

Using QFD methodology in design-led innovation of non-assembled products

From customer understanding
to design for processability

Welcome to share our innovation philosophy, novel perspectives
and best working practices in managing innovation and
production in the process industries



From art to science in innovation of non-assembled products in the process industries

One of the principal differences between companies in the process industries and those in other manufacturing industries is that the products supplied to and often delivered from the process industries are materials or ingredients rather than components or assembled products. Customers are not only business-to-consumer (B2C) but very often also business-to-business (B2B). Furthermore, whilst product innovation in assembly-based industries begins in the design office, the development of non-assembled products in the process industries generally starts with experimental work in the laboratory or pilot plant. Moreover, the importance of an integrative perspective

on raw materials, process technology and products in innovation is another significant contextual condition of the process industries and in the production of non-assembled products. In today's highly competitive industrial climate, and in times of tight company resources, effective and efficient tools and development methodologies is one avenue to follow in order to deliver more "fact-based" product development and company innovation performance. Not only must the product innovation work process be adapted to process-industrial conditions, but also their related supporting product innovation methodologies.

The inherent structures of products manufactured in the process industries, often determine their functionalities for customers, and even if such products appear low-tech for an inexperienced onlooker, they often have high material complexity. However, the product functionalities caused by such inherent structures are not "on display" (Lager, 2017a).

On the philosophy of "design thinking" in product innovation

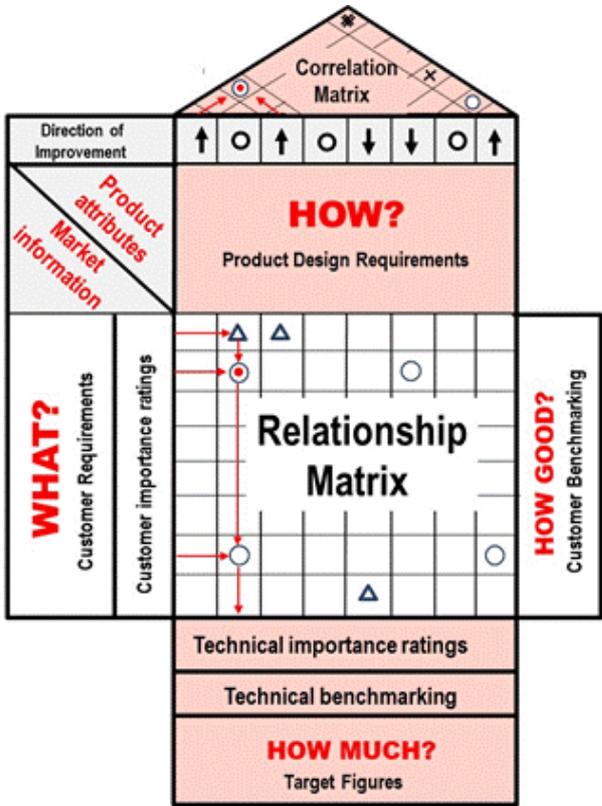
Design-led product innovation is a recent approach in product innovation that focuses less on HOW to make the product and more on WHAT is needed to wow the market. In design thinking, the product developer must first try to understand how product benefits are derived in the customer's "context of use" and then translate these customer requirements into measurable product attributes. In the process industries, the "process embodies the product", so these product attributes must also be further progressed into the production process in order to achieve a design for processability and an attractive product in terms of both price and performance. Because the Quality Function Deployment (QFD)

product innovation methodology rests on this philosophy, it is perfect instrument for design-led innovation. In the development of "value propositions" in design-led innovation there is a strong focus on creativity methodologies and supportive tools like product clinics, ethnographic approaches and co-development in the customers' natural environment. However, in design-led innovation of non-assembled products, prototyping is replaced by laboratory experiments and pilot planting. Furthermore, in B2B product innovation, improved customer understanding must partially be substituted by an improved understanding of the customers' production process.

Using QFD methodology for design-led innovation of non-assembled products

The mpQFD methodology adapted to process-industrial innovation contains three work process stages: collecting the “Voice of the customer”, building a “House of Quality” and “Phase Progression” of product specifications into the production process. Each of these stages is also applicable as a “stand alone” activity in product innovation. Combined with explicit product knowledge, the QFD matrices can be regarded as “containers of synthesized tacit knowledge”, and are thus outstanding instruments for company organizational learning, communication and the development of attractive value propositions.

Customer and competitor understanding



The House of Quality

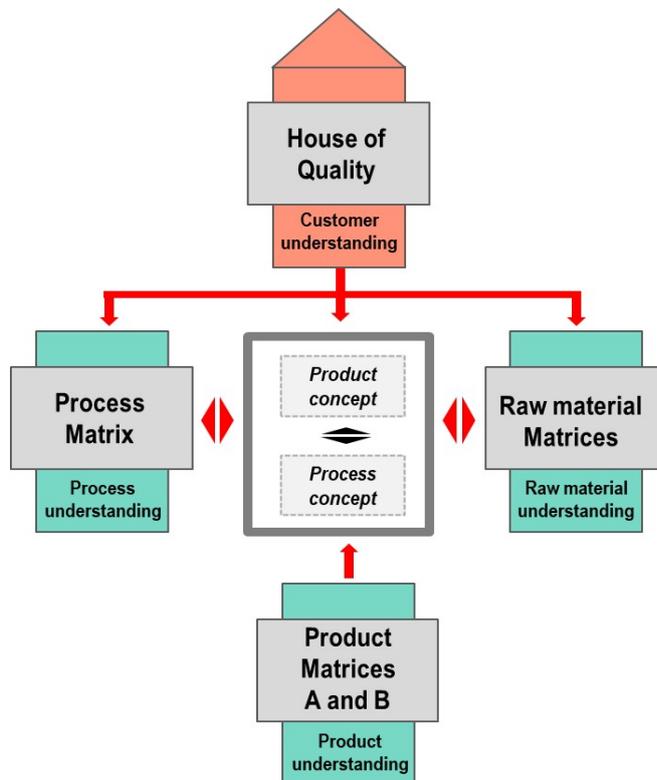
Product innovation is a process that always must start and finish with the customer. The first step in the QFD process is thus to establish customers’ demands and wishes in face-to-face contact, but also in the use of proper instruments for market research. The techniques used to establish Customer Requirements must naturally be adapted to the structure of the company’s clientele and the nature of its products. In the House of Quality the collected, refined and structured customer requirements are then further translated into measurable products attributes, including benchmarking of competitive products. The QFD matrices are outstanding instruments to “grasp the whole” in product innovation, and their gradual upgrade over time will capture new patterns emerging from new amalgamated product information.

In a design-led approach the Voice of the Customer is an excellent framework for in-depth market research and the use of related methodologies like Kano modelling. The House of Quality can also be used for managing product variety by collecting separate importance ratings of customer requirements for different market segments. Finally, the matrix approach keeps you away from “single parameter thinking” in innovation, helps you to identify “white spaces” on the product knowledge map, and creates a shared vision of the “product whole”.

In the use of the QFD methodology you will create a retrievable and accumulated company knowledge base coupled with improved company communication, you will get better decision support, assisting in the development of better product specifications, resulting in better products and ultimately leading better overall customer satisfaction (Lager, 2005a).

From customer understanding to design for processability

Since price/performance is a prime concern of customers, neglecting the manufacturing aspect in early product development is a serious mistake. Thus, product developers must not only understand which product attributes the customer values most, but also HOW such attributes can be created in a cost-efficient production system. While seeking technical solutions is the major concern in product design, it is at the production stage that product costs are actually committed, product quality is finally determined, and lead times for product launch are set. Since “the process embodies the product” in the process industries, methodologies that support product innovation must thus facilitate an early integration between product development and the development of necessary new or improved production process technology.



The mpQFD matrix architecture

The novel Multiple Progression QFD matrices transforms product concepts into new or improved process and raw material concepts. The well-defined measurable product attributes and target figures will secure necessary production system capabilities and target costing. The mpQFD can progress information within and outside company demarcations – addressing the total supply/value chain from suppliers to “end-users” in product innovation. Using the matrix approach, vital information for use in next generation product innovation projects will be captured, digitized, and made easy to retrieve and communicate. The use of the upstream matrices in the mpQFD system is thus “phase progression simplified”.

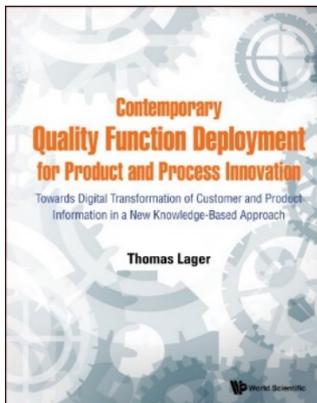
The product target figures that are developed using a platform of the mpQFD matrices are thus not ad hoc targets but developed in the process of “interactive target setting”, since the selected target figures can be traced back from the total consolidated matrix information.



Invigorate your company product innovation work process using the blinab “QFD toolbox” and “online QFD mentorship”

The blinab “QFD toolbox” contains a new book on QFD and the QFD Designer™ software. Learn how to introduce and use the QFD methodology in process-industrial applications in Thomas Lager’s new book. Find out more about his novel knowledge-based approach for product and process innovation, as well as the use of his new Multiple Progression QFD system adapted to process-industrial conditions. The book is available on major online bookshops and directly from **World Scientific Publishing**: <https://doi.org/10.1142/11265>

Contemporary Quality Function Deployment for Product and Process Innovation: Towards Digital Transformation of Customer and Process Innovation in a new Knowledge-Based approach



This book introduces the reader to the industrial use of the Quality Function Development (QFD) methodology in product and process innovation. The creation of Integrated Knowledge Platforms (IKPs), supporting more digitalized product and process innovation work processes, will speed up product development and capture vital information to be used in your next-generation product innovation projects. From an overall company perspective, the well-proven ability of the QFD methodology to stimulate cross-functional product innovation will guide product innovation towards a new knowledge-based approach in its enhanced digital transformation and use of integrated customer, product, and production information.

The adoption of the QFD tool and matrices in building such well-structured knowledge-based platforms (IKPs) related to individual products or product families is the heart of the matter and the "hidden gem" of QFD methodology use. The book aims to serve as a manual introducing the methodology and how to use it, offering a guiding framework, and being a handbook for the methodology's industrial use for both newcomers and product developers. Furthermore, it offers new perspectives on a more efficient and effective use of the QFD methodology for the seasoned practitioner.

Book contents:

- The Theory and Methodological Use of Quality Function Deployment in Industrial Product Development
- Process-Industrial Product Innovation and the Use of the QFD Methodology as a Facilitating Development Tool
- The "Voice of the Customer" and "House of Quality" — The Common Denominators and Matrices in All QFD Systems for All Manufacturing Industries
- The Advanced Multiple Progression Quality Function Development System (mpQFD) — Introducing the Upstream & Downstream Matrices Adapted to Process-Industrial Conditions for Innovation
- Consolidating Matrix Information into Integrated Knowledge Platforms (IKPs) — New Perspectives on the Industrial Use of the QFD Methodology
- Guidelines for Company Implementation of the Quality Function Deployment Methodology and Integrated Knowledge Platforms

Use the market leading QFD Designer™ software for product innovation and digital transformation of customer and product information

The QFD methodology comes to life with QFD Designer™ software. Used together, you will learn how to create an easy to access living company knowledge base for your product designs. Through the QFD Designer™ software, customer and competitor product data and information related to each “product family” will be digitized in powerful matrix layouts. The data becomes integrated and inter relationships suddenly become clear for an enhanced company communication. In company B2B product innovation the development of interactive product-service offerings (PSO) is an important part of a new or improved product value proposition. The use of House of Quality to translate customers’ qualitative service needs and expectations into measurable service attributes related to the core-product functionalities and properties, is generally experienced as an outstanding tool and instrument.

QFD Designer™ software power tools

Customize and change individual matrices, rooms and symbols using cut-and-paste tools

Select well-designed symbols from a symbol library for a holistic visualization of customer and product info at a glance

Drag-and-drop makes it easy to customize your charts and express unique relationship between design and data elements

Insert customer importance ratings for key target markets, and toggle graphical view if desired

Present your benchmarking results as snake plots to easily compare product performance ratings among competing solutions

Automatically translate customer importance ratings into technical importance ratings, the

powerful pinpointing of how to optimize your firm’s action to boost the market success. The software built-in pre-defined formulas adjust automatically as your add data

Capture tacit information for in “notes” which can be added to most any chart data points

Temporary hiding of individual rooms lets you tailor matrices for internal and external presentations and discussions focused on the decisions at hand

Create sub-charts from any matrix in order to drill down into a “deeper dive” focus on individual part of your design during revisions and reviews. The software even transfers high priority design factors into next phase charts for comprehensive design analysis

Selected reference users of the QFD Designer™ software



blinab is the preferred reseller of QFD Designer™ for process-industrial applications (www.IDEACore.com). Contact blinab for single program sales or for a corporate license of a tailor-made company program.

Secure a successful project outcome with blinab “online QFD mentorship”

Get access to the author of the new QFD book, and take advantage of blinab “online QFD mentorship” for an agile project execution using our online application support from Thomas Lager in the development of your QFD project. Take advantage of his professional general expertise in the area of innovation of non-assembled products and as a seasoned facilitator in the implementation and use of QFD in many sectors of the process industries. Our stepwise online support will be tailor-made to your project needs but is usually including:

- **Planning** and organization of the select innovation project in the perspective of design-led innovation and use of the mpQFD methodology. Answering FAQ and application support in the use of the QFD Designer™ software.
- **Assisting** in an agile project execution and the development of the “Voice of the Customer” and utilizing supplementary market research methodologies. Creation of an embryonal House of Quality structure, and matrix reviews at appropriate time intervals.
- **Securing** a “fast-track” QFD implementation and flexible methodology use in simultaneous matrix development and in a lean QFD approach. Support during matrix analysis and the use of HoQ in target setting for new or improved product concepts.

The blinab company and “Performance in innovation”

The blinab company, located close to the city of Stockholm, Sweden, is a “boutique” management consultancy in the area of Management of Innovation and Production in the Process Industries. Please visit our website to purchase the QFD Designer™ software and for more details on our supporting services. **www.blinab.com**

Professor Dr. Dr. Thomas Lager - blinab principal consultant

Thomas Lager is the General Manager of blinab “boutique” management consultancy in the area of Innovation & Production Management in the Process Industries, and an affiliated Professor at Mälardalen University, School of Innovation, Design and Engineering. As a visiting researcher in Japan, he had the privilege of having the founder of the QFD methodology, the late Professor Yoji Akao as his mentor and prime supporter in the development of the mpQFD methodology adapted to process-industrial conditions.



Thomas Lager Bio-express

Thomas Lager holds an MS degree in Mining Engineering from the Royal Institute of Technology in Sweden. He has a PhD in Mineral Processing and a PhD in Business Administration and Economics from Luleå University of Technology. He was previously Professor and Chair in Innovation Management at University Mohammed VI Polytechnique in Morocco, and an affiliated Professor at Grenoble Ecole de Management in France. He was formerly an adjunct Professor and Director of the Centre for Management of Innovation

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