

# Retiring the House of Quality

by **Anthony W. Ulwick, Richard E. Zultner, and Richard Norman**

With the advent of outcome-driven thinking and modern QFD methods, innovation and product development have been transformed. It is time to retire obsolete tools and adopt new Design for Six Sigma standard practices for the execution of these critical business processes.

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# Introduction

Quality Function Deployment (QFD) was conceived in Japan in the late 1960s by Yoji Akao and Shigeru Mizuno as a method for assuring quality in new product development. In 1972, to support this paradigm shift for designing in quality, the first QFD matrix, the “house of quality,” was added to QFD as a new tool. QFD spread to the United States from Japan in 1984, and in 1988, John Hauser and Don Clausing described the use of a simple subset of QFD by U.S. automotive parts suppliers in the classic *Harvard Business Review* article “The House of Quality” (May–June 1988). The traditional house of quality they presented is a matrix that has been used by thousands of companies in the United States as part of their implementation of QFD. The theory behind the QFD system is that companies should be customer-driven in executing the product development process; that is, they should begin with customers’ needs, not with technology. By taking customers’ needs into account, companies are more likely to design products that customers value. To accomplish this, everyone involved in product development must work together throughout the development process to focus their best efforts on what matters most to customers. The result is a product or service superior to the competition, and which satisfies customers by providing value. This can only be achieved when product developers accurately understand the true needs of the company’s customers. The QFD system was developed to assure this, and in the last decade, QFD and its tools have become widely adopted as standard Design for Six Sigma (DFSS) practices for product development.

Since its introduction, companies have also used the house of quality to help execute the innovation process, a related, but distinct, discipline. After years of use, the house of quality has become a de facto DFSS standard practice for this discipline as well. Today, with innovation and product development emerging as the keys to company growth, increasing numbers of companies are attempting to use the traditional house of quality to help execute these complex processes. But as a handful of companies discovered years ago, and as other companies are quickly discovering today, the traditional house of quality is not the best tool for the innovation process or even the best tool for the product development process, where it is most commonly used.

With modern methods available to execute the innovation process, specifically those integrated in the Outcome-Driven Innovation methodology introduced by Anthony Ulwick in “Turn Customer Input into Innovation” (*Harvard Business Review*, January 2002) and further described in *What Customers Want* (McGraw-Hill, 2005), companies are finding that the traditional house of quality is no longer necessary for concept innovation.

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Companies are also finding that the traditional house of quality requires renovation to be an effective tool in today’s complex product development process, and they are discovering the process often works better when it is begun with the maximum value table. (See Richard Zultner, “Blitz QFD: Better, Faster, and Cheaper Forms of QFD,” in the October 1995 issue of *American Programmer*.) The maximum value table is made even more effective when the inputs to the table are those made available by the Outcome-Driven Innovation methodology.

Given these facts, the time has come to retire the traditional house of quality from active service for concept innovation and to adopt these new successful tools and a renovated version of the house of quality for product development. By adopting these new DFSS standard practices for innovation and product development, both processes can be improved, resulting in greater value for customers and a competitive advantage for the firm.

# How the House of Quality Became a Standard Practice in Concept Innovation

Innovation is the process of devising product and service solutions that address unmet customer needs. It is important not to confuse the innovation process with the product development process, which is the process of developing a product once it has been conceptualized and approved for development (see Figure 1). The output of the concept innovation process is a product concept—a unique and valued solution that is worthy of entering a company’s product development process. Confusion about innovation sometimes arises because technical innovation, which includes making detailed technical design and manufacturing decisions as the product is being designed, takes place in the product development process. Although this too requires innovation, it is not concept innovation, as it takes place after the product concept has already been defined and funded.

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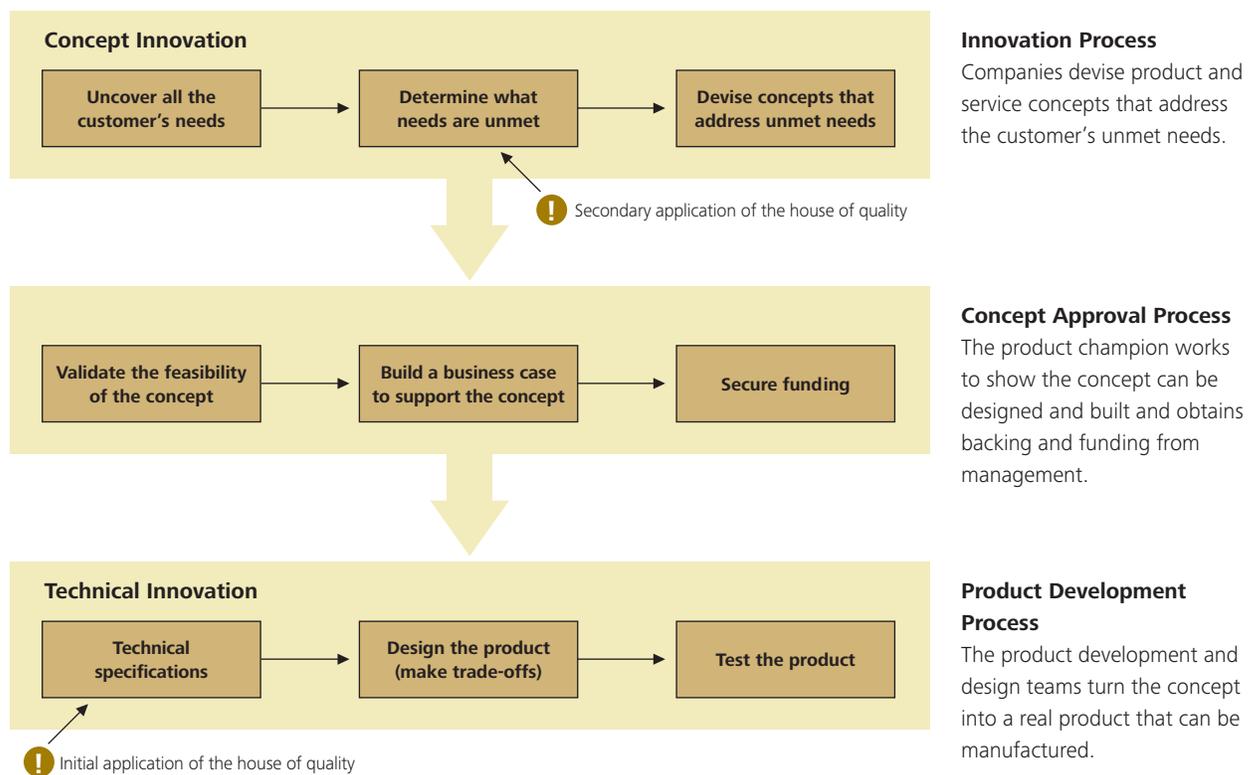
**The house of quality emerged as a tool for translating customer needs into technical requirements in the initial step of the product development process. But although it helped engineers and designers make technical design and manufacturing decisions, it was never intended by its creators as a tool for the concept innovation process.**

As mentioned above, the house of quality emerged as a tool for translating customer needs into technical requirements in the initial step of the product development process. But although it helped engineers and designers make technical design and manufacturing decisions, it was never intended by its creators as a tool for the concept innovation process, although companies tried to use it to fill this void. As the saying goes, when you have a hammer, every problem looks like a nail, which best explains why companies tried to use it to nail down concept innovation too.

Soon after the traditional house of quality was introduced in the United States, companies began to integrate it with the Pugh concept selection matrix, a tool used in technical innovation to evaluate different technical design alternatives against specific criteria. In addition, the house of quality used voice-of-the-customer (VOC) statements as inputs into the process. With this system working well for technical innovation, the push to use it for concept innovation was under way.

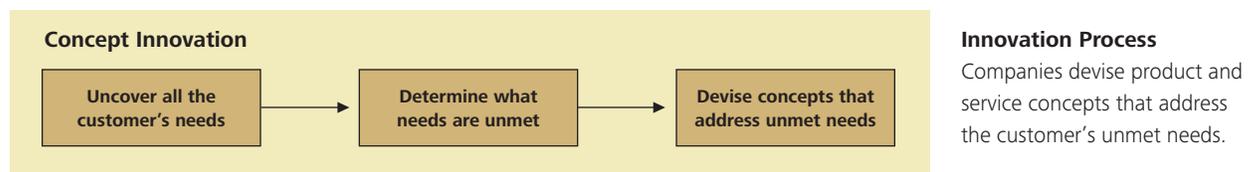
Over time, VOC inputs became the inputs of choice for concept innovation as well. In addition, companies repurposed the Pugh matrix to evaluate product concepts in the concept innovation process. For over 20 years now, companies have used VOC inputs, the traditional house of quality, and the Pugh matrix as ad hoc tools to help execute the innovation process. In a quest to find a best practice for innovation, many adaptations of the traditional house of quality and the Pugh matrix have been attempted, with varying results. Although use of this mixed assortment of tools still remains a de facto DFSS standard practice for concept innovation, many companies have moved on.

**Figure 1. Distinguishing the Innovation Process from Downstream Processes**



# New Tools for Concept Innovation Overcome Obstacles to Success

To excel at the innovation process, a company must be able to do three important things. First, for any given market, a company must be able to identify all the customer's needs. Second, it must be able to determine which of those needs are unmet, and third, it must be able to devise solutions that meet those needs. A solid tool for innovation must enable companies to identify and prioritize all the customer's unmet needs; it must be usable in all concept innovation contexts and must deliver the desired results. The traditional house of quality is weak on all these points.



The notion that the house of quality assists in the execution of the concept innovation process is based on an incorrect assumption—that customer needs (which in the house of quality are benefit statements) must be translated into technical requirements with their associated metrics (house-of-quality outputs) before the company can generate and evaluate alternative product concepts. As it turns out, when using the Outcome-Driven Innovation process, well-defined customer desired outcome statements are the only inputs required to uncover opportunities and brainstorm valued solutions.

A bit of background information is in order. Many companies accept the theory that customers buy products and services for a specific purpose: to get jobs done. By job, we mean the fundamental goals customers are trying to accomplish or problems they are trying to resolve in a given situation. (Harvard Business School professor Clayton Christensen backs this thinking in *The Innovator's Solution*, Harvard Business School Press, 2003.) From the customer's perspective, it is the job that is the stable, long-term focal point around which value creation should be centered because the job's perfect execution reflects the customer's true definition of value. Once the job is accepted as the sole unit of analysis, companies must stop capturing requirements on products and services and instead must capture requirements on the jobs that those products or services are intended to perform. This is a whole new way of thinking.

When following this approach, companies must ascertain from customers what must be measured and controlled to ensure the job is executed with the speed, predictability, and output the customer desires. The statements that describe what must be measured and controlled are called customers' desired outcomes; they are customers' fundamental measures of performance associated with getting a job done. (This concept was first introduced in "Turn Customer Input into Innovation," in the January 2002 issue of the Harvard Business Review.)

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**Replacing the traditional house of quality with a new and effective standard practice is a giant step forward in the evolution of the concept innovation process.**

When these facts are understood, and desired outcomes are adopted as customer inputs into the concept innovation process, the house of quality is no longer necessary. Because desired outcomes are defined and structured as metric-based requirements to begin with (ones that customers themselves define as measures of success when getting a job done), there is no need to translate customer needs into company-defined technical requirement statements, which is the primary purpose of the house of quality. Instead, desired outcome statements are used directly as inputs into the idea generation and evaluation process. (See *What Customers Want*, chapter 2.)

Replacing the traditional house of quality with a new and effective standard practice is a giant step forward in the evolution of the concept innovation process. Using the Outcome-Driven Innovation methodology, rather than the house of quality, not only simplifies the process, it improves it along three fronts. When using the Outcome-Driven Innovation methodology:

**1. Customer-defined metrics guide product concept innovation directly.**

The Outcome-Driven Innovation methodology uses customer-defined metrics (desired outcome statements) to guide the formulation, evaluation, and selection of new product and service concepts. The resulting concepts are tied directly to the customer's desired outcomes—and the job the customer is trying to get done—increasing the likelihood that the customer will value the new concepts' features. Because the inputs used to guide concept innovation are tied directly to the customer's actual inputs, no translation is required.

## **2. Hidden opportunities for market growth are revealed.**

Opportunities for growth vary in their attractiveness. Some unmet customer needs are more important and less satisfied than others, making them better growth targets. Determining which unmet needs represent the best opportunities for growth has long been a challenge. Many of the methods used for this purpose are leading companies to pursue phantom opportunities while missing others altogether.

To address this challenge, the Outcome-Driven Innovation methodology makes use of the opportunity algorithm, which reveals which hitherto unseen opportunities are the most important and least satisfied. (See *What Customers Want*, chapter 3.) The more important and less satisfied a desired outcome is, the greater the opportunity for value creation. With the outcome-driven methodology, importance and satisfaction data points are captured using advanced quantitative research methods. These data points are then used in the algorithm, eliminating another potential source of error and variability. This approach transforms the process of identifying hidden opportunities into a science.

## **3. Hidden opportunities alone define what the competitive position should be.**

In any market, there are a limited number of opportunities for growth. In other words, only a handful of desired outcomes are likely to be important and not well satisfied. By devising a solution that successfully addresses the best opportunities for growth, the best possible competitive position is automatically achieved—one that is most different from competitors' positions and most valued by customers.

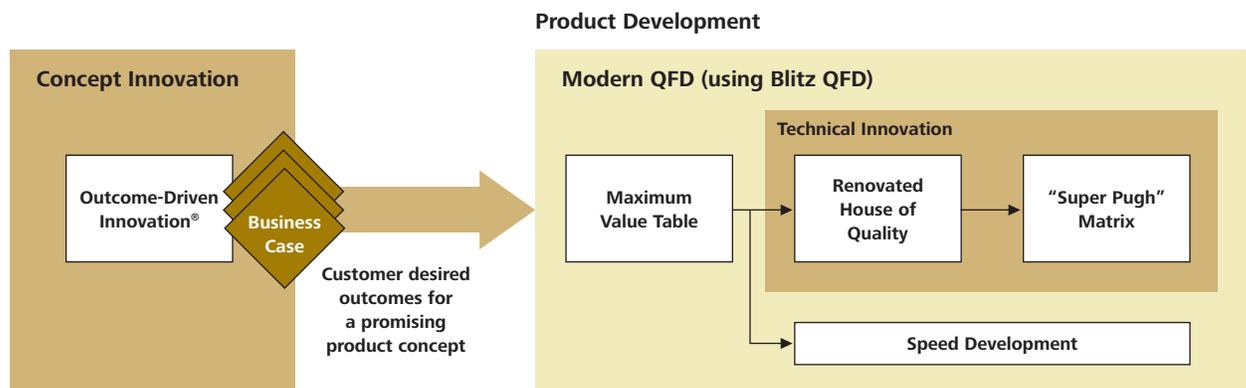
Once a company has identified the best opportunities, its next concern should be how to develop and leverage them. Consideration of competitive position should be subordinate to that aim. Unless the company concentrates on the discovery of hidden opportunities first, a truly unique and valued competitive position will escape discovery. Competitive positioning is not always approached in this manner when using traditional practices.

# New Tools for Technical Innovation Overcome Obstacles to Success

As mentioned earlier, it is vital to distinguish the concept innovation process from the product development process, which includes the technical innovation process (see Figure 1). The concept innovation process, which focuses on devising solutions that address unmet desired outcomes, produces multiple promising product concepts, which are supported by accompanying business cases. Each product concept is ready for launch into a company's product development process. Using these inputs, those responsible for product development create projects and give project teams the task of turning those concepts into real products. Detailed design and manufacturing decisions are made during this technical innovation process, which results in a complete and detailed product and process design. Innovation at this stage focuses on determining technically how a product will work and exactly how it should be produced.

The challenge in product development is to assure the successful realization of the promising concepts. It is here (see Figure 2) that QFD and the house of quality have compiled an impressive track record of success, leading to their adoption as a DFSS standard practice by many companies around the world.

**Figure 2: Modern QFD Leverages a Better Front End for Better Product Development**



Over time, new tools have evolved under the banner of modern QFD that work better than the 35-year-old traditional house of quality. First developed in the mid-1990s to address the shortcomings of the traditional house of quality, modern QFD emerged as the result of applying QFD to the traditional QFD process. (See Richard Zultner, “Blitz QFD: A Next Generation Approach for Delivering Value,” a paper given at the Seventh International Conference on Software Quality Tutorials, 1996). Key enhancements in modern QFD include: (1) the use of the maximum value table, which is a better initial step in product development; (2) use of the analytic hierarchy process to renovate the house of quality and Pugh matrices with improved prioritization and, (3) speed deployment to address concerns over development speed and project pipeline capacity. Modern QFD, energized by Outcome-Driven Innovation at the front end, gains three significant points of leverage for technical innovation:

### **1. Essential issues are the key focus across the entire development project.**

The traditional house of quality explores in detail the relationship of customer needs (from the world of the customer) to technical requirements (from the world of the product developer). And this is just one of the many product development matrices in QFD. If intensive analysis is what you want, then the house of quality certainly delivers. But should companies always start every product development project with this intensive effort? Is there a better way to assure customers’ needs are satisfied?

The maximum value table is a better initial product development step than the house of quality. The maximum value table acts as a router for the deployment of customer needs throughout the network of development activities comprising a complex development project. In contrast to a matrix, which only examines two dimensions of product development (but in great detail), the maximum value table can address more than twenty product development dimensions (in much less detail). With the maximum value table, a product development team can survey all essential issues across the entire project and then decide when and where a more detailed examination will be needed. The maximum value table allows the team to manage and control the effort that will be invested in technical innovation, so that the effort is appropriate to the project and the business case. This works even better with the high quality inputs from the outcome driven innovation methodology.

### **2. Priorities are more valid and accurate.**

In a traditional house of quality, customer needs are prioritized using a simple scale that unfortunately has problems with both accuracy and validity. Those limitations are definite problems for Six Sigma organizations that have invested heavily in training key technical people in the proper use of measurement scales and quantitative methods. In Japan, this problem was recognized in the early 1980s. The Japanese chose to solve it with the simplest known method for producing accurate and valid priorities: the analytic hierarchy process. (See Thomas Saaty, *The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation*, McGraw-Hill, 1980.) The analytic hierarchy process produces accurate priorities in a way that is valid for use in the house of quality and Pugh matrices. The result is a renovated house of quality and a “super Pugh” matrix for technical concept selection; together, these support better decisions regarding design alternatives. In most cases, results are achieved in time and with less analysis effort than was the case with traditional QFD. (See Richard Zultner, “Priorities: The Analytic Hierarchy Process in QFD,” in *Transactions from the 5th Symposium on QFD*, QFD Institute, 1993.)

### **3. More projects are completed faster with the same resources.**

A better front end in product development means that more promising concepts are devised and packaged in business cases, and those business cases are also more attractive. It means that a company has more development projects that it really wants to do each year. But undertaking more projects requires more resources, which drives up costs—which companies always try to avoid. Is there any way out of this conflict? Is it possible to take on more development projects without spending more? And can it be done without making trade-offs in scope, quality, risk, or customer satisfaction? Ten years ago, a new method was developed to manage resources across multiple projects better, for improved project throughput. (See Eli Goldratt's *Critical Chain*, North River Press, 1997.) Goldratt's breakthrough method for multi-project management has been implemented in hundreds of cases, and the results are the same: significantly more projects from the same resources, with no trade-offs.

QFD's speed deployment subsystem was created as a framework for this new multi-project management method. The speed deployment subsystem lets companies spend more time on technical innovation efforts and still make the market window (or management's desired completion date). Companies can be very confident that they will deliver promising new products to the market before their competitors. (See Richard Zultner, "QFD Speed Deployment: Doing Development Faster with QFD," in *Transactions from the 10th Symposium on QFD*, QFD Institute, 1998.) Again, this works even better with the high quality business cases resulting from the Outcome-Driven Innovation methodology.

# Adopting New Standard Practices

Because innovation and product development are now recognized as prerequisites for corporate growth, there is a renewed interest in tools and processes that allow companies to execute these complex and often misunderstood processes effectively. As companies evaluate DFSS programs that can be applied to these processes, some will no doubt choose the traditional house of quality, only to discover over time the inadequacies discussed here. The time has come to retire the traditional house of quality and to institute the renovated version and new tools for product development. By adopting the Outcome-Driven Innovation methodology and modern QFD as new DFSS standard practices for innovation and product development, companies are certain to improve their competency in innovation. This is the dawn of a new era in growth creation through innovation.

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# Contacts



## About the Author

Anthony W. Ulwick is the founder and CEO of Strategyn, an innovation consulting firm based in San Francisco, California. He is the author of *What Customers Want* (McGraw-Hill, 2005), "Turn Customer Input into Innovation" (Harvard Business Review, January 2002), "The Customer-Centered Innovation Map" (Harvard Business Review, May 2008), and "Giving Customers a Fair Hearing" (MIT Sloan Management Review, Spring 2008). He can be contacted at [ulwick@strategyn.com](mailto:ulwick@strategyn.com).

## Contacts

### United States

Tony Ulwick  
CEO & Founder  
Strategyn  
[ulwick@strategyn.com](mailto:ulwick@strategyn.com)  
+1 415 787 2706

### France & Italy

Maurizio Beltrami  
Managing Partner  
[maurizio.beltrami@strategyn.com](mailto:maurizio.beltrami@strategyn.com)  
+41 79 596 34 27

### EMEA

Petr Salz  
Director of Business  
Development  
[psalz@strategyn.com](mailto:psalz@strategyn.com)  
+31 40 2261800

### Germany, Austria & Switzerland

Martin Pattera  
Managing Partner  
[martin.pattera@strategyn.com](mailto:martin.pattera@strategyn.com)  
+43 7472 65510 121



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