Pleasing customers when competitors can't: Extreme product development

To satisfy the most demanding customers in the world, companies need the right operations structures, mind-sets, and management infrastructure.

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To succeed in competitive markets, products must do everything their customers need them to do, cost what customers are willing to pay, and be available when customers are ready to buy. Together these requirements force companies into a balancing act as the product development function manages the inevitable trade-offs that result.

In some cases, however, customers focus on just two or even one of the dimensions above the rest. To outperform their competitors in these "extreme" cases, companies can't just tweak their standard product-development formulas. Instead, they must transform the way the function is structured and run. In this article, we will look at four examples of product-development approaches that have been tailored to meet different types of extreme customer need.

Extreme reliability

The first example is a company that is a market leader in sub-sea equipment. Its products are installed at depths of up to 1500m, where they must resist high pressures and the corrosive effects of chemicals and sea water for decades on end. The extreme difficulty and expense of repairing equipment in these conditions—together with penalties for lost production caused by equipment failures—means product reliability is a primary driver for the industry. At the same time, however, the company operates in a highly competitive market in which customers are always looking for significant product cost reductions.

Reducing product cost presented significant challenges. The need to prove reliability means new designs must undergo a lengthy validation, testing, and documentation process prior to market introduction. And customers prefer designs with a track record in the field. As a result, opportunities to modify its products' design or the sources of critical components were limited. Instead, the company sought to squeeze cost out of its existing processes by establishing a new cost-management function to oversee improvements.

The new function started by analyzing all the factors that contributed to final product cost, from commitments made in the tender phase through to the development of the technical solution and associated sourcing, manufacturing, and risk provisions. From this effort, complexity cost emerged as the area with largest potential for improvement. However well-intentioned, each tailoring of a product to meet a specific customer request triggered an avalanche of subsequent changes to ensure reliability and regulatory compliance. The company's first step, therefore, was to make the added cost clear to customers early in the tender phase, allowing them to decide up front if the product changes they were considering were worth the inevitable added price.

The analysis also revealed that upstream functions often had little understanding of the downstream cost implications of their decisions. Moreover, inefficiencies in communication and documentation meant that internal change requests, which would always be expensive, ended up even more so. Once again, the solution was more transparency, with new processes to make the internal cost of design and configuration changes more visible so that engineering teams could make fact-based decisions about the cost implications of planned changes.

The company's third important step was a change in the way it thought about bought-in components, such as sensors, actuators, and electronic components. Here it moved from a department-driven to a category-driven strategy. It established cross-functional teams for each major product category, staffed by personnel from its purchasing, engineering, supply chain, and manufacturing functions. These teams established cost and performance benchmarks for their categories and worked closely with their suppliers to find ways to reduce the final installed cost of these components.

As a result, cost transparency rose while complexity fell, improving reliability in the supply chain while yielding product cost reductions in the order of 25 percent. In a further benefit to customers, lead times to deliver new projects also dropped by between 10 and 30 percent.

Extreme product performance

The second company is a manufacturer of products that operate at the limits of physics, moving at an accuracy measured in nanometers. The journey from prototype to finished machine requires close cooperation between manufacturer and customer, as products are validated and fine-tuned to meet very particular requirements. And if those challenges weren't significant enough, development speed matters too: the company's customers operate in a fast-moving, cyclical market.

During one market downturn, the company's managers decided that the only way to achieve its goal of market leadership was to invest heavily in risky, but potentially disruptive, new technologies. To do that, it transformed its R&D function in three significant ways, with stronger external links with both customers and suppliers, a new R&D culture with top in-house talent, and highly effective governance.

To improve its external links, the company established cross-functional teams, including customer personnel, to co-develop the new technologies and ensure the end products met the customers' performance and value requirements. In order for the in-house team to focus on the top product-development challenges, the company sought to outsource as many non-core parts of its technology as possible. It evaluated its supplier base to identify the most capable, low-risk suppliers for those non-core modules. Then it brought those chosen suppliers into its development processes early and worked closely with them, even placing its own project managers into supplier development teams to ensure alignment and good communication with HQ.

To reinforce its (already strong) R&D culture, the company established partnerships with leading universities and research institutions. These partnerships, together with its reputation as an innovator in an exciting field, helped it attract high-caliber scientists and engineers from around the world. To ensure that talent was used effectively, the company adopted a "front-loaded" product development process, in which

important product attributes such as manufacturability and serviceability were evaluated early in the design process. R&D resources were then allocated to the most complex problems that remained to be solved.

The company's product development process is now governed using a carefully selected set of key performance indicators (KPIs) designed to reflect the product attributes that matter most to its customers. Those KPIs cover product performance, scalability, availability, and serviceability, and new products have to meet defined targets in each area prior to commercial availability. The company also established a process to continually review the definition of core product modules—those that truly differentiate its offering in the market, where deep in-house expertise is required. This process ensures that in-house resources can focus on the most important areas, leaving non-core activities outsourced to suppliers.

Over a period of less than ten years, the company's R&D transformation helped it to double its market share, achieving a leadership position in its industry. Moreover, its technological leadership over its competitors allowed it to occupy a premium position, leading to significant revenue growth.

Extreme time to market

The third company is large consumer-electronics player. It operates in extremely competitive markets where customers demand rapid product development cycles and the fast introduction of new technologies.

To succeed in this environment, the company has pursued a vertical integration strategy in its core businesses. For new technology developments, this means that core components are developed in-house and used across a wide range of different end products. Components deemed non-core are outsourced to partners that can supply the latest technologies at competitive prices. To ensure its in-house processes really are giving it a competitive edge, the company also gives suppliers the opportunity to compete for the supply of core components. Any supplier whose offerings beat the in-house equivalent on performance or price wins the business.

The company also aims to tightly control product-development risk while also fostering innovation. Tasks in the produce-development processes are "front-loaded" so that testing and costing activities, for example, are commenced as early possible, before too much of the final design has been frozen. Rigorous management ensures projects stick to their time and cost objectives, and risks are continually assessed and evaluated. As long as the evaluation criteria are fulfilled, however, development teams are encouraged to take the risks.

Underpinning these strategies, the company devotes equal attention to its management and culture, especially through the use of lean-management practices across its R&D activities. Waste is eliminated wherever it is found, and the company strives to continually improve both its products and its processes. This culture of continuous improvement helps to drive innovation, too: for example, development managers receive strong incentives to deliver continuous feature and cost improvements. Finally, the company has built strong talent management processes, both by working closely with top universities to

identify potential future employees, and by offering clear internal promotion paths that keep staff engaged.

Together, these efforts have helped the company to build and sustain a strong position in its competitive markets, with each of its businesses becoming a top five player in its sector.

Extreme agility

Sometimes, customer requirements change during the development of a product, or only become clear once customer and product meet. Operating in such fluid and fast-changing environments requires extreme agility, leading companies in many sectors to adopt practices from the world of software development.

Agile development has become increasingly popular in the software world over the last 15 years, and with good reason. In a recent survey of the software-development community, 87 percent of respondents cited the "ability to manage changing priorities" as agile development's number-one benefit. While the methodology also improves efficiency, quality, and time-to-market, at its core agile development enables companies to improve collaboration between business and R&D stakeholders through a set of key practices that operate at the team, program, and enterprise/portfolio levels.

Starting from the bottom up, small groups of five to ten engineers are set up in teams that are cross-functional, empowered, and self-organizing within a clear, disciplined framework. In short iterations of two to four weeks, the teams deliver small feature increments of the product, running frequent demonstrations either directly to end customers or to their representatives inside the organization (typically product managers). Teams are also strongly encouraged to push automated product integration, testing, and delivery to extreme levels, through practices such as test-driven development and continuous integration (running several times per day).

At the program level, development teams work on features from a single, central task list, known as the product backlog. The backlog is managed and prioritized by a team of product managers (in the agile software environment they are usually called "product owners"), who ensure that the development teams are always working on the items that deliver highest customer value. In this regard, a crucial notion is the MVP, or "minimum viable product": a strong focus on early delivery of minimum functionality that adds value for end customers.

Finally, at the enterprise or portfolio level, agile development governance relies on a product structure that ensures a strong focus on the end-to-end delivery of each product, with minimal need for coordination (and waiting time) across different organizational units. Each product gets its own vision and target end state, with the product-management organization deciding when to release new product versions of the product to customers.

This setup, however, does not imply a rigid allocation of development resources to products. On the contrary, top-performing companies continuously evaluate the business priorities and resource needs across products, and reallocate entire development teams accordingly—bearing in mind that teams kept stable for a long period of time improve their

efficiency and effectiveness while also increasing the accuracy of the company's planning.

While agile is well-established in software development, many of its practices can be adopted or adapted by hardware OEMs as well. For example, feature-based development driven by small, cross-functional teams, and prioritized in a centralized backlog by a team of product managers, is as possible in hardware as in software development. Similarly, quick development iterations and feedback loops are increasingly enabled by technologies such as CAD design and additive manufacturing.

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In each of the four examples above, customers focus on different drivers of value. As a result, the organizations involved need different approaches to succeed. What these approaches have in common is an understanding of the one or two dominant dimensions that matter most to their customers, and a recognition that the entire R&D function must be built specifically to meet those customer requirements. While the best approach will always depend on a company's individual situation, the underlying operations structures, mind-sets, and management infrastructure described here are examples of best practices that we see again and again in high-performing R&D organizations■

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