly collaborative organizational culture, reflecting the idea that most disruptive innovations come from outside the organization. To embed this culture and outpace competitors, companies must continuously scout, filter, and channel global sources of technology, capabilities, and solutions as well as recommendations from suppliers. Perhaps most important, companies need to understand that delivery of differentiated products requires a deep well of sophisticated customer knowledge. Product teams must spend substantial time in the

field, observing customers using their products in real-life situations.

Many companies lack the skills, structures, metrics, and incentives to isolate market opportunities before they become obvious or to incubate and validate them before turning those opportunities over to a product development organization that can bring them to market effectively. To overcome these organizational weaknesses, executives must address decision rights and information flows with the goal of developing faster decision-making capabilities and mobilizing quickly to take advantage of new first-to-market opportunities. High-level metrics — for example, return on innovation investment, which measures the overall health of the product portfolio and pipeline — as well as project-level yardsticks that assess yield, value, and speed across the development life cycle should be adopted. Such carefully chosen metrics can improve transparency and accountability, enabling more educated decision making and trade-offs in the up-front agile iteration cycles.

Globalization has created scores of nimble competitors in every industry; as a result, the product development environment is too volatile for linear, standardized processes. In such a landscape, an approach that embraces the value of flexibility and unpredictability is needed to generate more stable and successful outcomes. Paradoxically, although gated processes are focused on linearity and order, they often result in chaos. In contrast, the agile model, driven by chaos and uncertainty at the front end, yields greater order at the latter stages of product development. It is the surest way to permanently increase product success rates and develop a much stronger, more sustainable position in the marketplace. +

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