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Aerospace 2016

QFD and the Systems Engineering Way of Working

Steve Dimelow, QFD Black Belt®, Systems Engineering Specialist, Rolls-Royce plc. United Kingdom.

This paper discusses the integration of Modern Blitz QFD® and Pathfinder, a Systems Engineering (SE) approach developed at Rolls Royce. In addition to the modern QFD tools such as Projects Goals Table, Customer Segment Table, Affinity Diagram, Hierarchy Diagram, AHP, and Maximum Value Table, the flow of Pathfinder tools such as Stakeholder Map / Context and Boundary Diagrams and Viewpoint Analysis are employed. The paper will support the ISO 196355 standard to reference good practice and evidence of usage in industry.

Keywords: ISO 16355, Blitz QFD®, Systems Engineering, AHP, Stakeholder Map

Energy 2016

The Hoshin Express — From Idea to Project

Dennis Frankos, QFD Black Belt®, Staff Engineer/Quality Deployment Leader, NextEraEnergy Inc. Power Generation Division, USA; Myra Gardiner, Lean Six Sigma Black Belt, Central Maintenance General Manager, NextEra Energy, Inc., Power Generation Division, USA; Glenn H. Mazur, QFD Red Belt®, Executive Director, QFD Institute, Academician, International Academy for Quality, USA.

The mission of the Power Generation Division at NextEra Energy is to deliver certainty of operations and maintenance for all its non-nuclear assets. Exceeding organizational goals are driven by the implementation of quality oriented continuous improvement opportunities that add value. This paper demonstrates the application of Hoshin Kanri - Policy (Priority) Deployment from idea generation to project selection in the central organization of the PGD business unit. Leveraging a systematic method across all fleets in the business unit make it easier to share best practices across the enterprise, provide line-of-sight from high value projects through to business unit strategies, and promote consistency in selecting projects with maximum value in meeting customer needs.

Keywords: Hoshin Kanri, Organizational Strategic Planning, Systematic Policy Deployment, Corporate Priorities, High Value Projects

Soft Systems Method Integration with Sustainable Energy Systems Development Using ISO 16355

Dr Kim Stansfield, CEng, QFD Black Belt®, Senior Teaching Fellow, Warwick University WMG, UK; Dr Mike Colechin, Partnership Manager, Energy Technologies Institute, UK; Glenn H Mazur, QFD Red Belt®, Executive Director, QFD Institute, USA.

The Soft Systems Method was developed by Peter Checkland's team at Lancaster University in the 1970s to help analyze complex situations or 'soft problems' where the problem for which a solution is sought is not clearly understood, or for which differences of opinion exist as to the precise nature of the problem. Such a 'soft problem' exists in the development of sustainable (economic and environmental) energy systems. This paper will illustrate how modern QFD methods described in the 'ISO 16355 standard for QFD' have been used in the UK's Energy Technologies Institute to help in the analysis of the 'soft problem' of transition to low-CO2 energy systems. Illustrations will be given on how these methods can be used to establish system specifications and designs.

Keywords: Sustainable Energy Systems; Soft Systems Method; ISO 16355; Modern QFD; Outcome Based Design; Sustainable Energy; Policy Deployment; Hoshin Kanri; Stakeholder Management; Prioritisation; Needs Analysis; Concept Design; Design Selection

Information Technology / Software 2016

Using QFD to Design a Smart School Quality Factor Model: Integrating QFD into IoT

Amany Alnahdi, Kent State University, Computer Science Department USA / King Abdul-Aziz University, Jeddah, Saudi Arabia; Austin Melton, Ph.D., Professor, Departments of Computer Science and Mathematical Sciences, Kent State University, USA

The internet of things (IoT) relies on the principle of making the whole much greater than individual things by connecting their data. But how can all these things work together effectively? This question is similar to the question which QFD always asks: What is the voice of the customer (VOC) regarding the important qualities of a product? Our research aims to show the integration of QFD will enhance IoT usefulness. This paper begins with an example of developing smart schools with QFD.

Keywords: QFD; IoT; Quality Factors; Smart Schools; Web Services

QFD for Testing the Internet of Things

Thomas Fehlmann, Ph.D., Senior Researcher, Euro Project Office AG, Switzerland

The theory of Combinatory Logic has a model that is very useful when dealing with unknown cause-and-effect relationships. Combinatory Algebra can be seen as a generalization of QFD as it deals with infinite cause-and-effect relationships and it lays the theoretical foundations for managing complexity in the Internet of Things (IoT). This paper shows the model of combinatory logics and how QFD implements such a model in practice, proposing new approaches based on theory for predicting strange and unforeseeable conditions and how the "things" behave under them.

Keywords: Combinatory Logic, Lambda Calculus, Combinatory Algebra, Six Sigma Transfer Functions, Quality Function Deployment (QFD), Internet of Things (IoT), Automated Testing of IoT

A Method of Software Requirements Analysis Considering the Requirements Volatility from the Risk Management Point of View

Yunarso Anang, University of Yamanashi, Dept of Computer Science & Engineering JAPAN / Institute of Statistics, Indonesia; Masakazu Takahashi and Yoshimichi Watanabe, Ph.D., University of Yamanashi, Dept of Computer Science & Engineering JAPAN

Due to immature, volatile nature of software specifications, the incremental development cycle such as spiral and agile models, or even the conventional waterfall model, are still inadequate to address the challenge. It is easier to just accept the potential of requirements change as a risk. In this study, we describe a method of software requirements analysis in consideration of the requirements volatility risk. We use QFD as the base method, while we apply R-Map as a tool for risk assessment. We use actual software changes tracking record to obtain the risk of changing, and we evaluate our proposed method by applying the method to a real software product as our case studies.

Keywords: software requirements volatility, risk management, quality function deployment, r-map

A Critical Analysis of Software QFD Publications

Prof. Dr. Georg Herzworm, Dipl.-Wirt.-Inf. Sixten Schockert and Tobias Tauterat, University Stuttgart, Germany

Software QFD publications are analyzed with respect to these points, and future outlook of QFD in software development is discussed.

- Corresponding type of software QFD model used (i.e. traditional, comprehensive, focused or dynamic);
- Reported case studies and application domain (e.g. business software vs. technical software);
- Form of embedding QFD into software development process and its relation to project management activities;
- Essential methodological characteristics such as stakeholders, teamwork, rigor of separating needs and solutions, accuracy of prioritization, and QFD elements such as customer voice tables, affinity diagrams or quality matrices; and
- Consideration of multidisciplinary issues as well as the possibility of reacting to changing working environments caused by digitalization and industry 4.0.

Keywords: Software Quality Function Deployment (Software QFD), Experiences with Software QFD, Literature analysis, Future of QFD

Early Requirements Validation by Means of Virtual Prototypes for the QFD Use

Christian Esser M.Sc. and Prof. Dr.-Ing. Robert Refflinghaus, University of Kassel, Department Quality and Process Management, Germany

Understanding requirements as part of proactive quality management is important, as is the need for early requirements validation for product development process. For this, using three dimensional virtual reality (3D VR) early on allows developers to visually illustrate or simulate

product features and functions. Integrated into the QFD, it is possible to restructure the requirements at an early stage. Based on clear requirement structures, the results of this proactive quality measure can lead to better product quality..

Keywords: Customer requirements, product development, QFD, virtual prototype, 3D virtual reality

ISO-16355 2016

Keeping Up with Global Best Practice: ISO 16355 – Applications of Statistical and Related Methods to New Technology and Product Development Process

Glenn Mazur, QFD Red Belt®, Executive Director, QFD Institute / International Academy for Quality, USA

This paper outlines the structure of the eight parts of the newly published ISO 16355, how they build on older QFD models from the 1970s and 80s, and what you need to do to become a leader and facilitator of this Modern QFD standard. ISO 16355 is already attracting the attention of quality organizations, Six Sigma, and Lean professionals. New Product Development professionals will want to master these global best practices so they can engage their organizations in surging ahead of their competitors in creating the truly great products their customers demand.

Keywords: ISO 16355, QFD, Hoshin Kanri

Using AHP in QFD - The Impact of the New ISO 16355 Standard

Thomas Fehlmann, Ph.D., Senior Consultant, Euro Project Office AG, Switzerland; Glenn Mazur, QFD Institute, USA

Traditional QFD uses ordinal weights-percentages of a total to describe priorities for customer's needs and technical solution approaches, while AHP (Analytic Hierarchy Process) works with profiles-vectors of unit length one, making it mathematically possible to add, subtract and compare profiles. The ratio method proposed by Dr. Saaty has been a part of Modern QFD for some time, and it is now incorporated in the new ISO standard 16355. Not understanding how to properly apply AHP in QFD, however, could lead to project failures, especially if you are still using the traditional House of Quality (HoQ) matrix. This paper discusses why and how to update the HoQ practice to the new ISO.

Keywords: AHP, QFD, Comprehensive QFD, Six Sigma, Eigenvectors, Linear Algebra, ISO 16355

New Kano Model / New Product Development & Marketing 2016

Using the New Kano Model: How to Really Excite Your Customers

Harold Ross, General Motors / QFDI (ret.), USA

Kano model is well known for its intriguing diagram of 'exciting quality' vs. 'expected quality.' However, it is one of the most misunderstood concept. As one of a few who actually examined the original 1984 research by Noriaki Kano, Ph.D., et.al, the author points out some serious deficiencies in the original Kano model as well as the one commonly practiced in America and elsewhere. He then

presents the New Kano Model that offers superior insights on what needs to be done to really build excitement in new product development.

Keywords: New Kano Model, exciting quality, new product development, extrapolating design decisions, latent requirements, advanced QFD

Sustainability 2016

Sustainability Function Deployment (QFD) Applied to Increase Environmental and Social Economic Value Added of Products, Service, and Projects

Juan Manuel García, Founder, [Leanradar.org](#) and Corporate EHS Sustainability, Baxter Corporation, USA

Products and services have the objective to increase quality of life, but in some cases the result is a negative impact to the community (environment, society, economy, and health). This can be especially true in rural communities. Using QFD to integrate socioeconomic life cycle assessment (SLCA) in five projects will demonstrate up to three times the economic value added. For three projects, information was collected directly in the communities, using focus groups, surveys and investigation. SLCA was then used to understand impact. Finally, critical functions of the projects, products, and services were determined by applying QFD and SFD. Results were examined for social economic return on investment (SEROI) in order to identify functions and characteristics that can maximize economic value added to existing or future projects, products, or services

Keywords: Sustainability Function deployment, Socioeconomic value added, Socioeconomic and Environmental Life Cycle Assessment

TQM / Kaizen 2016

TQM Implementation in China via Practicing QFD

Catherine Y.P. Chan, Ph.D., QFD Black Belt®, president, Hong Kong QFD Association, Hong Kong; Prof. Gail Taylor, Hong Kong Polytechnic University, Hong Kong.

Although TQM was introduced to China in the 1980s, it is only recently that Chinese manufacturers began recognizing its importance, as they face increasing competition from countries that offer even cheaper labor and declining global economy that affects the purchasing powers of their overseas customers. Added to this are Chinese organizational culture and Chinese way of implementing TQM that are not helping. This paper explains why introducing QFD is an essential business strategy for Chinese manufacturers in their pursuit for sustainable success in the global market.

Keywords: Quality function deployment, QFD, total quality management, TQM implementation, Chinese manufacturing enterprises

A Study on Sustainable KAIZEN based on Job Function Deployment Methodology and Methods Engineering at On-site Logistics and Processes

Masamitsu Kiuchi, Ph.D., Josai University, Japan; Kazushi Nagai, Tamagawa University, Japan

Job function deployment is a method that helps transform customer needs into engineering attributes for a service or product. Methods engineering is a domain of industrial engineering that deals with human integration and manufacturing engineering. These two methodologies used together, can help companies achieve "KAIZEN" as understood in the context of Japanese corporate culture and philosophy, a success that even non-Japanese companies can emulate.

Keywords: Job Function Deployment, Method Engineering, KAIZEN

QFD Historical Milestones 2016

Historical Perspectives on Global Spread of QFD

PANELISTS:

- Dr. Shindo, professor emeritus of University of Yamanashi in Japan, is the earliest colleague of Dr. Akao and witness to the concept development. He discussed the origins of Japanese QFD.
- Bob King, founder and ex-CEO of GOAL/QPC, is one of the first Americans to introduce QFD to the English-language world. He spoke on its beginnings and growth in the U.S.
- Harold Ross, who held various management positions at General Motors Vehicle Development and Systems Engineering, spoke on the introduction of QFD at GM some thirty years ago.
- Dr. Herzwurm, professor of Business Administration and Information Systems II at the University of Stuttgart in Germany and a founder of QFD-Institut Deutschland, discussed the dissemination of QFD in Germany and EU regions.
- Dr. Catherine Chan, president of Hong Kong QFD Association, discussed the spread of QFD in Chinese language countries.
- Glenn Mazur, executive director of QFD Institute and convenor of ISO 16355, spoke on the history of modern advancements, the new ISO and future prospect.

2016 marks the 50th anniversary of Quality Function Deployment (QFD) since the first case study publication half century ago in Japan. A new important milestone has been achieved recently: The establishment of ISO 16355 for QFD, approved in May 2016 ISO meeting in London, UK. Recognizing these historic moments, this International Symposium on QFD in Boise assembled the pioneers of QFD from Japan, US, Germany, EU, and China, to share their experience and perspectives on global spread of QFD.

Keywords: History of QFD, Global QFD dissemination, ISO 16355, advancements in QFD, QFD in EU, QFD in Americas, QFD in Japan, QFD in China

Appendix 2016

Slides for panel: "The origins and history of Japanese quality development and deployment" Hisakazu SHINDO, Ph.D., Professor emeritus and former vice president of University of Yamanashi, Japan

2014: The 26th Symposium on QFD (ISBN 1-889477-26-5)

Energy 2014

Proposed Systematic Priority Deployment Method of Strategic Initiatives

Dennis Frankos, Quality Deployment Leader, QFD Black Belt®, NextEra Energy Inc., USA; Glenn Mazur, QFD Red Belt®, QFD Institute, USA

The mission of the Power Generation Division at NextEra Energy is to deliver certainty of operations and maintenance for all its non-nuclear assets. Exceeding organizational goals are driven by the implementation of quality oriented continuous improvement opportunities that add value. This paper proposes a systematic method to deploy strategic initiatives across the business unit that places emphasis on selecting projects of maximum value. Leveraging a systematic method across all fleets in the business unit make it easier to share best practices across the enterprise, provide line-of-sight from high value projects through to business unit strategies, and promote consistency in selecting projects with maximum value in meeting customer needs.

Keywords: Blitz, QFD, AHP (Analytic Hierarchy Process), Priority, HOQ (House of Quality)

Information Technology / Software 2014

QFD for Cloud Computing

Prof. Dr. Georg Herzurm and Dipl. Wirt.-Inf. Sixten Schockert, University of Stuttgart, Germany

The introduction of the client-server model in the 80s had a huge impact on the information technology used in manufacturing industry as well as within IT organizations (e.g. concerning the operation and the development of applications). Just like that, cloud computing will have a severe impact on almost all industries. This paper describes how QFD can be used to define specifications for cloud based IT solutions. Starting with the global mega trends, this paper explains the characteristics of cloud computing and their impact on the application of QFD, especially on the collaboration of all involved stakeholders. From this analysis and a conducted case study with a German information technology service provider, the authors derive several recommendations on how to execute QFD for cloud computing.

Keywords: Cloud Computing, IT, QFD

Helping Software Engineers Apply QFD Methods

Leenah Alrabghi, Ph.D. student, Kent State University USA; Austin Melton, Ph.D., Professor, Departments of Computer Science and Mathematical Sciences, Kent State University, USA

There are many documented benefits of using QFD. The software engineer can use QFD as a framework for activities aimed at improving the quality of software. Since QFD was originally proposed to develop high quality manufactured products, a few considerations must take place before applying it to software development. Based on the waterfall model (four phase model), the researchers of this academic paper point out how QFD tools can be used to benefit software engineers, what features QFD is missing with respect to common software engineering practices, and how QFD can become more applicable to software engineers.

Keywords: QFD, SQFD, Software Engineer, Software Engineering, Waterfall Model

New Kano Model 2014

New Kano Model — How to Really Excite Your Customers

Harold Ross, QFD Green Belt®, Director, QFD Institute; General Motors (ret.), USA

Dr. Noriaki Kano developed an interesting approach to classifying quality attributes by determining customer satisfaction with different levels of product features or performance. Results of a unique survey of positive / neutral / negative responses to questions can help developers determine whether a new feature or performance would be an exciter or a basic expectation of the customer. General Motors began using Kano's method some years ago and achieved additional insights by making adaptations of the method. Among these insights included revealing unknown market segments, marketing/advertising content, and clearer performance targets for each segment. This paper discusses details of this as well as a case study for automotive braking systems. This modified approach is now called the New Kano Model and will provide better understanding of the model and implementation.

Keywords: New Kano Model, Attractive Quality, Expected Quality, Customer Satisfaction Survey

Sustainability 2014

Designing Sustainable Products With QFD

Dale Roach, QFD Green Belt®, Ph.D., P. Eng., Senior Teaching Associate, University of New Brunswick, Canada

As sustainability is often loosely defined and may be desired but not understood by the customer, QFD is an ideal tool for determining a product's requirements. Additionally, sustainable products can involve significant deviation from traditional solutions so it is important to incorporate it early in the design process prior to the rapid decrease of design freedom that takes place once design has begun. This paper examines the process of developing sustainable products and proposes a framework for ensuring that sustainability is addressed.

Keywords: Sustainability, Sustainable Product Development, Sustainable Design, QFD

ISO 16355 and QFD 2014

Driving Your QFD with ISO 16355

Glenn Mazur, QFD Red Belt®, Executive Director, QFD Institute, USA

This paper explains how to drive different kinds of QFD projects based on the advanced deployments in Dr. Yoji Akao's comprehensive book "Quality Function Deployment: Integrating Customer Requirements into Product Design." While most QFD experts are familiar only with Customer-driven QFD which begins with a market focus, these advanced drivers address many other types of new product development projects. Included will be Technology-driven QFD, Cost-driven QFD, Competitor-driven QFD, Regulatory-driven QFD, Manufacturing-driven QFD, etc., exemplified with case studies. These are included in the draft "ISO 16355 for QFD." Find out what you will need to know and change in order to comply with the new standard.

Keywords: Technology-driven QFD, Cost-driven QFD, Competitor-driven QFD, Regulatory-driven QFD, Manufacturing-driven QFD, ISO 16355

Bonus Papers 2014

Using QFD to Design a Multi-Disciplinary Clinic

Children's Mercy Hospital

Keywords: Healthcare QFD

DREAM/QFD to Re-design Staff Service Excellence at Rutland Regional Hospital Systems

Rutland Regional Health Systems

Keywords: Healthcare QFD

Future Combat System Concept Development: Integrating Service and Product Requirements in QFD

Lockheed Martin Missiles and Fire Control

Keywords: Defense QFD

The Analytic Hierarchy Process: How to Measure Intangibles in a Meaningful Way Side by Side with Tangibles

Thomas L. Saaty, Ph.D., University of Pittsburgh

Keywords: Analytic Hierarchy Process (AHP)

Why We Drink Beer: Using QFD, Kansei, and AHP to Understand How Consumers Identify with Brands

Boonrawd Trading International Co., Ltd. (Thai Beer)

Keywords: Beverage, Branding, Market Research

2013: The 19th International & 25th N. American Symposium on QFD

(ISBN 1-889477-25-7)

Global QFD 2013

Keynote: Global QFD — From Japan to the World

Yoji Akao, Ph.D., Japan

Since its conception in Japan in 1966, QFD continues to advance and spread across the world. In this keynote, the global history of QFD is presented, recalling each inaugural training and project that Dr. Akao personally was involved. These include the 1981 introduction to South Korea, Taiwan (1882), USA (1983), Italy (1988) and many so other countries..

Keywords: Comprehensive QFD, Global QFD

A Critical Analysis of the Turkish Literature on QFD

Aysin Kapucugil-Ikiz, Ph.D., QFD Green Belt®; Guzin Ozdagoglu, Ph.D., QFD Green Belt®; Askin Ozdagoglu, Ph.D., QFD Green Belt®; Banu Atrek, Ph.D., QFD Green

Belt®; Adem Tuzemen, QFD Green Belt® — Dokuz Eylul University, Department of Business Administration, Turkey

This study serves as a knowledge base for the researchers by offering a holistic reference on the current state of QFD applications in private sectors as well as QFD research in academic field in the Turkish region. With economic activities rapidly globalizing and competitive pressure mounting, this knowledge will be a competitive differentiator for developing nations such as Turkey as they will compete more on the global stage. A comprehensive project has been planned to identify the level of awareness and prevalence of QFD methodology, the purpose of use, implementation levels and difficulties, and analysis, based on the literatures produced between 2000 and 2012 in Turkey from both private sector and academic sources.

Keywords: Quality Function Deployment (QFD), Literature Review, Turkey

Top technology is not all we need for a successful business: QFD logic, methods and tools — Dutch experience

Biljana Visnjicki, Ph.D., QFD Black Belt®, Coddell BV, the Netherlands; Tj .Gorter, Qanbridge BV, the Netherlands; Glenn Mazur, QFD Red Belt®, QFD Institute, USA

This paper reports a pilot project in The Netherlands, the utilization of QFD for business development. It will share the Dutch experience of customer centered marketing campaigns based on the VOC and modern QFD, as well as the logical, systematic, and interactive link between commercial and technology teams in one organization.

Keywords: Modern QFD, Business Development, Business Analysis, VOC

Industrial Design 2013

Towards QFD-based Industrial Design

Prof. Dr. Wolfram Pietsch and Prof. Dr.-Ing. Andreas Gebhardt, Aachen University of Applied Sciences, Germany.

Customer Orientation is achieved within QFD by a systematic approach. Within industrial design, requirements of the customer are also analysed and deployed with the power of artistic creativity, less with a systematic or qualitative approach. The paper proposes the integration of QFD and industrial design through a case study, leading a tentative framework for QFD-based Industrial Design.

Keywords: Customer-Oriented, Industrial Design, Conceptual Integration, Conceptual Map, Design Concept, Product Catalogue

IT Architecture / Security / Software QA 2013

QFD and Requirements Prioritization: A Survey on Security Requirements for Cloud Computing

Prof. Dr. Georg Herzwurm; Norman Pelzl, Dipl.-Wirt.-Inf.; Benedikt Krams, Dipl.-Kfm. (FH), M.Sc. of University of Stuttgart - Chair of Information Systems II (Business Software), Germany.

Prioritization is an essential task within QFD, and QFD is highly suitable for the development of Cloud Computing (CC) applications where non-functional requirements play a main role. Many of them are security requirements, often the main concern for CC investments. This paper introduces the usage of QFD for Cloud Computing (CC). In this research, CC security requirements were prioritized by pairwise comparison, showing that not all security requirements are equally important. With this finding, the appropriate usage of QFD for CC development will be discussed.

Keywords: QFD, Requirements Prioritization, Security Requirements, Cloud Computing

Application of QFD to the Symptom Analysis of Input-device Software Defects

Yamamoto Takahiro, Software QA, Wacom Co., Ltd., Japan.

The traditional function/regression tests following the design specification do not adequately ensure software quality, due to the evaluation complexity posed by various input-device software such as USB, wireless communication device, sensor, LCD display technologies, etc. This paper proposes a better method for evaluating and analyzing software defects by correctly assessing the symptoms of original causes of failures and identifying the relationships between the operations and subjects through the use of the function deployment tables and state transition tables. This feeds back not only reliability but also functionality to the quality evaluation.

Keywords: Software QA, QFD, FTA, Symptom Analysis, Test Coverage, Evaluation Deployment

Evaluating User Needs in a Web-based Learning Environment

Prof. Aysun Kapucugil-Ikiz, Ph.D., QFD Green Belt® and Guzin Ozdagoglu, Ph.D., QFD Green Belt® — Dokuz Eylül University, Department of Business Administration, Turkey

Although the users of a web-based Learning Management Systems (LMS) are typically invisible to the systems developers and administrators, understanding their needs has high priority in order to develop and implement effective virtual learning services that meet diverse expectations of the users. This paper shows using QFD for identifying the user needs that are vital to LMS and translating them into architectural characteristics of the system. Include a case study of a local LMS platform in Turkey.

Keywords: QFD, SOA, Online Learning, Customer Process Model, Gemba Visit table, AHP, CVT, MVT, Turkey

Improvement of University e-Portfolio System in Consideration of Students' Demands

Masanobu Yoshikawa, M.E., Kohei Nitta, M.B., Yoshimichi Watanabe, Ph.D., and Hisakazu Shindo, University of Yamanashi, Japan.

Using a QFD approach, demand analysis and factor analysis were performed for the successful introduction of e-Portfolio system for a public university in Japan. By analyzing the students' demands and factors of an existing software, the researchers were able to turn the e-Portfolio system software into an information infrastructure that can be fully utilized by students for effective introspective study and efficient completion of their study plans.

Keywords: Quality Assurance in Higher Education, e-Portfolio, Requirement Analysis, Software Development

Software Development Method Based on Twin Peaks Model with QFD

Yoshimichi Watanabe, Ph.D., Masanobu Yoshikawa, and Hisakazu Shindo, Ph.D., University of Yamanashi, Japan.

In software system development, it is important to analyze the stakeholder's requirements and design the architecture. One proposed method for this is the twin peaks model which intertwines software requirements and architectures to achieve incremental development and speedy delivery. The researchers used QFD to clarify these relationships in hope to propose more efficient software development.

Keywords: Software Development, Requirements, Architecture Design

New Product Development 2013

Quality Function Deployment for New Product Development: Transforming Waste to Worth

Pattarit Sahasyodhin; Kritaya Suparnongs, QFD Black Belt®; Paweena Lertchanyakul, QFD Green Belt®, SCG Chemicals Co.,Ltd., Thailand

Barley grain is a waste product from the customer's production process and typically sold as pet food. By incorporating our innovative product, we have developed a new kind of eco-friendly construction material that adds value both in function and for the customer's brand image. This paper reports an application of QFD in this NPD, most challengingly in eliciting the needs from psychological elements and deploying them into design specifications, development process, sourcing, and other considerations for successful product rollout.

Keywords: Gemba visit, VOC table, HoQ table, Design of experiment, Concept Test

Application of QFD for the Development of An Organic Product: A Pilot Study

Paulo Augusto Cauchick Miguel, Ph.D.; Jaqueline de Fátima Cardoso, Ph.D. researcher; Nelson Casarotto Filho is an Associate Professor of Federal University of Santa Catarina (UFSC), Brazil.

This paper reports a pilot QFD application for the development of an organic product. The paper presents a conceptual model which consists of four matrices for the development of an organic fruit jelly. The main adaptation is in the first matrix to include major actors in the production supply chain. The first results indicate the feasibility of the proposal for food development.

Keywords: Product Development, Organic Products, QFD

Manufacturing 2013

Study of Applying QFD to Modularity Strategy

Tadao Nakamura, Dassault Systemes K.K., Japan.

Japanese manufactures are excellent at developing integral type products, such as cars and complicated machines that need fine tuning (e.g. Semiconductor manufacturing machines). However, many products are currently shifting toward modular systems, and this is where Japanese manufacturers are weak at establishing logical architectures and rules needed for modularity. This paper defines a better modular product architecture by using QFD to arrange many complex issues such as customer needs, cost, technology, manufacturability, serviceability etc. and simulates them through a series of matrices.

Keywords: QFD, Modularity, Modular, Integral-type

Starting QFD for Clothing Manufacturers in Hong Kong

Catherine Y. P. Chan, Ph.D., QFD Black Belt®, Hong Kong QFD Association; Gail Taylor, Institute of Textiles and Clothing at The Hong Kong Polytechnic University, Hong Kong, China.

Some 20 years ago the Hong Kong clothing manufacturers only had to deal with the sewing or knitting of the samples for fashion designers. Today they are expected to provide technical design services as well as sample development process. The increasing degree of abstractness and the shift

from quantitative to qualitative nature of technical data have created many communication problems. This paper identifies the areas in which QFD can help Hong Kong clothing manufacturers in development and design and also explore the effective QFD approaches.

Keywords: Clothing Manufacturers, Apparel Industry, QFD, Hong Kong

Service Quality 2013

A Study of Service Quality Improvement Using the Theories of Nonverbal Communication, FMEA and QFD

Kazushi Nagai and Tadashi Ohfuji, Tamagawa University, Japan; Masamitsu Kiuchi, Ph.D., Josai University, Japan.

This study discusses how to improve the service quality. Study of service industry presents unique challenges because of soft issue measurements such as quality evaluation and service quality. With this in mind, the authors propose a quality improvement process specifically for service industry and will show a case study using non-verbal communication, FMEA, and QFD.

Keywords: Service Quality Improvement, QC story, QFD

Keynote: "QFD for Membership Organizations – Practicing What We Teach"

Glenn H. Mazur, QFD Red Belt®, Executive Director - QFD Institute, USA; Academician / Treasurer - International Academy for Quality.

Dr. Armand Feigenbaum, appreciating the power of quality thinking in transforming the post-war economies of Europe and Japan, planted the seeds in 1966 for the International Academy for Quality (IAQ), a membership organization that facilitates an international exchange of information about quality in order to promote quality throughout all nations. The IAQ's growing membership in developing nations means that member needs have to be periodically assessed and incorporated into future activities, beyond its original missions. Following the footsteps of the QFD founders, late Dr. Shigeru Mizuno and Dr. Yoji Akao, the author (an elected member of IAQ since 2010 and the Secretary and Treasurer since 2013) has proposed to current President Janak Mehta, that QFD be used to reassess current member needs and plan future programs. The study began in 2013 with a survey to members regarding their "likes" and "wishes" about IAQ membership and for suggestions for the future. This paper will explain the QFD process being used for this assessment, including the data from the responses, as well as the results to date and ongoing improvements to the organization.

Keywords: Quality Function Deployment (QFD), Modern Blitz QFD®, Voice of Customers (VOC), Membership Organization, Service Quality

QFD for activating a workplace Ba—Part 2

Koji Tanaka, Tokibo, Co., Ltd., Japan.

The various components of QFD draw out member's tacit knowledge through 'Ba' (the workplace gemba). In order to achieve this, the 'Ba' must be invigorated with changes that encourage the individuals to express and share his/her tacit knowledge. This paper, a sequel to the author's 2012 presentation, examines the relationship between QFD and 'Ba' from the viewpoint of cognitive engineering and social-psychology and show some examples of his company's practices.

Keywords: Service Quality Improvement, QC story, QFD

Supply Chain 2013

Modern QFD Application on a Supply Chain to Become Green

Askin Ozdagoglu, Ph.D., QFD Green Belt®; Banu Atrek, Ph.D., QFD Green Belt®— Dokuz Eylul University, Faculty of Business, Turkey.

Increasing concerns for resource scarcity and global pollution beseeches us for more environmentally friendly practice in supply chain management. This study is based on the voice of customer (VoC) data collected from the aluminum accessories industry located in Izmir, Turkey. Using the Modern QFD's maximum value table, the VOC were deployed into technical characteristics that are essential for the greener practices of the sector's supply chain management. This project is going to provide the academicians an insight into usability of Modern QFD and to the industry professionals the methods for extending their green activities.

Keywords: Modern QFD, Supply Chain, Green Practice

Transportation 2013

Application of QFD within a Co-opetition Network of Public Transport Organizations

Dipl. Wirt.-Inf. Sixten Schockert, German QFDID certified QFD-Architect; Prof. Dr. Georg Herzwurm; Dipl.-Kfm. techn. Andreas Helferich, Universität Stuttgart, Germany.

The paper reports a QFD application case study from a project funded by the German federal ministry of Education and Research. Public transport organizations are competitors as well as cooperative partners. In this setting of co-opetition we apply QFD, with the vision of offering passengers seamless transportation services. The paper presents the necessary adaptations and extensions of QFD as well as lessons learned.

Keywords: QFD, Public Transportation, Competitive Cooperation

Methods 2013

A Statistical Engineering Approach to Codifying the Voice of the Customer

Thomas Scripps, Scripps & Associates, USA.

This paper proposes a way to create a logical flow for the Voice of the Customer processing by codifying a series of tools into a linear statistical engineering roadmap, in order to populate the conventional House of Quality matrix that uses "whats" and "hows" approach. The proposed method is explained with hypothetical data and examples.

Keywords:

2012: The 24th Symposium on QFD (ISBN 1-889477-24-9)

Education 2012

Elementary QFD: Using QFD to Assess and Evaluate the Learning Environment of a Private School Library and to Systematically Engage an ISACS Review

Ken Mazur, QFD Black Belt®, Japan Business Consultants (USA)

This paper reports a Modern Blitz QFD® application in a non-traditional customer/product model – a school. Emerson School, located in Ann Arbor, Michigan, is in the midst of undergoing a review by The Independent Schools Association of the Central States (ISACS). The project goal was to identify key customers and translate their Voice of Customer as well as ISACS criteria into true customer needs.

Often organizations act on a situation without fully determining the true needs of stakeholders that would reveal the important context or unstated factor, leading to inadequate solutions or even exacerbated situations. This occurred several years ago. QFD Gemba study revealed the largest and unexpected hindrances to the current learning environment in the library media center. These observations and customer verbatims were translated into true needs and fully ordered using paired comparisons in the Analytic Hierarchy Process (AHP). Finally, the highest ranking needs were evaluated on a systematic level, addressing potential causes for concern such as difficulties of implementation, perception of teachers and students, as well as resources like cost, time and effort.

Keywords: Blitz QFD®, gemba visits, VOC translation, AHP, ISACS review, defining customers, elementary school, learning environment

Information Technology 2012

Change Fix Model

Karthik Jegannathan and Karthik Pandian, Cognizant Technologies Solutions (India/USA)

Issues that add complication to IT projects include volatility of customer requirements and assessing risks involving changes. The Change Fix Model aims to improve agility of the estimation by using lean and QFD tools, enabling assessment of the impact of a change into the entire software lifecycle, starting with a regression model for establishing the relationship between impact of change and additional effort for implementing the change.

A major player in communications was facing cost and cycle time challenges due to quality and volatility of the requirements. The end users faced issues in the features, and integration suffered many functional defects, as a result. Upon a root cause analysis, management wanted a mechanism to measure the volatility and score the quality of the requirements with respect to the importance of prioritizing and baseline requirement changes in agile as well as a non-agile environments. Using a CTQ drill down tree, which is one of the mechanisms to implement QFD, the paper is the first of its kind to measure the impact of a change by using a regression model.

Keywords: Change Fix Model

Political QFD 2012

QFD and Politics – A Sure Way To Start An Argument

Carey Hepler, QFD Black Belt®, 2010 Akao Prize recipient, Solantic Urgent Care (USA)

First of its kind, this paper examines using QFD in a political campaign. QFD is the art and science of taking the voice of the customer (VOC), and, more specifically, the top needs of the targeted customer segments, into consideration before developing a product or service. Can this technique be applied to a political campaign? This paper addresses this lofty question with the specific steps of using Modern Blitz QFD® tools for an actual election campaign by his wife Ruth Ann for a Florida county judgeship.

The primary focus of this paper is to understand how to: 1) select target segments; 2) use the voice (top needs) of the target segment customers to develop the strategy; 3) create messaging; and 4) deploy the messaging to the targeted segments. This presentation will present the QFD analytics and tools used to understand the constituents' VOC and formulate the campaign strategy deployment. Carey's QFD application is solid and innovative. It deploys downstream using the data to make strategic and operational decisions. For example, what sort of true "customer needs" can be identified from this verbatim voice of voters — "what do you think about the Chick-fil-A case?" and then what kind of a campaign strategy and slogan should be deployed?

Keywords: political QFD, election campaign, voice of constituents, target segments, political messaging, strategy

Telecommunications 2012

Repertory Grid – Potential for Requirements Management in the Quality Function Deployment - An Example of the German Smartphone Market

Dipl.-Ing. Philipp Tursch, Industrial and Systems Engineering Department, Brandenburg University of Technology (Germany); Dipl.-Wirt.Math. Katrin Baumert, Chair of Marketing and Innovation Management, Brandenburg University of Technology (Germany); Prof. Dr.-Ing. Ralf Woll, Chair of Quality Management, Cottbus University of Technology (Germany)

Integration of cognitive psychology science, the Repertory Grid Technique (RGT), into QFD is proposed. In evaluating quality/performance of a product/service, customers follow unconscious personal perceptions, besides consideration of physical properties such as size, color, functions, etc. It is these unconsciously perceived characteristics that play an important role in the decision making process.

Based on the Personal Construct Theory that contends that people experience, organize, and describe their environment in terms of cognitive personal concepts, the RGT was initially used in psychological diagnosis but has evolved to a set of general guidelines used in a wide variety of application domains, including environmental studies, education, healthcare, business, and it can be useful in identification of customer requirements in QFD analysis. Using a case of German smartphone market, this paper introduces RGT and show how it can be used in QFD analysis.

Keywords: QFD, Repertory Grid, voice of customer, customer requirements

Implementing Quality Function Deployment to Improve Service Quality and Customer Satisfaction: A Three Stages Empirical Approach in Jordanian Mobile Telecommunication

Tasneem Alfalah, Glasgow Caledonian University (UK); Elizabeth Williamson, Ph.D., Glasgow School for Business and Society, Dept. of Management, Glasgow Caledonian University (UK); and Susan Ogden, Ph.D., Glasgow School for Business and Society, Dept. of Management, Glasgow Caledonian University (UK)

The purpose of this study is to develop a conceptual model that integrates the SERVQUAL Gap model and QFD which would, through identification of attractive attributes, highlight the weakness to overcome and innovative services to implement in the future by the telecommunications industry in Jordan. This industry is vital to Jordanian economy and has become highly developed in recent years.

The first stage involved designing, administering and analyzing the SERVQUAL framework questionnaire. The study population comprises all Jordanian mobile telecommunication companies (Zain, Orange, and Umniah) located in Amman, the capital of Jordan. There is a gap between expectations and experience in all service quality dimensions. The QFD Model will be used to close these gaps.

Keywords: service quality, Quality Function Deployment, customer satisfaction

Transportation 2012

Going to the Gemba: Number Two with a Bullet

Jack B. ReVelle, Ph.D., ReVelle Solutions, LLC (USA)
A case study of China's high-speed rail, this paper will report the 'gemba' study to capture the VOC for the second generation bullet trains being developed by Tangshan Railway Vehicle Company and the Chinese Ministry of Railways. QFD was selected as a way to address the design deficiencies (such as quality and safety) manifested in their first generation bullet trains. The symposium presentation will include the unique gemba story in a country where the central government believes it represents the VOC, analytic methods such as thematic content analysis, MS Excel® sorting, affinity and Pareto analysis as well as the continuing challenge of overcoming the culturally ingrained belief that the government speaks for everyone.

Keywords: bullet train, gemba, high-speed rail (HSR), master HOQ, ministry of railways (MoR), neighborhood of quality (NOQ), Peoples' Republic of China (PRC), QFD Capture, T-solution (TS), Tangshan Railway Vehicle Company, thematic content analysis (TCA), statement of work (SOW), MS Excel® sorting

2012 Skills Building Exercise:

Hoshin Kanri (Strategic Policy Management) mini workshop

Instructor: Glenn Mazur, QFD Red Belt®, QFD Institute (USA)

Hoshin Kanri is a systematic quality approach to planning, executing, auditing, and managing corporate vision and business strategy. It is a company-wide strategic management system that uses common QFD tools to visually indicate the relationships between executive-level targets and the means to achieve them, and those of direct reports. In this mini workshop using Blitz Hoshin approach, attendees are introduced to the basic concept and application of how Hoshin Kanri works through an easy-to-follow example and hands-on exercise. The 2012 Transactions volume contains the slides from this session.

2011: The 23rd Symposium on QFD

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Medical Device 2011

The QFD Process at Medtronic — Creating the Next Generation of Insulin Pumps and Sensors

Carey Hepler, QFD Black Belt® and 2010 recipient of Akao Prize, Medtronic; Cary Talbot, QFD Black Belt®, Senior Marketing Product Planner, Medtronic, USA

Changes in technology and customer expectations are creating many new opportunities for medical device organizations. As the oldest and most respected diabetic medical device organization in the world, Medtronic MiniMed strives to stay ahead of the competition by quickly responding to these changes with new and improved insulin pumps and continuous glucose monitoring products. Recently, we have begun using QFD to discover the unspoken customer needs for targeted portions of our population. QFD has allowed us to convert their needs into new products, services, and features to delight and attract new customers as well as retain current customers. This paper will describe some of the new opportunities we are facing, and show step by step how we are addressing them by understanding the Voice of the Customer and innovating and implementing exciting solutions.

Keywords: Voice of the customer, QFD, cross-functional teams, design, prioritization, AHP, segments, medical device QFD

IT Architecture / IT Service Management 2011

Applying QFD Process, Tools and Techniques for Service Management: Business and IT Service Management (BSM & ITSM)

Rajesh Radhakrishnan, Senior Managing Consultant & IT Architect, IBM, USA

Quality Function Deployment and the House of Quality (HoQ) are tools that have relevance for field of IT management, particularly architecture management (including requirements management) and IT service management (including service quality management). This paper provides a detailed method to use QFD and HoQ in the 1) Requirements Management Process; 2) Architecture Development Management Process; as well as 3) Service Management Processes such as: Availability Management, Continuity Management, and Incident Management, among others.

This paper focuses on the use of QFD and HoQ and their applications for enterprise architecture domains and IT service management domains. Specific examples of applications of QFD for IT enabled business services (such as CRM services) and IT services (such as messaging services) will be discussed.

Keywords: Service Management, Six Sigma, QFD, Architecture Management, Requirements Management

Design for Six Sigma (DFSS) 2011

Using QFD to Organize Design for Six Sigma

Benson Tendler, VP, First Solar (formerly VP Quality at Research In Motion, Canada); Gregory Watson, Business

Excellence Solutions, Ltd., Finland; and Camille DeYong, Associate Professor, Oklahoma State University, USA DFSS tools require organization using Product Line Management methods. QFD provides a means to sequentially develop market features into engineering functions that are specified by quantitative requirements which are testable. Understanding the Voice of the Customer and using the Kano Model to characterize engineering functions that are integrated with QFD can help to provide creative insights. This paper illustrates how to develop and deploy this approach to DFSS using QFD as an organization method and using the Kano Model to focus on the transition of market features into engineering functions.

Keywords: Design for Six Sigma (DFSS), Kano model, Voice of the customer (VoC)

Healthcare Service Development 2011

Using QFD to Design a Multi-Disciplinary Clinic

Jim Grimm, Quality Coordinator, Center of Clinical Effectiveness, Children's Mercy Hospital; Deb Denavs, consultant/ instructor, Johnson County Community College; Glenn Mazur, QFD Red Belt® and recipient of 1998 Akao Prize® for Excellence, QFD Institute, USA Pediatric patients and families have become discriminating shoppers for healthcare. Hospitals must improve quality and attract and retain patients. This paper proposes Quality Function Deployment (QFD) as a way to ensure focus on the vital few requirements, creating a structured planning and decision making methodology for capturing and translating stakeholder requirements into useful clinic language for the building of the Virtual Clinic. The QFD tools used include Customer Segments Table, Customer Process Model, Customer Voice Table, Gemba Visit Table, Customer Needs Hierarchy Diagram, Analytical Hierarchy Process, Customer Needs Hierarchy Diagram With AHP Priorities.

Keywords: AHP, Multi-Disciplinary Clinic, Patient and Family Centered Care, Virtual Clinic, VOB, VOC

Corporate Governance / Policy Development 2011

QFD Applications for the Board of Directors

Gregory H. Watson, chairman, International Academy for Quality; Glenn H. Mazur, QFD Red Belt® and recipient of 1998 Akao Prize® for Excellence, QFD Institute, USA; Yoji Akao, Ph.D., Yamagata University, Japan QFD is not just a methodology that is useful for engineering or marketing — it is also helpful for organizing the design and development of policy by the Board of Directors. The International Academy for Quality (IAQ) has been developing the concept of "governance quality" over the past 15 years. Recently, IAQ has published an assessment methodology for Boards of Directors to apply in assessing their level of maturity in application of quality in the practices of their activities. This paper and presentation will extend this work by developing infrastructure for the leadership initiatives of a Board in the encouragement of continuous improvement of the organization from their level of executive oversight. The methodology for developing a strategic approach to quality definition and deployment will be the "Voice of the Customer" as developed using QFD.

Keywords: Corporate Governance, QFD for Boards of Directors, policy development

Systems Engineering / Complex Systems 2011

Systems Engineering (SE) and Quality Function Deployment (QFD): A SE Perspective on Opportunities for Complementary Application in the Development of Complex Systems

Michael W. Grenn, PhD Candidate, The George Washington University (Deputy Director, DTSA); Shahram Sarkani, Ph.D., P.E., Professor of Engineering Management and Systems Engineering, The George Washington University; Thomas Mazzuchi, D.Sc., Professor of Operations Research, The George Washington University, USA

Basic principles of SE are described with emphasis on the SE process and the challenges associated with development of highly complex systems. SE and QFD are top-down, structured, disciplined and tailorable problem-solving processes for identifying customer-focused system solutions, and both processes typically start with an effort to fully understand customer needs. SE can be generally characterized as a functional architecture-based analysis approach to embed quality requirements into the system, and QFD can be generally characterized as a physical architecture-based analysis approach to embed quality functions into business processes. The different perspectives offer potential for complementary application to improve complex system development. Opportunities for complementary application of SE and QFD in the areas of problem understanding, requirements engineering, quality management, cross-functional teamwork, communication, risk management, value engineering, verification and validation, and integrated life-cycle engineering are summarized. The relationship between SE and QFD is illustrated in some cases using figures and diagrams generally accepted to represent best practices. A generalized method for estimation of system complexity early in SE and QFD process is described and a research framework for retrospective analysis of Department of Defense (DoD) Major Defense Acquisition Programs (MDAPs) and commercial engineering projects is discussed. Hypotheses of the relationship between system complexity, design effort, design review, requirements stability, and program success are suggested to gain further insight into the correlation between SE and QFD (comprehensive, 4-phase model, SE+QFD) design effort and successful development of complex systems.

Keywords: systems engineering (SE); quality function deployment (QFD); complex systems; major defense acquisition program (MDAP); customer needs; requirements; risk; lifecycle; design effort; design review; requirements stability; project success; complexity estimation

Dynamic Capability and Kano Model 2011

Applying Dynamic Capability Theory to Understand the Kano Model for Attractive Quality

Ali Masoudi, PostTech, South Korea; Gregory H. Watson, Chairman, IAQ; Camille De Yong, Assistant Professor, Oklahoma State University, USA; Benson Tandler, VP, First Solar / RIM (ret.), USA

The concept of Dynamic Capability was proposed by David J. Teece as a means to explain certain phenomena regarding innovation in new product development. The Theory of Attractive Quality developed by Noriaki Kano explains the relationship between functional design capability and customer satisfaction for three functional quality conditions. This paper links these two concepts. A proposed scalar relationship between the Kano functions will be proposed based on the degree of capability or incapability based on the Teece concept of Dynamic capability as a means to better explain the erosion of quality functions over time.

Keywords: Dynamic Capability, Kano model, functional quality, customer satisfaction

2010: The 16th International & 22st N. American Symposium on QFD

(ISBN 1-889477-22-2)

Chemical Industry 2010

The Process of New Product Development to Assure Customer Satisfaction and Create New Business Opportunity in Chemical Industry

Paweena Lertchanyakul, SCG Chemicals Co., Ltd., THAILAND; Kritaya Suparnongs, Corporate Total Quality Promotion Center, The Siam Cement PLC, THAILAND

This paper reports a QFD application in the chemical industry, specifically how QFD helps understanding of latent customer needs and incorporating them in the company's new product development and quality assurance process, leading to better customer satisfaction and business growth for both the company and their customers and creation of new market opportunities. A House of Quality matrix (HoQ), Design of Experiment (DOE), Process Failure Mode and Effect Analysis (PFMEA), Hazard Analysis (PHA), and Quality Assurance process charts were used, as well as product design review (DR) techniques for assuring product safety and liability from the initial development process.

Keywords: Solid Surface, QFD, Design of Experiment (DOE), Product Hazard Analysis (PHA), Process Failure Mode, and Effect Analysis (PFMEA)

Consumer Products 2010

KEYNOTE: A Case Study on the Development of a Folding Bicycle

Yoji Akao, Ph.D., Yamagata University Graduate School, JAPAN

An overview of QFD will be presented by a founder of QFD. QFD's intrinsic framework for the Knowledge Management and basic steps of QFD are shown through a student project for developing a folding bicycle.

Keywords: Quality Function Deployment (QFD), Comprehensive QFD, Knowledge Management
Keywords: Quality Function Deployment (QFD), Comprehensive QFD, Knowledge Management

Education 2010

QFD-based Curriculum Development Model for Industrial Training

Catherine Y. P. Chan, Ph.D., QFD Black Belt®, Hong Kong QFD Association, Hong Kong, PRC; Glenn H. Mazur, QFD Red Belt®, QFD Institute, USA and ICQFD

The basic principles of QFD were adopted to develop an industrial training curriculum model for service-oriented manufacturing industries in Hong Kong. Recognizing the importance of dually meeting job performance requirements and knowledge needs of the incumbents, the model is characterized by the performance-focused as well as learning-oriented approaches, based on the Voice of Customers from both employers and individuals, as well as the dynamics of trainers who make use of their subject-matter expertise to suggest the kinds of industrial knowledge for meeting the defined performance needs vs. course developers who make use of his/her professional knowledge to synthesis the derived subjects into an effective and coherent curriculum. Affinity Diagram, VOC

Table, and AHP were used as the tools for assisting the operation of the model.

Keywords: QFD, Curriculum Development, Industrial Training, Vocational Training

Development of Educational Structure for Business Students in Quantitative Methods Area

Aysun Kapucugil Ikiz, Ph.D., QFD Green Belt®; Guzin Ozdagoglu, Ph.D.; Sabri Erdem, Ph.D.; and Ferkan Kaplanseren, Ph.D. of Dokuz Eylul University, TURKEY

This paper addresses how to align the educational structures of the business school program at Dokuz Eylul University in Turkey with the Bologna Process, an European higher education reform through international cooperation and academic exchange. To facilitate mobility of academic talents and offer broader access to high-quality higher education as aimed by this initiative, it is essential to have a systematic methodology to figure out the knowledge, skills, and competency requirements with respect to stakeholders' requirements and transform them into the commonly accepted professional and learning outcomes. The insights from this study can help other universities see how to perceive their stakeholders' requirements and deploy them into their curriculum by expanding the scope to the other areas in all disciplines.

Keywords: Bologna Process, European Higher Education Area, QFD, Curriculum Development, Business Administration, Quantitative Methods

Curriculum Planning for Education in Enterprise Resource Planning Systems

Lars Oliver Mautsch, Georg Herzwurm, Ph.D., Benedikt Krams, and Sixten Schockert of Universität Stuttgart, GERMANY

Enterprise Resource Planning (ERP) is nowadays dominated by the major software producers and tends to be product-driven and solution-oriented. This research presents an approach for planning a more customer-oriented education in ERP software through the use of QFD techniques and by focusing on the most valuable modules within an education. Matrix consistency rules are applied so as to ensure identified customer requirements are met by the service offering of the university and to avoid wasting of scarce resources. A House of Quality (HoQ) matrix and pair-wise comparison are among the methods that will be shown.

Keywords: Enterprise Resource Planning, Education, Curriculum Planning, QFD

Government 2010

An Application of ANP together with Conjoint Analysis to Political Decision Making in Local Government

Yasushi Kasai, Yamanashi Prefectural Office/University of Yamanashi, JAPAN; Masanobu Yoshikawa, Yoshimichi Watanabe, and Hisakazu Shindo, Ph.D. of University of Yamanashi, JAPAN

This paper proposes an application of Analytic Network Process (ANP) and Conjoint Analysis (CA) in a local government decision-making process concerning the use of public land for establishment of a community IT activity center, in an attempt to make policy making and executing in this Japanese prefectural government more transparent and improve accountability of political decisions, to better serve its diverse constituents.

Keywords: Municipal Policy Making, Analytic Network Process (ANP), Conjoint Analysis (CA)

Healthcare 2010

DREAM/QFD to Re-design Staff Service Excellence at Rutland Regional Hospital Systems

Darren Childs, QFD Green Belt; Melissa Bartlett, QFD Green Belt®; and Shannon Stover, QFD Green Belt® of Rutland Regional Health Systems, USA; Dom Serino, QFD Gold Belt®, Rutland Health Foundation, USA; Glenn Mazur, QFD Red Belt®, Japan Business Consultants, QFD Institute, USA / ICQFD

As a regional medical facility, the goal of Rutland Regional Health Systems is to develop standardized processes and clear expectations for how they serve their customers. Through working to apply quality thinking, the hospital team has identified the non-clinical areas needing improvements such as the way they deliver care to the patients, staff behaviors, words, body languages and different team coordination. This presentation will share an on-going project that demonstrates this hospital's commitment to understanding what is important to their patients and bringing fresh improvements in the delivery of patient care and the mind-set of healthcare professionals through the use of QFD (Quality Function Deployment) and DREAM (Design/Redesign Effectiveness Assurance Method).

Keywords: Quality Function Deployment (QFD), Analytic Hierarchy Process (AHP), Service Excellence, Healthcare, Voice of the Customer (VOC), Design/Redesign Effectiveness Assurance Method (DREAM)

QFD to Re-design New Physician Orientation and Induction: Connecting New Physicians into a Healthcare Community

Jill Jesso-White, QFD Green Belt®, Rutland Regional Medical Center, USA; Glenn H. Mazur, QFD Red Belt®, QFD Institute, USA and ICQFD

The physician induction process is an interactive process beginning from the recruitment of a physician and continuing over the first year to help him/her as well as the doctor's family adjust to both the medical and broader community environment. Its success is crucial to physician retention and development of a happy work force that can ultimately affect better patient care. This project shares our ongoing efforts to build a better process of orienting and inducing new physicians in our hospital and community, by using Modern QFD tools and Voice of the new physician feedback.

Keywords: Quality Function Deployment (QFD), Analytic Hierarchy Process (AHP), physician orientation, healthcare, Voice of the Customer (VOC), Design/Redesign Effectiveness Assurance Method (DREAM)

IT 2010

Complex IT Systems Design Using Both Traditional QFD and Blitz QFD®

Kim Stansfield, Ph.D., QFD Black Belt®, CSC Computer Sciences Ltd., UK; Jeff Cole, Six Sigma Black Belt, CSC Computer Sciences Ltd., UK; Glenn H Mazur, QFD Red Belt®, Japan Business Consultants Ltd., QFD Institute, USA and ICQFD

This paper shows the benefits of traditional and Modern QFD approaches applied to align design complex IT Systems to meet customers' priority business needs. The uniqueness of this paper is the comparative study of Traditional QFD vs. Modern QFD - a rare opportunity in real business applications - in Complex IT System design and the revelation that how the associated prioritization and value analysis techniques in the latter bring alignment with business drivers - a key issue for IT Systems design today. First, it discusses Traditional QFD supported by other Six Sigma Methods, namely Boundary Analysis, Supplier, Input, Process, Output, Customer (SIPOC) and Critical To Quality Characteristic Analysis, and Prioritization using Pair-wise Comparison. It then demonstrates how inclusion of Blitz QFD® methods brings a level of clarity to customer and stakeholder value for the Business Solution and Business Architecture on which IT Systems are developed.

Keywords: Blitz QFD®, Traditional QFD, IT Systems, Design

Value-based Pricing as Origin for New and Further Development of IT-Products - Usage of Quality Function Deployment and Target Costing for Customer-oriented Pricing

Georg Herzwurm, Ph.D. and Sixten Schockert, Universität Stuttgart / QFD Institut Deutschland e. V., GERMANY; Benedikt Krams and Lars Oliver Mautsch, QFD Institut Deutschland e. V., GERMANY

By applying QFD and Target Costing approaches, we can use derived pricing strategies and thereby achieve cost reduction in the customer-oriented, value-based pricing of IT-products. This paper considers not only established IT products but also software as a service, business and delivery model where software is distributed via the Internet without the need of installation on a client. Setting prices, therefore, is very challenging. For new development of IT products, this presentation will show an approach of combined usage of QFD and Target Costing to monitor the ex-post of IT development projects. For further development of IT products, the approach can be used to derive pricing strategies to be communicated into the market.

Keywords: QFD, Target Costing, Software Development of IT Products (SaaS), Value-based Pricing, Pricing Strategies

Taming IT Infrastructure Library (ITIL) with QFD

Wolfram Pietsch, Ph.D., Aachen University of Applied Sciences, GERMANY

Professionalization of IT Services gained increasing attention in business and academia supported by the emergence of the process-oriented ITIL, a de-facto international standard for IT Service Management. The current version of ITIL comprises of total 1343 pages. An extensive employment of such a complex framework may lead to over-regulation. ITIL currently specifies only 'Whats'; it must detail the 'how' if it is to be implemented in business environment, but this would increase complexity. This issue has been addressed within a large telecommunication enterprise, solved with a complex QFD deployment, and validated within a pilot project. This presentation will show the specific toolset and tailoring process geared to IT service management.

Keywords: IT Infrastructure Library (ITIL), Stakeholder Analysis, Audit, Pareto, Portfolio

Enhancement of QFD Tool "T2T" and Its Application for Sightseeing Contents

Bao Tuoya, Zheng GenZhao, Masanobu Yoshikawa, Yoshimichi Watanabe, and Hisakazu Shindo, Ph.D., University of Yamanashi, JAPAN

This paper reports the functional enhancement of T2T, a QFD tool that was developed by the authors at Yamanashi University in Japan to simplify the construction of the Japanese Quality Chart, using the quantification method called QM3. The presentation will discuss the enhancement, challenges, and an example of its application in an online sightseeing information project.

Keywords: QFD tool, Quantification method, Two-way tables, Sightseeing contents

Logistics 2010

A Holistic Model for Structuring requirements Considering the Degree of Requirements' Fulfillment and Its Implementation for Data Processing

Priv. Doz. Dr.-Ing. Robert Refflinghaus, Prof. Dr.-Ing. Horst-Artur Crostack, and Dipl.-Kff. Sandra Klute of Dortmund University of Technology, GERMANY

When planning and developing intra-logistical facilities, many stakeholder requirements with different weightings have to be considered in the early stages of QFD. This paper presents a holistic multidimensional structuring model including feedback. Using an example of a roll conveyer, an appropriate structure for a productive transfer into QFD is presented, along with an overview of the developed model and its dimensions, including the requirements concerning surroundings, information, reference object, the weighted level of performance and customer satisfaction.

Keywords: Requirements, Stakeholder, Multi-dimensional Model

Computer-aided Method for Automatic Identification of Effect Relations between Requirements on an Intra-logistics Facility

Dipl.-Ing. Constanze Kolbe, Dr.-Ing. Horst-Artur Crostack, and Priv. Doz. Dr.-Ing. Robert Refflinghaus of Dortmund University of Technology, GERMANY

While planning an intra-logistics facility, a huge number of requirements from several stakeholders are emitted. Effect relations are occurring among requirements, according to technical correlation and trade-offs between stakeholders. This study will present a new computer-aided method which enables an automatic cognition of requirement relations and evaluation based on their negative or positive effects. The method has been implemented as a software system for establishing technical-functional requirement category.

Keywords: Requirement, Requirement Relation, Intra-logistics Facility, Quality Function Deployment

Marketing 2010

QFD for planning the Marketing Mix

Dipl.-Wirt.-Inf. Sixten Schockert and Georg Herzwurm, Ph.D., Universität Stuttgart / QFD Institut Deutschland e. V., GERMANY; Benedikt Krams and Lars Oliver, QFD Institut Deutschland e. V., GERMANY; Wolfram Pietsch, Ph.D., Aachen University of Applied Sciences / QFD Institut Deutschland e. V., GERMANY

This paper presents an application of QFD in marketing and product planning. It shows QFD as a tool for product managers for mediating between product development and marketing interests, especially with focus on planning the marketing communication activities. Two case studies are shown to illustrate QFD's capability to mediate / integrate product management and the mutual benefit of QFD use in marketing. Tools used in these examples include message-means-matrix and IT product compass.

Keywords: Product Management, Marketing Mix, IT, Case Studies

The Customer's Way: Know what to do because you know why you do it

David Mitchell, Eaton Corporation, USA; Daniel Walker, River's End Consulting, USA

Eaton, a global technology leader in electrical and industrial systems for aerospace, hydraulics, and vehicles, uses a phase gated product development cycle. During the initial deployment, the project team had experienced a gap in the ability to systematically identify essential customer wants and needs and to convert those into product requirements. This paper describes how they were able to gain clear directions by developing survey questions for each stakeholder that resulted in excellent feeder stock information for QFD House-1.

Keywords: Customer Wants and Needs, Quality Function Deployment, Voice of the Customer, Question Guides, Affinitization, Survey, House of Quality

An Efficient Customer Group Selection for Quality Function Deployment

Ali Ahmady, Wichita State University, USA; Don Malzahn, Ph.D., Wichita State University, USA; S. Hossein Cheraghi, Ph.D., Western New England College, USA

This paper proposes a Rough Set-based approach to efficiently identify the consistent user classes whose perceptions on functional and non-functional requirements of a product play an important role in effective product design. Rough Set is a powerful mathematical approach which can identify redundant data and is effective in handling non-linear and non normal data commonly used in human evaluations such as QFD. This approach is helpful for companies that rely on traditional market segmentation to initiate and implement QFD projects, as it provides a mean to redefine primary customer groupings whose perceived satisfaction lead to purchasing decisions. A case study of website design is used to illustrate the approach.

Keywords: QFD, Rough Set, Customer Segmentation, Market Segmentation, Customer Groupings

QFD Implementation 2010

KEYNOTE: Integrating QFD into Phase-Gates Product Design

Glenn H. Mazur, QFD Red Belt®, QFD Institute, USA & International Council for QFD

Quality approaches to new product development as a pipeline for commercialization has been growing in recent years. Methods such as Stage-Gate®, Design for Six Sigma, Design for Lean Sigma, and others have been helping organizations structure their techniques. QFD has been recognized by all these methods as an important tool set within the process, but exactly what QFD tools to use and when to use them must be determined on a case-by-case basis by custom-tailoring the QFD process to the organization and the development process being used. This paper shows how to expertly integrate QFD into different processes and different companies, through similarities and differences in each. The discussion will include the characteristics of Stage-Gate®, Design for Six Sigma (DFSS), Design for Lean Sigma, and how to truly benefit from these and other New Product Development (NPD) techniques by efficiently and correctly integrating QFD through customization into your unique NPD process and business strategy.

Keywords: Stage-Gate®, Design for Six Sigma (DFSS), Design for Lean Sigma, Integration of QFD (Quality Function Deployment), QFD Customization, New Product Development (NPD), Quality Methods

Efficient Way to Advance Policy Management Using QFD

Koji Tanaka, Kanjie Associates Inc., Knowledge Management Society of Japan, JAPAN

The management system for achieving fiscal year targets is called policy management. It is employed by many Japanese companies and relies on daily management of improvement activities by managers and workers. This paper reports the use of business function development in the policy management system to make the job functions visible for more efficient and effective targets setting.

Keywords: Job Function Deployment, Policy Management, Control Item

The Fusion of QFD and Next Generation PLM including Systems Engineering

Tadao Nakamura, Competency Center Division, Dassault Systemes K.K., JAPAN

This paper introduces the integration of QFD and the latest Product Lifecycle Management (PLM) tools in Japan, including Systems Engineering. The most important element in successful product development is the human activities that cannot be done automatically by software. QFD plays an important role in offering the means for multi-discipline

workers to relate to a development project in analyzing the requirements and organizing defined information that are important for the course of PLM.

Keywords: QFD, PLM (Product Lifecycle Management), Systems Engineering, CAD, PDM (Product Data Management), CAE, MBE (Model-based Engineering), Requirement Management, VR (Virtual Reality)

QFD for the Company's Sustainable Growth – A trial of the new QFD training in Japan

Kazushi Nagai, Tamagawa University, JAPAN; Tadashi Ohfuji, Tamagawa University, JAPAN; Masamitsu Kiuchi, Ph.D., Josai University, JAPAN

In 2007, the authors presented a concept named e7-QFD (evolution 7-QFD) for uniting QFD with other statistical methods such as design of experiments, Taguchi method, etc. that called for construction of Quality Management System centered around a Japanese Quality Table (an initiative they named Sus-QFD). This was driven by the authors' research on helping Japanese companies apply QFD more smoothly. This paper discusses the progress with a case study example from the current House of Quality-based QFD training by Japan's trade group JUSE and the authors which this research aims to improve by using customer complaints as the source data.

Keywords: evolution7-QFD, Sustainable growth QFD, QFD training

A Critical Analysis of QFD Application in Brazil after 20 Years of Its Application

Paulo A. Cauchick Miguel, Ph.D., Universidade Federal de Santa Catarina, BRAZIL

This paper will discuss QFD applications by the academics and industry practitioners in a developing country. It offers a critical analysis of the types of matrices, scales, Voice of Customer and other tools that are often used in QFD applications in Brazil and the future opportunities for improvement.

Keywords: Brazil, QFD application, voice of customer, matrices, scales

QFD for Effective Business Process Design (II)

Hideaki Haraga, Innovation Advancement Center, Konica Minolta Technology Center, Inc., JAPAN

In 2008, the author reported the knowledge workers' method of designing a business process by relating job-assurance elements that progressed from a high-ranking target to job functions. The method, however, had a weakness that required deployment of objectives into individual job assurance items, resulting in a big matrix. This paper reports improvements where assurance items of each job are extracted precisely and efficiently, leading to not only quality assurance but also a method of revamping internal operations such as planning, design, and prototyping.

Keywords: Job Function, Assurance Items, Job Function Deployment, Business Process Design

Reliability 2010

Visualization of Attainment Levels of Design

Hiroyuki Okamoto, Engineering Process Innovation Planning Center, Ricoh Company, Ltd., JAPAN

This paper reports a trial to make visible the levels of design attainment in the design phase. A QFD matrix, wisdom, and information about past failures and so forth were used to identify content omissions in verification, so as to prevent design imperfection from resulting. The degree of risk from a quality loss originating from imperfect design was evaluated and used to guide the manager's decision.

Keywords: Attainment Levels, Risk, Visualization, QFD, Excel Application

Service 2010

Prevention of Recurrence and Preventive Measures of Service Quality Problem

Noriharu Kaneko, Service Quality Management Ltd. and CBM Co., Ltd., JAPAN

What is recurrence prevention and how to grasp the facts concerning service quality failures and how to devise countermeasures, how to prepare Standard Operating Procedures as the preventive measure against service quality failures? These are explained through actual cases and the relation to the QFD concept.

Keywords: Recurrence Prevention, Preventive Measures, Service Quality Problems, Failure Mode Analysis, SOP, Visual Manual, Principles of Handling Claims, QA in Service Sectors

Strategy 2010

Developing a Church Growth Strategy through QFD, AHP, and Balanced Scorecard Strategy Mapping

Chad M. Johnson, QFD Black Belt®, Six Sigma Master Black Belt, TRW Automotive - Braking Division, USA

In order to flourish, today's church must be extremely focused with both its mission and prioritized objectives, and also capable of adjusting quickly as this landscape changes, just as in any business and organization. As such, it is important to have a repeatable process to develop, implement, and maintain an effective long-range plan. In the case of a church or any community activist group or non-profit organization for that matter, such a planning process is an exercise typically accomplished by an ever-changing mix of volunteers who must make sense of a vast, diverse, and sometimes precarious Voice of Customer landscape. This case study shares a Michigan church's application of Modern QFD tools, Analytic Hierarchy Process (AHP), and Balanced Scorecard® approaches to derive the customer needs from church Gemba feedback and Customer Voice Table (CVT). The needs were then "affinitize" and made into a hierarchy diagram where AHP was applied to determine relative priorities with respect to the highest level objective of achieving sustainable church growth.

Keywords: Quality Function Deployment (QFD), Analytic Hierarchy Process (AHP), Service Excellence, Healthcare, Voice of the Customer (VOC), Design/Redesign Effectiveness Assurance

2009: The 21st Symposium on QFD (ISBN 1-889477-21-4)

Cost-cutting QFD Applications 2009

Cost-cutting QFD: How to Reduce Non-value Added Costs in Goods and Services

Harold Ross, QFD Green Belt®, QFD Institute; Glenn Mazur, QFD Red Belt®, QFD Institute, USA.

Since the 1960s, QFD has been used by companies around the world and in numerous industries to add quality, value, and customer satisfaction during the design and development of new products and services. Through a linked series of analytic tools, the Voice of the Customer can be deployed into design, build, and delivery specifications and identify the critical tasks to achieve them. Though most QFD studies focus on improving customer satisfaction by increasing the functionality or performance of the product, in these difficult economic times, "low cost" and "price" have become important elements in purchasing decisions. Price being

defined as cost plus profit, traditional cost cutting approaches include value engineering to reduce design cost or lean activities to reduce manufacturing waste. QFD can offer an additional approach that enables companies to remove functions and performance that add little value to customers, bringing features in line with the benefits they give the customer — as defined by the customer. This paper re-visits Cost Deployment, which was integrated by Dr. Akao in late 1970s but has never gained much traction outside Japan, as well as reviews additional tools that companies can use for Cost-Cutting based on Reverse-QFD, Value Engineering, and others methods.

Consumer Branding & Marketing 2009

Why We Drink Beer: Using QFD, Kansei, and AHP to Understand How Consumers Identify with Brands

Theera Vongpatanasin, QFD Black Belt®, Managing Director, Boonrawd Trading International Co., Ltd., Thailand; Glenn Mazur, QFD Red Belt®, QFD Institute / Japan Business Consultants, Ltd., USA.

There are numerous approaches for understanding consumer motivation and insight. This paper explores the application of new product development methods such as Quality Function Deployment, Kansei Engineering, and Analytic Hierarchy Process to assist sales and marketing groups to better understand how customers feel about the products they buy. QFD is a Japanese created approach to translating the voice of the customer into product functional requirements, kansei is a Japanese created approach to identify product sensory attributes that affect consumer emotions and image, and the AHP is an American created method to determine priorities based on human decision making modes. The authors have applied these techniques to learn about how the image that Thailand's premier beer, Singha, is perceived by consumers in the U.K. to apply the findings for future marketing and branding campaigns.

Food Industry / Process Industry 2009

The Use of QFD to Develop a New Food Offering with a Cross-functional Team from Consumer Behavior to Formulation and Production

Glenn Mazur, QFD Red Belt®, Japan Business Consultants, Ltd., QFD Institute, USA.

This paper reports an application case study by a food products company using QFD's consumer-centric processes to enhance its existing product development process to develop a new food offering. While the service aspects of this offering have been previously published, this paper focuses on the food product itself, and how QFD for a transforming chemical process (mixing and baking) differs from that of an assembled product or human process. Traditional tools such as the House of Quality (HOQ) as well as some of the tools of Modern QFD were integrated in this study as well. This paper discusses, with examples, several of the steps necessary to focus the project and delivery channel, identify customers and their needs and preferences, and then work step-by-step through the process of the food product end characteristics, intermediate batch characteristics, ingredients and process parameters, and key manufacturing and final production quality control points. Sales impact is also discussed.

Gemba Study / Multi-national Corporations 2009

Globalizing Gemba Visits for Multinationals

Nicklas Bylund, Ph.D., QFD Black Belt®, Sandvik Coromant, Sweden; Glenn Mazur, QFD Red Belt®, Japan Business Consultants, Ltd., QFD Institute, USA.

There are approaches to improving a company's new product development process by improving bits and pieces, but a more thorough impact is accomplished with a chain of well integrated methods in an educational package including certified skill levels.

QFD is used by companies to better understand the spoken and unspoken customer needs and their priority, and then translate them into product requirements, assuring quality throughout the design, manufacturing, and after-sales phases. The traditional QFD tool set focuses on time consuming matrices, called 'houses,' but in today's lean businesses, the resources available to do this depth of analysis are reduced. Furthermore the matrices have often overshadowed the true soul of QFD, i.e. drive customer needs through the whole process. More efficient methods have been introduced by the QFD Institute under the guidance of Dr. Yoji Akao, the founder of QFD. For a manufacturer with a worldwide presence, especially, translating the Voice of the Customer was found to take on cultural in addition to linguistic imperatives. Sandvik Coromant is a leading manufacturer of metal cutting solutions with worldwide presence, with a long history of innovative products. The company has put forward a goal to reduce by half the time from identifying customer needs to achieving peak sales. This paper will focus on the going to the customer's Gemba (or machine shop in our case), one of the methods in modern Blitz QFD® methods and discuss the differences of applying Gemba in different countries and cultures where Sandvik Coromant is active.

Industrial Product Development / Training 2009

Thinking Outside the (corrugated) Box

Michael Harrington, Director of Engineering, Alliance Machine Systems International, Inc., USA; Jack B. Reville, PhD., USA.

We've done all right in the past but need to do better going forward... How can we get new designs to the market place that hit the critical specification targets? How can we make the lives of our sales force so easy that all they need to do is sit back and take orders because our customers are coming to us rather than us trying to convince them that our products will add value to their processes? This paper shares this company's experience in the initial training and applications of QFD and House of Quality (HOQ) matrix approach on a project to design a new industrial product for the corrugated box industry. It reports chronologically on the steps that the company took to obtain training and then implement QFD, including planning Gemba visits, data translation into a Voice of the Customer Table, use of A-1 table, E-series tables based on the 4-phase QFD approach, and noun/verb function analysis. The paper finally discusses the success as well as the areas for future improvement, including an insight on how to introduce the HOQ based QFD into a small company and what pitfalls to avoid.

Research - Lean Methods 2009

Lean QFD: Evolving QFD for a Lean Six Sigma World

Richard E. Zultner, QFD Red Belt®, QFD Institute / Zultner & Company, USA

Lean Six Sigma is becoming even more popular than Six Sigma. The next step in the evolution of QFD is both to add QFD to Lean, and apply Lean to QFD. This paper explores what QFD can do for Lean, and what Lean can do for QFD. This will result in a Lean QFD well suited for Lean Six Sigma. The House of Quality matrix is used as an example, resulting in a Lean House of Quality.

Beyond Lean: Evolving into a Super Talent Factory

Yong Yin, Visiting Scholar, University of Texas at Dallas, USA; Kathryn E. Steckle, Ph.D., Ashbel Smith Professor of Operations

Management, School of Management, University of Texas at Dallas, USA; Ikou Kaku, Ph.D., Professor, Akita Prefecture University, Japan

This paper introduces a new-to-the-word, emerging manufacturing organization called "seru." *Seru* is a next-generation, lean manufacturing concept that has been taken up by some of major Japanese manufacturers in recent years but it is still largely unknown outside Japan. *Seru* is an inheritance and evolution of Toyota's lean philosophy and Sony's one-man production organization, but it is more efficient and flexible than lean when applied to industries such as electronics and auto components, bringing huge benefits. By using historic cases of many global leading companies (Ford, GM, Toyota, Sony, Canon, NEC and others), this paper provides an overview of various evolutionary processes of manufacturing organizations over the history and then it explains what the "*seru* system" is and how to create and apply it and the important future impacts of *seru* for industries.

Research2009 – Rough Set Theory and Kansei

Using Rough Set Theory to Efficiently Implement "Choice of Domain" Step in Kansei Engineering

Ali Ahmady, QFD Green Belt®, Wichita State University, USA; Don Malzahn, Wichita State University Industrial and Manufacturing Engineering Department, USA; S. Hossein Cheraghi, Western New England College School of Engineering, USA

Kansei Engineering is a customer-oriented, product development approach which maps customers' emotional values into product design. Identifying the consistent groups of customers based on their emotion is an essential part of the "choice of domain" step in Kansei engineering.

This paper presents a method to identify the most influential users' characteristics on different customers' Kansei when there are inconsistencies of preferences within groups of people in a heterogeneous market for a specific product. These users' attributes can be used as the bases for customer grouping in Kansei Engineering. This paper will introduce the proposed method and its validation through an application to website examples to identify multiple consistent sets of groups of users.

2009 Appendix: Bonus Case Studies

Consumer Encounters: Improving Idea Developments and Concept Optimization. *by Cathy Rings & Brian Barton, Home Products Division, Rubbermaid Inc.; Glenn Mazur, QFD Institute*

Kansei Engineering for Commercial Airplane Interior Architecture. *by Jeanne Guerin, Payloads Concept Center, The Boeing Company*

The Application of Quality Function Deployment (QFD) to Design a Course in Total Quality Management (TQM) at the University of Michigan College of Engineering. *by Glenn Mazur, QFD Institute*

2008: The 20th Symposium on QFD (ISBN 1-889477-20-6)

Automotive / Build-to-print Suppliers 2008

Value Based Product Development - Using QFD and AHP to Identify, Prioritize, and Align Key Customer Needs and Business Goals

Chad Johnson, QFD Green Belt®, Six Sigma Master Black Belt, TRW Automotive Braking Division World Headquarters, USA.

In order to distinguish ourselves from the competitive pack, it is becoming increasingly important to seek a deeper understanding of value-driving customer needs during the early stages of product/process development. Although automotive suppliers are often asked to be creative and lean, we still often build strictly to given specifications. We receive data in the old "build to print" paradigm but we are often required to design in a more creative and lean one. To address this dichotomy and break away from the costly design- build-test iterative loop, QFD suggests that we seek an understanding of customer's needs beyond the requirements specification and incorporate that understanding into the final product. This case-study reports how TRW Automotive has utilized QFD and augmented it with the Analytical Hierarchy Process to develop a working model for project leaders to prioritize and focus their design efforts effectively.

Defense 2008

Use of QFD & Technology Road Mapping to Develop a Mobile Data Collection System

Dr. Kim Stansfield, Programme Manager, CSC Computer Sciences Ltd., UK; Jeff Cole, Security Architect, CSC Computer Sciences Ltd., UK.

The work described in this paper considers the systems engineering procedures used to select and design a 'mobile data collection' sub-system of a larger enterprise application development project for a UK government client. A critical aspect addressed by the sub-project was to identify mobile devices that allow field operators to systematically log material found in-the-field such that all subsequent results of treatment and analysis could be linked to the item in an auditable manner. The customer required that the system integrator identify suitable devices meeting the requirements of the various customer stake-holders, and recommend the best fit, preferably a single device. The focus of this paper is to illustrate the benefits of combining QFD processes with the Technology Road Mapping (TRM) process described in the European Industrial Research Management Association (EIRMA) report, Technology Road Mapping Delivering Business Vision. The structured framework incorporating Voice of the Customer methods, QFD, TRM and Pugh Matrix allowed the supply team to rapidly identify the priority critical to quality characteristics for the system and its components, and to develop the engineering requirements from which design concepts could be developed.

Quality Function Deployment at Lockheed Martin MS2

Jorge Pica, QFD Green Belt®, Deputy Program Manager, Lockheed Martin - MS2, USA; Mark Tracy, Electrical Engineering Manager, MS2 Hi-Team Lead, Lockheed Martin - MS2, USA; George W. Chollar, PhD, PE, Statistical Design Institute, LLC, USA

Since its inception, QFD has become a comprehensive tool for keeping customer focus at the forefront of any design activity. Flexible and tailor-able, QFD has also been adopted by our government customers which utilize the method for everything from contractor selection to technology assessment. At Lockheed Martin, QFD has been deployed in multiple areas from technical kick-offs to manufacturing process validation. This presentation will show a variety of QFD implementations at Lockheed Martin MS2, including power supply design efforts as

well as several other hardware examples. Lessons learned from these QFD deployment efforts will also be summarized and reviewed. QFD techniques that integrate Parameter Diagrams, Boundary Diagrams and FMEA have now become part of mainstream QFD use. This presentation will also review how Lockheed Martin MS2 utilizes these Design for Six Sigma Tools in an integrated fashion to verify robustness and identify risks in its products and processes.

Healthcare Insurance / Financial Products 2008

Predicting Future Health Insurance Scenarios using Quality Function Deployment (QFD) and Analytic Hierarchy Process (AHP)

Carey Hepler, QFD Black Belt®, Innovation Director, Blue Cross Blue Shield of Florida, USA

Election years breed uncertainty especially when the incumbent president and vice president are not seeking office. The 2008 U.S. presidential elections have additional healthcare related urgencies due to the impending retirement of the Baby Boomers and the shifting winds of global competitiveness. While forecasting the election outcomes is beyond the scope of this paper, just as many businesses do, Blue Cross Blue Shield of Florida (BCBSF) wants to anticipate how the next administration and congress might set new healthcare policy in order to begin planning for and implementing new processes for their members, providers, and business decision makers. To achieve this, this project used a combination of QFD, AHP, and other forecasting tools to look at possible 2008 election and policy outcomes and what new opportunities might be created to service both their traditional members as well as the uninsured in the State of Florida. The identified scenarios can be used to map and prioritize different market segments, formulate key customer needs into value propositions, determine strengths and weaknesses in their current competencies and capabilities, and then initiate service quality projects to begin improving those areas where customers will need them most. Several quality methodologies have been used to design successful products.

Using QFD to Understand, Prioritize, and Develop Solutions to Address the Future Needs of Customers

Kathy Hines, QFD Black Belt®, Innovation Leader, Blue Cross Blue Shield of Florida, USA

As the United States health insurance model continues to evolve, with increasing financial responsibility falling on the consumer, the opportunities for new and different interactions with the health insurance company are sure to follow. Consumers are already very savvy when it comes to evaluating alternatives in other industries and it's only a matter of time before the health care industry is also comparatively shopped like many other commoditized products and services. BCBSF must continue to evolve to create a service experience that enables and empowers members in their decision-making efforts. This project utilized the QFD methodology to anticipate the changing needs of consumers and how service might evolve. The requirements for the project included: Understanding the future-state of the industry; Anticipating and prioritizing future member needs as a result of new industry pressures; Developing a well defined goal for the service organization; Identifying solutions that target member needs; Validating solutions from the member's perspective; Selecting the best solution(s) given benefits and constraints; and Implementing solutions that are most valuable to the member and continue to differentiate BCBSF.

QFD Research 2008

KEYNOTE: QFD in Europe: State-of-the-art and Case Studies

Georg Herzwurm, Ph.D., Universität Stuttgart, certified QFD-Architect of QFD Institut Deutschland, Germany; Dipl. Wirt.-Inf.

Sixten Schockert, Universität Stuttgart, certified QFD-Architect of QFD Institut Deutschland, Germany.

The presentation will provide an overview on the state of the art of QFD in Europe. The first part covers a general analysis of QFD applications in Europe based on a literature review with focus on contributions in quality journals and past national and international QFD symposia. The underlying assumption of this analysis is that there may exist regional distinctions in the dissemination of QFD and in the industries QFD has been applied. The second part of the talk will present selected case studies from various representative industries like the automotive, the software and the service sector. Companies involved in these QFD applications include among others the Volkswagen Group and T- Systems.

Shipping Industry 2008

Customer-driven Process Improvement in a Shipowner Company: Modern QFD Approach

Aysun Kapucugil Ikiz, QFD Green Belt®, Research Assistant, Dokuz Eylul University, Turkey; Guzin Ozdagoglu, Research Assistant, Dokuz Eylul University, Turkey

Business operations can be broken down into development phases which require multiple business functions and processes to make a new product or service a reality. Success in one customer-driven design process is not sufficient unless every other phase of the operations is analyzed from a customer expectations point of view. That way, successful process can take root within an organization. Quality Function Deployment (QFD), a known requirements analysis technique for service/product design, can be also useful for redesign or reengineering business operations and processes. The main scope of this study is to analyze the operations of a commercial shipping line company to identify improvement opportunities. This paper reports a detailed requirements model of the operation process and improvement areas based on a 'gemba' analysis of internal customers and critical incident reports by external customers.

Software / IT 2008

Getting AHEAD: Applying AHP for Software Technology Evaluations

Karen Smiley, QFD Black Belt®, Principal Consulting Software Engineer; Elizabeth Kielczewski; and Qingfeng He, ABB Corporate Research, USA

Evaluations of software technologies and components can be complicated, and are easily influenced by acknowledged or latent technology biases. The Analytic Hierarchy Process (AHP) is a natural choice for neutralizing these biases, and bringing greater objectivity to the evaluations. This paper reports on an industrial case study for software technology evaluation which complemented the Software Engineering Institute's (SEI) Attribute-Driven Design (ADD) technique by applying AHP for importance ratings and for comparing the prototype implementations. We present our Attribute Hierarchy-based Evaluation of Architectural Designs (AHEAD) methodology, our findings, and our analysis of the evaluation. This project is a pilot application of Modern QFD in the Requirements Engineering research led by a provisional QFD Black Belt®.

2008 Appendix I: Bonus Case Studies

Defining Customer Needs for Brand New Products: QFD for Unprecedented Software Development, by Richard Zultner, Zultner & Company, USA

Future Combat System Concept Development: Integrating Service and Product Requirements in QFD, by Kirk Kirkpatrick, Lockheed Martin Missiles and Fire Control; Maj. Shel Jones, US Army; Glenn Mazur, Japan Business Consultants, Ltd.

QFD to Direct Value Engineering in the Design of a Braking System, by Jim Dimsey, Hayes Brake, USA, et. al.

QFD Addresses The Role of NATO Tactical Aircraft, by Suzanne Bergman, McDonnell Douglas Corporation, USA

2008 Appendix II: Abstracts of Papers from Symposia on QFD 1989-2008

2007: The 19th Symposium on QFD (ISBN 1-889477-19-2)

Tutorials 2007

Super Pugh Concept Selection with the Analytic Hierarchy Process (AHP) by *Richard Z ultner, QFD Red Belt® and Six Sigma Master Black Belt, QFD Institute / Zultner & Company*. AHP contains two phases: prioritization of criteria, and prioritization of alternatives using those criteria (the "ratings method"). This second phase is less discussed in QFD circles, but can be used to enhance Stuart Pugh's matrices into an even more powerful approach to technology concept selection. This tutorial will introduce the basics of both AHP and Pugh Concept Selection, and present the four fundamental types of selection criteria (bigger is better, smaller is better, absolute judgment, and relative judgment), as well as hands-on practice with the cross-tabulation techniques used for enhanced "super Pugh" concept selection. An MS Excel template will be provided, so bring your laptop.

General Theory of Innovation to Design a Superior Corporate Strategy by *Greg Yezersky, President, Institute of Professional Innovators, USA*. Why is business success so random? Why can't more companies realize the power of strategy and come up with a successful one? Why can't former leaders employ a new strategy and repeat success more often? What is the connection between strategy and innovation? Is there a robust process to engineer powerful strategies on demand? How can we come up with the right strategies? If we can identify the formula for the science of innovation, we will be able to control the process and create better strategies on demand. The General Theory of Innovation (GTI) is just such a theory that can be used for gaining control over the process of innovation. GTI evolved from the Russian-born inventive problem-solving technique called TRIZ and since 1988 has gone through rigorous tests in real-world conditions with consistently successful results.

Analytic Hierarchy Process (AHP) 2007

KEYNOTE: The Analytic Hierarchy Process: How to Measure Intangibles in a Meaningful Way Side by Side with Tangibles by *Thomas L. Saaty, Ph.D., 2007 Akao Prize Recipient, University of Pittsburgh, USA*. One of the best decision-making methods available today, the Analytic Hierarchy Process (AHP) is a mathematically rigorous and yet relatively easy to use multi-criteria prioritization method that has become an integral part of Modern QFD. Dr. Thomas Saaty, Ph.D., renowned architect of AHP, discusses the fundamentals of AHP through colorful application examples ranging from estimating the cereal industry market share and dominance of various drinks in the U.S. to predicting the outcome of a world chess championship match (Karpov-Korchnoi match) and U.S. presidential elections (1980: Carter-Reagan; 1992 Perot-Bush-Clinton).

The Many Faces of AHP - How to use AHP with Different Audiences for Maximum Results by *Carey Hepler, QFD Black Belt®, Innovation Director, Blue Cross Blue Shield of Florida, USA*. Blue Cross Blue Shield of Florida (BCBSF) is the oldest and most respected health insurance organization in the State of

Florida. This paper discusses the company's use of Analytic Hierarchy Processing (AHP) in terms of audience and technology delivery, as well as the advantages and disadvantages of each of the technologies when working with our constituent groups.

AEROSPACE 2007

Development of Highly Reliable Valves for H-IIA Rocket by *K. Kojima, M. Matsuda, and K. Yoshikawa of Mitsubishi Heavy Industries; H. Nanri, K. Okita, and M. Fukuoka of Japan Aerospace Exploration Agency; Yoji Akao, Ph.D., Asahi University, Japan*. H-IIA rocket is Japanese main launch vehicle to put about four tons payloads into Geosynchronous Transfer Orbit at an altitude of some 36,000 kilometers. The rocket consists of many components including tanks, engines, valves and electric equipments. In these components the valves are very important flow-control equipment that controls rocket flight operation, including startup and shutdown of the engine, keeping the tank pressure at a desired level, feeding propellants to the engine, and controlling vehicle attitude in flight. Reliability of the valve is utmost critical to the space mission, launch schedule, and operational costs. This paper reports a joint project by Mitsubishi Heavy Industries and Japan Aerospace Exploration Agency where QFD methods were used to improve reliability of the H-IIA rocket valve design which led to the development of a new model. The presentation will show the QFD approaches, development process for this high reliability valve, and the project accomplishments.

BUSINESS PROCESS 2007

QFD for Effective Business Design by *Hideaki Haraga, Business Development Center, Konica Minolta Technology Center, Inc., Japan*. This paper introduces an example of business function deployment in which expectations and business functions are extracted from the project targets and goals by using a relational diagram. An application method is proposed as a business management tool in which progress is recorded in a matrix of business functions and expectations.

Context Sensitive Solutions (CSS) / Government Projects 2007

Context Sensitive Solutions: The Application of QFD for Developing Public Transportation Projects in the U.S. by *Theodore Hopwood II, P.E., Kentucky Transportation Center, University of Kentucky, USA; Glenn H. Mazur, QFD Red Belt®, The QFD Institute, USA*. For many years, the selection of transportation routes, design of roadway features, etc. were based mostly on engineering considerations. QFD has developed since the 1960s a powerful tool set for new product development that enables engineers to listen to the Voice of the Customer and translate the most important needs into design requirements and then assure their quality in the resulting goods and services. This paper will show how QFD tools can be adapted for Context Sensitive Solutions (CSS) and Design in road building and other large projects.

EDUCATION 2007

Application of QFD to Curriculum Planning of Vocational Education by *Catherine Y. P. Chan, QFD Green Belt®; Gail Taylor; and W. C. Ip of The Hong Kong Polytechnic University, Hong Kong*. Winner of 2007 Akao Scholarship for QFD. This paper proposes a conceptual framework for applying QFD to curriculum planning for vocational education. A study on the content planning of an in-house staff development program illustrates the application method, which can be useful to vocational education institutions in Hong Kong and elsewhere.

Application of QFD in Engineering Education: Assurance of Learning Outcomes Fulfillment by *Zbigniew Prusak, Ph.D., Central Connecticut State University, USA*. Principles of QFD used in assessment of engineering students' activities during

classroom and laboratory instruction. Twenty two types of student activities were analyzed for their contribution toward fulfillment of thirty learning outcomes. Each type of student activity was also assessed in terms of its level according to Bloom's taxonomy in senior level courses in engineering design and manufacturing processes. Design projects, concept generation, individual formal presentations and forensic studies proved to be the most universal activities, developing a wide range of professional skills.

Design of a Methodology to Elaborate Curriculo CIM of the Industrial Engineer in Spain, Based on QFD by *Isabel Melina Balderrama Durán, Institut Quimic de Sarria, Spain / Bolivia*. Developing a methodology that will allow construction of industrial engineering curriculum that teaches Computer Integrated Manufacturing (CIM) technology requires the support of methods like QFD and other tools such as Delphi, Diagrams of Affinity, Analysis of Systematization of the hierarchy, etc. This research uses QFD and Delphi methods to design a CIM curriculum, translating industry requirements into design characteristics of an online course.

INNOVATION 2007

Using QFD to Involve All Employees in the Corporate Innovation Process by *Kathy Hines, QFD Black Belt®, Innovation Leader, Blue Cross Blue Shield of Florida, USA*. With competition at an all time high, more and more companies are seeking ways to capture that next "big" idea, including Blue Cross Blue Shield of Florida (BCBSF) which currently has over 9,000 employees, each with an idea on how the company can increase membership, reduce costs, differentiate products and services from our competitors and expand our distribution channel. Random idea creations, however, can become a drag on resources and lead to disappointment among those whose ideas are not utilized. When the Voice of the Customer is used to drive idea creation and selection process, then the diversity of our internal resources can be fully harnessed.

KEYNOTE: The Quality Revolution by *Glenn Mazur, Executive Director, QFD Institute and International Council for QFD*. The 2007 Symposium in Williamsburg, Virginia serves a special reminder for what we can learn from history to build a better future. 2007 marked the 400th anniversary of Jamestown, the first permanent English settlement in America which began as a business venture to improve the lives of its citizens through new trade routes, new sources of raw materials, and new opportunities for economic advancement. The descendents of these early settlers would grow wealthy in the next 150 years and begin demanding political and economic rights equal to those of their fellow citizens still in England. Now thirteen colonies spread over a continent and Babel of different ethnicities, economies, and religions, they were able to come together in common cause to resist and eventually revolt against British control. This keynote discusses how technological advancements led to improved product quality and choice, and how this new found choice of goods inevitably led to a demand for freedom of choice in all aspects of life, the revolutionary path from industrial revolution to to consumer, lifestyle, and political revolutions. QFD is about the Voice of the Customer. Once unleashed, this voice continues to demand more and more from the marketplace and beyond. Those who supply goods, services, and ideas will see that when the customer wins, we all win.

KANO MODEL & QFD 2007

QFD Kano Model for Designing College Women's Dormitory by *Yoji Akao, Ph.D., Japan*. This paper reports using the Kano Model to find out how various functions and features of a dorm facility are being perceived differently by the student residents and their parents and how this finding can be used in the planning stage of a QFD project. Dr. Yoji Akao, Ph.D., founder of QFD, in presenting this research by his students,

discusses how you can integrate QFD and the Kano Model to create customer delights in your product and service.

LIFECYCLE 2007

Fusion of QFD and PLM by *Tadao Nakamura, Dassault Systemes K.K., Japan*. This paper introduces the fusion of QFD and PLM to aim the smooth and quick digital simulation in the concept stage of the product development. At first, PDM to manage the criteria and standard of various areas made by QFD, then, 3D-CAD simulates various matters with using the specified and quantitative information from PDM seamlessly.

Applying Quality Function Deployment to the Product Life Cycle of an Aluminum Wheel Project by *Javaid M. Cheema, VP-QA, Molex Interconnect Inc. and Muhammad I. Hussain, Sr. Mfg. Engineer, General Motors, USA*. This study was based on a project for the design, development, production, and aftermarket service management of a cast aluminum wheel program for a Japanese OEM customer. This paper reports the application of QFD to all stages of a product life cycle.

LOGISTICS 2007

Requirements for Structuring of Logistic Demands in the Run-up to QFD by *A. Crostack, Ph.D., Robert Refflinghaus, Ph.D., Nadine Schlueter, and Katharina Noll of University of Dortmund, Germany*.

In order to develop a customer-oriented logistic facility, the marketing research and developer have to work together. They must take into consideration such requirements as the whole life-cycle identified through market research, in order to achieve optimum in both facility and service. This paper reports a study, conducted by the University of Dortmund Chair of Quality, that aimed to develop a procedure for structuring, analyzing, and displaying unsystematic requirements into a QFD structure in the development of such logistic facility.

METHODS INTEGRATION 2007

Design of the Product Development Process in Cooperation with QFD, TRIZ and Taguchi Method (II) by *Hiroyuki Okamoto, RICOH Engineering Process Innovation Center, Japan; Yoshiharu Isaka, IDEA Inc., Japan; Yukio Miyamura, SANYO Electric Evolution PJ Management Gr., Japan; Masaaki Todoroki, Q-teck consulting Co., Ltd., Japan*. This paper reports the second phase of a joint research which was first reported at 2006 International Symposium in Tokyo. This paper describes an integration flow illustrating the authors' concept for fusing QFD, TRIZ, and Taguchi method by the "function" of a product, a common thread identified among the three techniques, and a hypothetical case study using this technique.

A Framework of e7-QFD as the 3rd Generation QFD in Japan by *Kazushi Nagai and Tadashi Ohfuji of Tamagawa University, Japan; Kei Inayoshi, Asahi University, Japan*. At the 11th and 12th International Symposium on QFD, the authors proposed a new framework called e7-QFD (evolution 7-QFD) which unites QFD with new quality control tools such as statistical method, strategy plan, and Taguchi method. Seven techniques had been independently treated in the proposed e7-QFD method so far. This paper will report this continuing research and explains the causal relationships of the techniques as well as systematization of e7-QFD.

QA-QFD — The making method in the Quality Table which can be Utilized by *Masaaki Todoroki, Consultant, Q-teck Consulting, Co. Ltd., Japan*. In QFD, the Quality Table is an important tool. However, misuse and misconstruction of this table are not unusual, often due to inadequate understanding of the required quality and customers. This paper and presentation

will explain how to correctly make the Japanese Quality Table and better utilize it in product development.

PROCESS INDUSTRY 2007

Multiple Progression QFD: A Case Study of Cooking Product Functionality at Arla Foods by *Thomas Lager, B&L Innovation AB (blinab), Sweden; Åsa Kjell, Project Manager Innovation, Arla Foods, Sweden*. This paper reports a project at Arla Foods, the largest dairy company in Europe. The objective was to advance knowledge of how the production process and ingredients could influence the cooking functionality of a certain dairy product and how to measure such product properties, so that this knowledge could be used in subsequent product developments/improvements. QFD methodology was used to guide and structure the information-gathering processes and to link individual sub-project information. A new lean QFD project management approach which the authors developed for process industry and tested will be discussed.

SOFTWARE / IT 2007

An Application of 'System's Near Decomposition' to Software Structure Analysis by 'T2T' Tool for QFD by *A. Amemiya; T. Kuroda; M. Yoshikawa; Y. Watanabe, Ph.D.; H. Shindo, Ph.D. of University of Yamanashi, Japan; Y. Anang, Sync-Information System Co., Japan*. Using "Object-Oriented Design" concept, a software tool for QFD can be described as a table made of "function" and "component" viewpoints in the integrated software development environment "Delphi". Authors applied the processes of nearly decomposing a system to the QFD's Quality Table by using "QM3 (Quantification Method III)" in order to decrease the complexity. As the result, the structure of the software tool became more understandable and some design problems have been identified, leading to a re-design of the software tool structure and better design.

IT Service Deployment by *Wolfram Pietsch, Ph.D., Aachen University of Applied Sciences, Germany*. If IT is reduced to a fundamental technical commodity like a power supply, its business value will degrade ('IT doesn't matter'). In order to survive the outsourcing battle, full potential IT service must shift their focus to the business requirements and needs of their customers. This paper shows how a QFD framework can be utilized in the IT business in order to develop customer-focused products and services encompassing customer requirements, performance criteria, and functions to process improvements.

QFD-based Method to Choose a Suitable CAQ-system by *Robert Refflinghaus, Ph.D., University of Dortmund, Germany*. Choosing a suitable Computer Aided Quality (CAQ) system is an important decision for an enterprise. It requires high investments in costs, time and manpower, and therefore, a sound and rational decision process is very important. To support this, we have developed a QFD-based instrument for selecting a CAQ-system. The aim of this instrument is to reduce the choice of CAQ-suppliers from about 100 to three to five.

QFD in the Development of a WIKI: A QFD-WIKI by *Georg Herzwurm, Ph.D. and Sixten Schockert of Universität Stuttgart, Germany*. A wiki is a web based software which allows all visitors of a website to change its content by editing the site online in a web browser. With this key capability a wiki is an easy to use platform for collaborative working on hypertexts. This paper is about the development of a wiki on QFD and all its aspects as the content of the website. The so called QFD-Wiki is not only on QFD, it is also developed using QFD as the product planning method.

SECURITY 2007

KEYNOTE: QFD and Knowledge Management: QFD Application on the Development of a Finger Vein Authentication Device by *Akao Yoji, Ph.D., Yamagata*

University, Japan. Founder of QFD methodology, Dr. Yoji Akao will present a case study on the development of a new finger vein authentication device using the state-of-art near-infrared light transmission technology by Hitachi Omron Terminal Solutions, Ltd. QFD and Knowledge Management were applied to understand the customer needs of a medical application. And then, this knowledge was used to develop a brand new product for the financial and security industries, enabling the company to enter the new markets successfully. The presentation will show the entire flow of the QFD project, how knowledge management fits into the process, as well as new technology deployment. The product was released into the Japanese market just last year with great success.

TELECOMMUNICATIONS 2007

Route of the Quality Model: Translating the Voice of the Customer in Process Improvement by *Edmundo Eutrópico Coelho de Souza, Telemar Norte Leste S/A, Brazil; Rosângela Maria Pereira Catunda, Pontifícia Universidade Católica, Brazil; Claudia Massena Barbara, Pontifícia Universidade Católica, Brazil*. This paper presents the Telemar Norte Leste – TNL Route of the Quality model, describing the methodology, step by step application process, and the main results achieved. The Route of the Quality is a QFD-based methodology developed to implement actions for improving customer-perceived quality. It is followed by surveys to measure the customer satisfaction and link the important indicators to the customer focus, strategic objectives of the company, regulatory frameworks, and establishment of goals that portray the reality of the company.

The Improvement of Telecom Service Quality Based on QFD by *Wei Xiong and Jun Xia, Zhejiang University School of Management, China*. This paper proposes application of QFD-based Telecom Service Quality Improvement Model (TSQIM) to Chinese telecommunication service. TSQIM analyzes service requirements of telecom customers and translates these requirements into telecom quality characteristics through use of HOQ (House of Quality); a series of HOQs can be used to design an optimization program for the network quality, to improve telecom service and increase customer satisfaction. The model has been applied to the PHS network business of Lishui Telecom Company.

2006: The 18th Symposium on QFD (ISBN 1-889477-18-4)

Education 2006

QFD-based Curriculum Planning for Vocational Education. *Catherine Y. P. Chan, QFD Green Belt®, Institute of Textiles & Clothing, The Hong Kong Polytechnic University, Hong Kong, CHINA*. Originally set up by the government in the "Golden Age" of manufacturing, the vocational education institutions in Hong Kong are struggling to adapt to the profound changes brought by today's global market. This paper shows how QFD enables a paradigm shift in vocational education to face a changing world and how Modern QFD tools and methods can be applied to college curriculum design, including the concept, system, tools and the mechanism of incorporating Modern QFD into curriculum planning, as well as a pilot study using Blitz® QFD to identify important industry-specific knowledge, a Customer Voice Table for identifying the job needs of the clothing industry, Affinity Diagram, Customer Needs Hierarchy table, and Maximum Value Table.

Insurance/Financial Products Development 2006

Finding Customer Delights Using QFD. *Carey Hepler, QFD Black Belt®*, *Integrated Market Intelligence, Blue Cross Blue Shield of Florida, USA*; *Glenn Mazur, QFD Red Belt®*, *Japan Business Consultants, Ltd., USA*. Changes in market demographics and the regulatory environment are creating many new opportunities for health-care and related organizations. As the oldest and most respected health insurance organization in the State of Florida, Blue Cross Blue Shield of Florida (BCBSF) strives to stay ahead of the competition by quickly responding to these changes with new and improved insurance and health maintenance products. Recently, we have begun to use QFD to discover the unspoken customer needs for an underserved portion of our population. QFD has allowed us to convert their needs into new products, services, and features to delight and attract new customers as well as retain current customers. This paper describes some of the new opportunities we are facing, and shows step by step how we are addressing them by understanding the Voice of the Customer and innovating and implementing exciting solutions.

Healthcare Services 2006

Challenges in Rapid Deployment of New Services in Healthcare. *Michael Scutero, Six Sigma Master Black Belt, Quest Diagnostics Inc., USA*; *Sonja Draganic, Six Sigma Black Belt, Quest Diagnostics Inc., USA*; *Angela Rylsky, Six Sigma Black Belt of Quest Diagnostics Inc., USA*. Through careful application of QFD in the early phases of a DFSS activity, we show solutions to customer queuing problems. The problem occurs in patient outreach, or service centers (PSC) that are responsible for patient blood draws and specimen collection. Patient flow through PSC sites, when disrupted, often results in delays and dissatisfaction. Patients are essentially "pushed" through the sites. The new and improved services generated include personnel redeployments, customer routing, customer flow regulators, supply chain efforts and improved transportation. In addition, we uncover needs & solutions for implementation of these new services to over 40 geographically separated PSC sites in a relatively short time. Included are discussions of: Project Management activity (PM), new product introduction (NPI), Design for Six Sigma (DFSS), QFD deliverables, QFD application, and case study success.

Innovation 2006

Controlling Innovation as a Basis for Continuous Success - An Executive Overview of Systemology. *Greg Yezersky, President, Institute of Professional Innovators, USA*. When we design a product or service, we must follow the laws of physical science. Similarly, if we expect business to be successful, we must follow the laws of system evolution. This practice, often done intuitively by business executives, can help businesses achieve continuous innovation if it is better articulated and strategically applied. This paper introduces the General Theory of Innovation (GTI), an evolutionary development of TRIZ for non-manufacturing organizations and general business management, and how to control the innovation process and outcomes by applying GTI to business processes, just as TRIZ has done to manufacturing and engineering problems.

IT/Database Management 2006

Pair-wise House of Quality (HoQ) Matrices: Turning poor perception to customer satisfaction. *Rituparna Maji, Six Sigma Black Belt, Sr. Quality Consultant, Wipro Technologies, INDIA*. During a review of a project for database production support in a financial services company, the customer expressed unhappiness in terms of 'processes being loose, not being hands-free' and a host of others. Lacking clear direction from the customer, it became difficult for the team to arrive at any tangible actions. In absence of data from customers, a pair of House of Quality (HoQ) matrices was used to self-evaluate

the company's service quality and identify improvement areas need to satisfy the customer.

Kano Model 2006

Kano Model: Dr. Kano's Latest Developments. *Richard Zultner, QFD Red Belt®*, *Director, QFD Institute*; and *Glenn Mazur, QFD Red Belt®*, *Executive Director, QFD Institute, USA*. The Kano model is often cited by experts in quality, design, and marketing. And yet, it is one of the topics that are often misunderstood. What is the historical background of this concept? Are there methods that product developers and marketers can apply beyond the visually-interesting diagram? What is the relationship between QFD and Kano's model, and how it can be integrated into QFD? What should QFD practitioners know about applying this in their project? This paper examines the Kano Model, including the latest developments as presented in the October 2006 Kano master class taught by the master himself, and introduces new application methods and models that are currently being developed by the QFD Institute through its on-going international research.

Build-to-spec Design & Manufacturing/OEM 2006

Using a Spec Document, the Customer Voice Table, and a QFD Matrix to Generate a CTQ (Critical to Quality) List. *Bruce White, Staff Statistician, QFD Black Belt®, Imation, USA*. When all you have to work with is a large specification document and you need to identify what specs are truly important to the customer, the techniques outlined in this paper will help you. Imation is a leading memory device manufacturer. This paper reports how they were able to identify from specs, a Critical to Quality List (CTQ), the most important, measurable characteristics of the finished product that are strongly linked to customer requirements by using the Modern QFD and a matrix to structure customer need statements, weigh and access the importance and relationships between the customer need statements and the specs. It can be very useful for any OEM supplier as well as internal customers. The talk at the Symposium will discuss the Modern QFD tools used for this technique, the process, and how successful the outcomes were.

Prioritization & Math in Traditional QFD 2006

An Analysis of Methods for Prioritizing Design Characteristics in Quality Function Deployment. *Marcus J. McLeese, Maintenance Supervisor, Coca-Cola Enterprises, Alsip Operations, USA*; *Bruce DeRuntz, Ph.D., Southern Illinois University Carbondale, USA*. This research compares three popular methods for ranking design characteristics in the traditional House of Quality: Simple Additive Weighting; Modified Simple Additive Weighting; and Technique of Order Preference by Similarity to Ideal Solution. The three methods were simulated and statistically tested to identify whether a significant difference existed between the outcomes and the pros and cons associated with each.

2006 Appendix I: Bonus Case Studies

QFD Applications in Health Care and Quality of Work Life by Glenn H. Mazur; Jeff Gibson, Baptist Health System, Birmingham, Alabama, USA; and Bruce Harries, TELUS Corporation, Edmonton, Alberta, Canada

Quality Function Deployment for a Medical Device by Glenn Mazur, Japan Business Consultants, Ltd.

Making The Neon Fun To Drive by J. E. Fernandez; J. L. Chamberlin; E. G. Kramer; J. H. Broomall; H. A. Rori; and R. L. Begley, Small Car Platform Engineering, Chrysler Corporation

The Application of Quality Function Deployment (QFD) To Design a Course in Total Quality Management (TQM) at the University of Michigan College of Engineering by Glenn H. Mazur, Adjunct Lecturer, The University of Michigan College of Engineering and Executive Director, QFD Institute, U.S.A.

2006 Appendix II: Abstracts from Symposia on QFD 1989-2006

2005: The 17th Symposium on QFD (ISBN 1-889477-17-6)

Education 2005

The Applicability of QFD for Designing Vocational Courses for Clothing Industry in Hong Kong. *Yin Ping (Catherine) Chan, Dr. K. Chan, and Dr. S. F. Chan, Institute of Textiles & Clothing, Hong Kong Polytechnic University, Hong Kong.* For decades, the Hong Kong clothing industry has been a leading supplier of clothing within the developed world as the receiving end of the global outsourcing practice. Now their position is being threatened by emerging countries that offer even cheaper labor and business costs, putting an end to the "Era of Quantity." As the "Era of Quality" begins, the Hong Kong Vocational Education and Training (VETC) institutions can no longer remain just production centers. They must become commercial enterprises. The usefulness of Quality Function Deployment (QFD) for improving various aspects of education has been demonstrated by numerous studies. This paper reports how one Hong Kong VETC institution is trying to embark on a new strategic direction through application of QFD to develop new courses that would best serve their customers in this changing global market and to prepare graduates who would carry on the future of the Hong Kong clothing industry.

Lifestyle QFD / Kansei Engineering QFD 2005

Lifestyle QFD: Incorporating Emotional Appeal in Product Development. *Glenn H. Mazur, The QFD Institute, Japan Business Consultants, Ltd., USA.* Outsourcing and the search for the lowest cost producer has led to increasing commoditization of products. Companies in developed nations are searching for the next "edge" that will help them produce highly profitable, differentiated products and services. This paper will explore an emerging area in applying QFD to lifestyle, image, and psychological needs. The basics approach, easily available software tools, and case studies will be presented, including a review of Boeing's application of these methods to their brand new B787 Dreamliner commercial aircraft, which is priced higher than competitor Airbus and yet is "set to jet past" them, according to a recent article in the Wall Street Journal.

Six Sigma / Design for Six Sigma (DFSS) and Modern QFD 2005

The Essential Role of QFD in Design for Six Sigma (DFSS): Modern QFD for Modern TQM. *Richard Zultner, Zultner and Company, USA.* While traditional Six Sigma focuses on improving existing products and processes, DFSS is an approach to prevent problems in the first place, and to incorporate positive customer satisfaction into the initial design intent from the beginning. Experienced QFD practitioners will immediately recognize the role they can play in DFSS as the House of Quality is one of the core tools in the DFSS approach. But as QFD has continued to evolve since its "4-House" model in the early 80s, our latest tools can help DFSS professionals

make their training programs more competitive, such as tools for incorporate strategic planning, project selection and management, customer visits, identifying unspoken needs, and a valid mathematical model for the DFSS transfer function. This describes the most significant improvements to QFD and how Six Sigma Black Belts and Master Black Belts can improve their DFSS training and application.

Driving Cultural Acceptance in a Six Sigma

Implementation. *Mike Scutero and Doug Conklin, Quest Diagnostics, Inc., USA.* When business leaders desire an expansion of continuous improvement techniques, they must increase their awareness regarding cultural acceptance. To transition a business that has successfully employed classical Six Sigma DMAIC defect-reduction methods into a business that fully embraces the Lean and Kaizen method-variation reduction techniques requires a re-visitation of the cultural enablers, behaviors and anchors. Often this is easier said than done. This presentation will discuss an interesting application of QFD for identifying the right behaviors to accelerate business performance and translate company values into action.

Supply Network 2005

Agile Supply Network Transition Matrix: The QFD-Based Tool for Creating an Adaptive Enterprise. *Manisra Baramichai and Emory Zimmer, Enterprise System Center, Lehigh University, USA.* Volatility has become an undeniable and consistent feature of the current business world. Companies have increasingly reached the point where they need to be more adaptive – intelligent, fast, agile, flexible, and responsive to changes. One of the strategies that can help a company make a successful transition toward becoming an adaptive enterprise is to leverage the partnership and create agile supply networks through outsourcing. Although the need for adaptability is now widely appreciated, the adoption of an agile supply network is still in its infancy. Companies require a tool to help them successfully transform their business. This research proposes a new QFD-based tool, Agile Supply Network Transformation Matrix, which can be used to relate the change domains with the strategies needed for agile supply network configuration. By addressing the relationships among the change drivers, change response capabilities, design principles, key deployment areas, and supplier selection strategies through the phase progression methodology, this tool can assist managers complete the entire transition process. The presentation will include an industry case study to illustrate the implementation of this new tool.

Government Project 2005

LORD (Local Opportunity – Regional Development) and TASQUAM (Technical Assistance Services Quality Management) : Applying QFD-based Applications for Quality Management of Technical Assistance Services in

Regional Development Areas. *Witold Edmond Witowski, Ph.D., Ministry of Economic Affairs & Labor, Poland.* In Poland, over 400 business support organizations have applied for assessment and accreditation from the National Support Systems program overseen by the Ministry of Economic Affairs & Labour since its initiation in 1996. The program provides public financing to regional development projects and related technical assistance, training, and other services. This involves a significant amount of public funding that the Ministry is responsible for managing. It is important, therefore, to implement a clear and transparent method for evaluating the projects and programs in such way that efficiency and adequacy of public money spending can be accounted for. EU Directives of Polish regulations also recommend applying quality factors for programming, contracting and evaluating public-financed projects. Hence, a QFD-based methodology was used to address the specific problems of the Technical Assistance

services as well as compliance with the ISO 9001:2000 requirements.

2005 Appendix I: Bonus Case Studies

QFD to Direct Value Engineering in the Design of a Braking System. Jim Dimsey, QFD Green Belt®, Hayes Brake, USA.

Case Study - Applying QFD for the development of the World's First High-Quality 3D Home Theatre System. Pierre-Hugues Routhier, Sensio, Canada.

Defining Customer Needs for Brand New Products: QFD for Unprecedented Software Development. Richard Zultner, Zultner & Company, USA.

QFD's role in Advanced Tactical Aircraft Development. Suzanne Bergman, McDonnell Douglas Aerospace - East, USA.

How QFD Saved A Company - The Renaissance Spirometry System. Kaelin, Puritan. Bennett, Klein.

2005 Appendix II: Abstracts from Symposia on QFD 1989-2004

2004: The 16th Symposium on QFD (ISBN 1-889477-16-8)

Aerospace / Kansei Engineering / Ergonomics 2004

Kansei Engineering for Commercial Airplane Interior Architecture. Jeanne Guérin, Human Factor Specialist, The Boeing Company, USA; Glenn H. Mazur, QFD Red Belt®, Japan Business Consultants, Ltd. And QFD Institute. Kansei Engineering process was used to ease the difficult task of down-selecting the final interior architecture concept for the Boeing's new commercial airplane that is under development. This paper reports the Kansei experiment performed by the design team, simultaneously with several other methods in a project that is still on-going. To be presented at the symposium are: the Kansei Engineering methodology used for this project including extraction of the Kansei words from a market research study, the Kansei Domain and Physical Domain, examples of Kansei Engineering matrices and software, and the results, as well as the experience and lessons learned by the project team.

Critical Chain Project Management / Schedule Reduction / Theory of Constraints 2004

Utilizing Critical Chain Project Management in Your QFD to Manage Project Schedule and Get More Done in Less Time. Tony Rizzo, Product Development Institute, USA. Many projects experience delays despite careful planning. Project managers, wanting to be realistic in project estimates, tend to build 'safety' into new project planning, while management, being pressed for decreasing time-to-market, tend to ax the project schedule: a vicious cycle. This paper summarizes the Critical Chain Project Management, an application of the Theory of Constraints and the project examples presented at the symposium.

Manufacturing / Chemical 2004

Implementing QFD for Product Development through Action Research. P. A. Cauchick Miguel, Quality & Methodology Research Group, Faculty of Engineering, Methodist University of Piracicaba, Brazil. A number of organizations have implemented QFD, but to what degree is a question that is difficult to tell from outside. This paper will report an 'action research' project which began in 2000 in Brazil. It will present the 'action-oriented' research through a case study of QFD implementation by a flexible packaging film manufacturer. To be included in the talk are: the new product development process employed by this company, how QFD was part of their product development practice, in what stages QFD was used, data and results of this three year research project, and the results of QFD implementation in a pilot project.

Modern QFD Tools & Deployment Methods 2004

QFD for Innovative Companies: Using Voice of Customer to Focus Opportunities. Glenn Mazur, Japan Business Consultants, USA. America's technology-driven juggernaut roars unabated by economic uncertainty, employee outsourcing, and even international opinion. Our innovative capacity is the engine for a successful tomorrow. Yet, both marketing and engineering groups within these companies complain of the same problems: too many opportunities with too few resources, products too new for customers to define their requirements, and an organization too immature to cope with it all. What is needed is a systematic, repeatable approach to: prioritizing projects and allocating human, schedule, and budget resources accordingly, exploring key customers for those projects to discover unspoken needs that can win customers away from the current technology, and organizing management and technical processes to efficiently deliver value to all stakeholders. Quality Function Deployment (QFD) is a powerful system of processes and tools that harness the efforts of managers, sales, and technical people by focusing them on what matters most to the customer. This paper will explore some of the major front end deployments in QFD, including Strategy Deployment, Project Deployment, Customer Deployment, Voice of Customer Deployment, Quality Deployment, and Schedule Deployment, as well as key processes and tools, to achieve this.

Appendix I: Select Papers from North American Countries

Sensio - The Evolution of a Revolution: QFD Applied to the Development of New Businesses. Pierre-Hugues Routhier, Sensio, Canada. The next chapter in one of the top presentations in 2002. Sensio's world's first Stereoscopic Home Theatre System was the fruit of a four-year effort in QFD and Value Management, which led to an instant success. Building on their earlier product development success, Sensio again set to invest in understanding and integrating the needs of its customers and partners. This case study follows the different phases of this new product's development, and demonstrate the system developed by Sensio to define which needs are assessed at which stage of the development process to maximize the effectiveness of the marketing and engineering efforts.

Large Scale System Redesign Using QFD. Robert Gerst, Converge Consulting Group Inc., Canada. This paper reports QFD applications in the public sector large system design. It will describe the consulting firm's experience in using QFD to: 1) analyze and redesign the system of funding and service delivery in providing support for those living with HIV/AIDS in southern Alberta; and 2) analyze the entire social and health services (human services) system for the regional municipality of Wood Buffalo in Alberta; and 3) analyze and redesign the system for providing services to the deaf and hard of hearing in the city of Calgary.

Prioritizing Customer Needs at Spectator Events: Obtaining Accuracy at a Difficult QFD Arena. Francisco

Tamayo-Enríquez, Arnecom; González-Bosch, Mercadotecnia Estrategia Dirigida; and Javier Santa Cruz-Ruiz, Mexico. Once customer needs are extracted from customer verbalizations and field observations, it is critical to understand the relevance that each need has to customers. Accurate information must come directly from customers, but sometimes due to the complexity of gemba this information needs to be obtained very quickly. Direct evaluation of needs without tradeoffs is easy to perform, but can lead to serious deviations from reality. On the other hand, comparison-based techniques such as AHP may be impossible to perform effectively at some gemba. An effective solution was devised by the authors while applying QFD for improving services at spectator events.

Appendix II: **List of Past Transactions and Abstracts 1989-2003**

2003: 15th Symposium on QFD & 9th International (ISBN1-889477-15-X)

Automotive / Reliability 2003

QFD for Preventing Failure. *Masaaki Todoroki, Q-tech Consulting Co., Ltd., Japan.* Ever-changing product conditions have made traditional reliability activities less effective because it has become increasingly difficult to verify individual design values and process control values in a short term development. QFD has had a component of reliability deployment but often this is not put into practice. This paper proposes a method that combines FMEA and QFD to address this issue. The proposed method can predict failures and determine the design values and process control values through the use of a quality table, thus determining the conditions for failure prevention. The presentation will include description of the method and a case study of an automotive part development where the failure rate was decreased by one third by this method.

Concurrent Engineering 2003

QFD, MATE-CON and 3DCE - A Truly Collaborative Product Development Process. *Esteban Guerrero and David Stagny, MIT Leadership in Manufacturing Program, Mexico/USA.* Design engineers look at their supply base to design products, for they need to know their technical capabilities and the price. Concurrent engineering guidelines require companies to design products and processes concurrently. So, it is only natural to design product, process and supply chain simultaneously. That is the concept of 3DCE (Fine, 1998). After exploring the strengths and weaknesses of several tools, we developed an overarching framework that defines a 3DCE process. This includes QFD to best read customers' needs and translate stakeholders' requirements into attributes and MATE-CON (the Multi-Attribute Tradespace Exploration with Concurrent Engineering tool) to best conduct a tradeoff process among Engineering, Manufacturing, Marketing and other stakeholders.

Concrete and Construction 2003

QFD Application in Concrete Industry. *Emin Arca and S. Serdar Yoruk of Marmara University; and Esra Atac of Yeditepe University, Istanbul, Turkey.* QFD is used in improving as well as developing new products and services. This paper shows an application of QFD in the development of a new plasticizer product used in concrete production. The QFD team used the results of a survey applied to 17 plants in Turkey to prioritize the customer requirements and determine the focus areas of

product and related services to achieve high market share and customer satisfaction. The customer's evaluations of the two competing firms were also taken into consideration. The project, their results, and lessons taken will be discussed.

Consumer Electronics 2003

Sensio - The Evolution of a Revolution: QFD Applied to the Development of New Businesses. *Pierre Routhier, Sensio, Canada.* Sensio's world's first Stereoscopic Home Theatre System was the fruit of a four-year effort in QFD and Value Management, which led to an instant success. Building on their earlier product development success, Sensio again set to invest in understanding and integrating the needs of its customers and partners. This case study will follow the different phases of this new product's development, and demonstrate the system developed by Sensio to define which needs are assessed at which stage of the development process to maximize the effectiveness of the marketing and engineering efforts.

Defense 2003

Using QFD to Select an Explosive for an Army Munition. *Richard Rhinesmith and Bruce Williamson, US Army Armament Research Development and Engineering Center, USA.* QFD methodology was used by a team from the U.S. Army's "Excalibur" 155mm artillery munition development program to down-select among several "Insensitive Munition" (IM) explosives candidates. This is a summary of the symposium presentation which discussed the lessons learned from conducting the "real world" effort, where issues such as safety, schedule, cost, expert judgment, and multiple customers and interests compete for supremacy. Was QFD a success in this application? Should it be used in something so specialized and potentially hazardous as the arcane world of explosives development and use? Should this be better left alone to the experts who use their traditional methods of haggling things out? These and other questions were addressed.

The Next Generation Explosive Ordnance Disposal (EOD) Robotic Controlled Vehicle: Using QFD to Define the Operational Analysis. *Bruno Eddy and Dave Schroeder, QFD Green Belt®, Applied Research Associates; and Glenn H. Mazur, QFD Red Belt®, Japan Business Consultants, Ltd., USA.* In this Operational Analysis (OA), QFD was used to identify and quantify DoD user requirements for the next generation EOD remote controlled vehicle. The OA data was obtained using joint armed service focus groups, surveys, and one-on-one interviews with 322 DoD unit-level EOD technicians. This paper presents the NGEODRCV Operational Analysis, including the methodology, process, and a prioritized list of seventy technical characteristics. This OA identifies user prioritized technical characteristics and desired abilities, and will aid program managers in identifying technology solutions and prioritizing developmental efforts for the Next Generation EOD Remote Controlled Vehicle.

Education, Online 2003

e-Learning System for QFD with improving contents and mentoring in "e-TQM" Project. *Masanobu Yoshikawa, Yoshimichi Watanabe, and Hisakazu Shindo of University of Yamanashi, Japan; Masao Takeshita of Japanese Standards Association; and Naofumi Takayama of SYNC Information System Co., Ltd., Japan.* This research examines the learning patterns of the students participating in the Internet-based e-learning programs in order to develop an effective online TQM course that provides both support and educational ease to the students, as well as evaluation formula and quality control. It examined these issues: (1) How to automatically collect data on students' learning process; (2) How to analyze the data so we can find ways to improve the content and learning; and (3) How to discourage students from retiring. The result is an e-learning system for an online TQM course that alerts instructors when to

update the contents, when to mentor students, and. The finding has been implemented in some of the online courses offered by the Japanese Standard Association.

Government / Public Sector 2003

Large Scale System Redesign Using QFD. *Robert Gerst, Converge Consulting Group Inc., Canada.* This paper will report QFD applications in the public sector large system design. It will describe the consulting firm's experience in using QFD to: 1) analyze and redesign the system of funding and service delivery in providing support for those living with HIV/AIDS in southern Alberta; and 2) analyze the entire social and health services (human services) system for the regional municipality of Wood Buffalo in Alberta; and 3) analyze and redesign the system for providing services to the deaf and hard of hearing in the city of Calgary. The resulting benefits and reactions of the local government agencies are also included in the report, as well as other potential areas of QFD application.

Adapting QFD for Evaluating Employment

Initiatives. *Geert M.J. Clijsters, Limburgs Universitair Centrum, Belgium; Maurice J. Oude Wansink, OWP Research, The Netherlands; Ludo M.K. Peeters, Limburg University Centre, Belgium; and Wolfgang E. Baaske, Studienzentrum für Internationale Analysen, Austria.* QFD is applied to obtain quality scores for local employment initiatives, enabling them to monitor, evaluate and benchmark themselves. Calculating quality scores of products (employment initiatives), instead of identifying core quality characteristics (performance measures) expands the standard application possibilities of QFD. However, several methodological issues arise due to this extension of the methodology. In order to overcome scaling problems, the authors introduce a nonparametric approach to scale efficiency. Still, some other problems could not be solved yet within the framework of this research and are pointed out for further research.

QFD and Administrative Knowledge Management. *Yoji Akao, Ph.D. and Kei Inayoshi, Lecturer, Faculty of Management Studies, Asahi University.* This research paper proposes the use of Knowledge Management to accommodate the short and long-term needs of citizens. Traditional QFD tools such as Scene Deployment, Affinity Diagrams, AHP, and Quality Tables will be employed to identify and prioritize public sector job functions and detailed governmental tasks.

Information Technology/Financial 2003

Quality Infrastructure Improvement: Using QFD to Manage Project Priorities and Project Management Resources. *James LePrevost, QFD Green Belt®, National City Bank and Glenn H. Mazur, QFD Red Belt®, Japan Business Consultants, Ltd., USA.* National City Bank has applied QFD to help identify and prioritize the needs of the customers, and then used these findings to evaluate each IT project for its benefit contribution and degree of complexity to assign appropriate resources. This paper shows customization of the QFD process through the QFD Green Belt® training of the QFD Institute, development of a list of internal customer needs which became the criteria for determining project benefit, and further development of another set of criteria for determining project complexity and technical skill level required to work on the project. This case study demonstrates how IT projects can be prioritized and optimum human resource assignment can be determined through the use of QFD in order to deliver the greatest value to the customers.

Lean Manufacturing 2003

QFD application for tackling Internal Customers Needs as a base for building a Lean Manufacturing System. *Javier Santa Cruz-Ruiz; Francisco Tamayo-Enríquez, and Verónica González-Bosch, Mercadotecnia Estrategia Dirigida, Mexico.* In

the fast-paced and lean economy that modern manufacturing nowadays has as its environment, we propose that the ability of applying QFD tools and principles along the whole manufacturing chain will turn critical, mainly because of 2 factors: (1) Lean Manufacturing allows no waste [1] and therefore, a complete match between resources and customer needs is required. (2) Rapid organizational redesign is needed to adapt to the ever-evolving customer needs and therefore company-wide understanding, alignment of purpose and common language (memes) are required. A successful application of an internal customer case will be presented as a reference for implementation.

QFD Theory / Math 2003

Linear Algebra for QFD Combinators - A Tutorial for QFD Practitioners: How to Combine Measurements with Deployments.

Thomas M. Fehlmann, Euro Project Office, Switzerland. One of the most prominent tools in QFD is the matrix. Matrices are well known in mathematics as a means to represent linear mappings between vector spaces. We use similar matrices to represent cause and effect correlations. From this viewpoint we immediately face two questions: 1) Is the matrix invertible?; and 2) What does it mean when it is? On a more practical side, one might have this question: The matrices are constructed from the cause and effect relationships. Thus they represent a linear mapping from the solution space into the goal space. However, when calculating the solution weights, we use the matrix the other way round. Is this correct? This paper gives answers both from a mathematical viewpoint and from practical experiences.

Service 2003

Prioritizing Customer Needs at Spectator Events: Obtaining Accuracy at a Difficult QFD Arena. *Francisco Tamayo-Enríquez, Arnecom; González-Bosch, Mercadotecnia Estrategia Dirigida; and Javier Santa Cruz-Ruiz, Mexico.* Once customer needs are extracted from customer verbalizations and field observations, it is critical to understand the relevance that each need has to customers. Accurate information must come directly from customers, but sometimes due to the complexity of gemba this information needs to be obtained very quickly. Direct evaluation of needs without tradeoffs is easy to perform, but can lead to serious deviations from reality. On the other hand, comparison-based techniques such as AHP may be impossible to perform effectively at some gemba. An effective solution was devised by the authors while applying QFD for improving services at spectator events.

Six Sigma Integration 2003

Keynote: Integration of QFD into Design for Six Sigma. *Gregory H. Watson, Business Systems Solutions International, Inc., USA.* This is a collection of slides used for the symposium presentation describing a Six Sigma Design architecture that uses QFD to structure the design process and apply it as a program management tool across the entire DFSS process, making it the organizing principle and methodology that links all tools and methods into a coherent whole.

The Integration of Comprehensive QFD, TRIZ, and Six Sigma in an Axiomatically Driven Total Product/Process Development System. *Michael S. Slocum, Breakthrough Management Group, and Ellen Domb, PGQ Group, USA.* This paper shows the math for TP2DS (Total Product/Process Development System) from the given condition of a societal need (SN) through the establishment of process variables (PV's).

Software 2003

QFD for Software Development Considering Future Design Risks. *Yuji Kyoya, Kunio Noguchi, Takashi Nakano, Tatsuhiro Nishioka, Software Engineering Center, Toshiba Corporation, Japan.* Many software systems suffer from the problems such as "frequent specification changes" and "functional requirement-biased Voice of Customers (VoC)." These problems cause future risks such as inconsistency in required specifications and increase in maintenance cost. Software-FMEA, based on traditional FMEA but it is also used to complement non-functional requirements, is proposed to avoid these risks during the phase of requirement analysis. The method aims to address the Voice of the Managers (VoM) by paying as much attention to it as we normally do to VoC, so as to ensure maintainability and fail-proof future expansion.

The Support of Quality Function Development by the Customer-orientated Evaluation of Software Tools. *Georg Herzwurm and Stefan Reiß, University of Stuttgart Information Systems, Germany.* This paper reviews available software tools and rates them on the basis of a customer orientated evaluation. The subjects of the paper are (1) a market survey of QFD software tools, (2) the development of a customer oriented evaluation, and (3) customer interviews on the basis of the customer-orientated criteria list which was formerly developed. The main issue of the research was the development of an evaluation system for rating the value of customer orientated software. The research was established in two stages; an overview of the customer requirements and the rating of customer satisfaction, together with two interview series with members of the QFD Institute Germany (QFD-ID) and international subscribers of the QFD-ID mailing.

Strategy 2003

QFD as a Model for an E-Intelligent Revolution. *Verónica González-Bosch, Mercadotecnia Estrategia Dirigida; Francisco Tamayo-Enríquez, Arnecom; and Javier Santa Cruz-Ruiz, Mexico.* In the Information Era, success will be of those who are able to think, learn, solve problems and take effective actions faster and better. Organizations must continuously maximize its Organizational Intelligence (OI) to learn, and solve problems, and adapt in this dynamic competitive environment because people are discovering and inventing new ways to share relevant knowledge about a product or service at blinding speed. This paper proposes the concept of OI conceptual formula, Speed of change for adaptation capability (S), and organizational E-Intelligence, a fundamental element for E-Businesses success. Looking at an example of restaurant.com, a Mexican dot-com who uses QFD to develop core strategic decisions and redesign, the authors propose that QFD Systems can significantly increase E-Intelligence and help in the development of these characteristics.

Customer Driven Strategy: Solving the Fuzzy Front-End Using Outcome Based Segmentation and Innovation. *Robert Hunt, Ph.D., Macquarie University, Sydney, Australia; and Mike Walker, Customer Driven Strategies Pty Ltd, Brisbane, Australia.* What will give the organization a unique, valuable and sustainable position in the markets in which it decides to operate? Indeed what markets should it operate in? Most approaches to strategy are very weak on this "fuzzy front end". However, approaches to strategy using QFD principles provide a coherent methodology that has been successfully applied by many organizations both large and small. This paper focuses mainly on the issues in the fuzzy front end of strategy, and gives an overview of the rest of the strategy process.

Business Priorities and Quality Function Deployment: A Case Study. *Tan Kay Chuan and Vijayalakshmi Raghavan, Dept. of Industrial and Systems Engineering, National University of Singapore, et., al.* While Traditional QFD prioritizes the technical attributes of a product based on the voice of the customer, businesses often encounter unforeseen risks in executing these attributes. This paper integrates the two

concepts of circle-of-control and the effort-impact matrix into QFD.

2002: 14th Symposium on QFD (ISBN1-889477-14-1)

Automotive 2002

QFD to Direct Value Engineering in the Design of a Braking System. *Jim Dimsey, QFD Green Belt®, Hayes Brake, USA.* In designing a new braking system, QFD was used to determine the importance of various functions of a braking system and performance levels to users, and subsequently to design both a lower-cost alternative as well as a high performance model. This paper will present the customer evaluation process including a web-based questionnaire, the deployment through the House of Quality to a Function Analysis, multiple cost modeling studies, and the design concepts that were created and proposed to the OEM.

Commodity / Materials 2002

Improving Technical Support to Make Commodity Products More Competitive. *Henry Hearon, QFD Green Belt®, GCC Rio Grande, USA.* How does one take a commodity that is essentially unchanged for hundreds of years and develop a competitive position that is based on something more than a cheap price? GCC, a cement company from Mexico with expanding sales in the US, used QFD to create the customer value that set them apart from competitors without resorting to a bottom price. This paper details the journey that started with well planned Gemba visits, as well as a one-year follow up to this QFD study.

Design for Six Sigma (DFSS) 2002

Integrating QFD and Design for Six Sigma. *Charles Huber, QFD Green Belt®, Seagate Technologies, USA.* Amid the shift from inspection-based quality to design-based quality, zero defect or 3ppm defect levels are being achieved by design through QFD, design of experiments, failure mode analyses, and other quality tools. Even greater gains can be made, however, when DFSS is combined with QFD to assure not just an absence of defects, but true value as defined by the customer. This case study will present how the goals of DFSS can be achieved and surpassed through the complimentary usage of QFD.

Electronics / Entertainment 2002

Case Study - Applying QFD for the development of the World's First High-Quality 3D Home Theatre System. *Pierre-Hugues Routhier, Sensio, Canada.* QFD provided the right approach in a successful launch of new technologies for this Montreal-based start-up specializing in immersive experiences. The process ensured not only end customer delight but also the whole value chain of more than 10 strategic partners that created a whole new industry. A QFD case study on a brand new product slated for unveiling in January 2003.

Education 2002

Deploying and integrating education system indicators with QFD - An Application Case. *Ricardo Hirata Okamoto, Provisional QFD Black Belt® and José Carlos Arce Riobóo, Provisional QFD Black Belt®, Keisen Consultores, S.A., de C.V., México.* This paper shows the Comprehensive QFD approach that has been undertaken at the Education Ministry of the State

of Guanajuato in México (SEG) in order to identify specific strategies for improvements in the nation's educational system and manage them. The study examines a various indicators of the educational delivery system and combines the use of the Balanced Score Card to implement a management information system that would monitor the whole educational indicators system, as well as SAP (Systems, Applications and Products in data processing).

Healthcare 2002

Keynote Address by Mr. Todd Hoff, CEO, Continental Rehabilitation Hospital, San Diego.

How a Successful QFD Project for a Niche Product Eventually Changed the Entire Organization. *Ed Chaplin, M.D., Provisional QFD Black Belt®, Continental Rehabilitation Hospital San Diego, USA.* Using Comprehensive QFD, a niche product in healthcare was redesigned. The result doubled the service volume and led to another project – redesign of the core competency of physical rehabilitation services. The paper will report the application of QFD as a path provider for the hospital's financial success, the 3-yr progress and challenges.

Strategy 2002

Using QFD Principles to Develop Vision, Mission and Top Level Strategy. *Fernando B. Xavier, Schindler Lifts Australia Pty Ltd, Australia; Robert A Hunt, Ph.D., Macquarie University, Sydney, Australia.* This paper describes a current case study of the application of a comprehensive Quality Function Deployment (QFD) based strategic planning methodology to develop the vision, mission of an organization, and deploy the key strategies for implementation. The company was able to formulate a strategy that was of value to its selected customers and attractive to all its stakeholders, while differentiating itself from its competitors. In parallel, it produced a set of connected tasks to deploy which are highly predictive in realizing the strategy. Based on these insights the paper seeks to address the future direction of the development of this promising field of strategic methodology.

Supplements I: Featured QFD Case Studies and White Papers

- **Gemba Research in the Japanese Cellular Phone Market**
- **Bagel Sales Double at Host Marriott - Using Quality Function Deployment**
- **Defining Customer Needs for Brand New Products - QFD for Unprecedented Software**

Supplements II: List of Abstracts 1989-2001

2001: 13th Symposium on QFD (ISBN 1-889477-13-3)

Aerospace 2001

Performance Excellence - A QFD Approach *by James P. (Jim) Walden, Boeing Airlift and Tanker Programs.* This QFD analysis is being undertaken to help Boeing Airlift and Tankers better understand how well the How's (A & T's major thrusts and initiatives) address the What's (the 18 items within the

Criteria for Performance Excellence), analyze relationships for synergy/trade-offs, identify gaps and redundancies, and benchmark progress against other organizations through competitive comparisons. The paper will include a complete House of Quality and a detailed analysis of the relationship and correlation matrices, ratings, weightings, and comparisons.

Parametric Paired Comparison: A New Methodology for Rapid and Accurate Customer Needs Assessment *by Pierre H. Routhier, Pratt & Whitney.* In a technical environment where complex customer needs go far beyond "verbatim," assessment of needs and relative weights can become a daunting task. Facing these realities, a relatively simple yet powerful methodology - Parametric Paired Comparison (PPC) - was developed, to analyze and highlight critical customer needs in a fraction of the time, while eliminating bias and subjectivity. The methodology, which can be used for such complex products as aircraft jet engines, power generation systems and electronic devices in 1½ to 2 days, will be described in this presentation through real-life examples, as well as implementation guidance.

High Tech / Software / Telecommunication 2001

QFD Killed My Pet (Project) - Using QFD to Confirm Market Needs for New Technology *by Dwight Delgado, Fusion UV Systems and Glenn Mazur, Japan Business Consultants, Ltd.* We assumed customers would be as excited as us about the advanced technology of our new product. We were surprised at what they told us during our QFD-guided customer visits early in the development. To avoid disaster, we had to rethink our strategy and redesign a more successful product line. This paper shows how QFD can save high-tech companies from making costly market decision errors by determining customer benefit of a new technology or features before it actually commits resource.

Integrated "Demanded Quality Deployment and Quality Function Deployment (QFD) *by Rajendra Prasad, Tata Consultancy Services, USA and Gargi Keeni, Ph.D., Tata Consultancy Services, India.* The global competition among software companies increases the risk of not knowing what your customer needs are. The traditional zero bugs definition of software quality is insufficient to discover the latent needs of the customer in order to sustain this competitiveness. This paper will use Demanded Quality Deployment and a Quality Plan to identify customer needs and translate them into solutions.

Integration of Assembly Requirements in Early Stages of Product Planning *by Dipl.-Ing. Stefan Berger and Dr.-Ing. Jürgen Hoffmann, Fraunhofer-IPA/TEG, Germany.* In simultaneous engineering, consideration for assembly issues is important in the early stages of product development. QFD was used to identify, substantiate, and rank internal customer wants concerning the assembly process. QFD was also used to identify possible target conflicts with quality features. This paper shows how designers of a leading Chinese telecommunication systems company use QFD to efficiently assess the as-assembly design in the design process.

Technical Services 2001

Applying Quality Function Deployment to Align Customer Needs to A Technical Service *by Ian Ferguson, Ian Ferguson Associates, U.K.* A technical service organization often fails to understand major wants and needs of its customers. Sometimes the customer is not used to expressing the needs in a readily perceivable way. Using examples of how customers typically describe their situations, ways to interpret these statements, keys to assigning target values that measure benefit to both parties, and most important of all, what a technical service organization should be doing, are shown to be vital to consumer care and a profitable business.

Defense and Government 2001

Future Combat System Concept Development: Integrating Service and Product Requirements in QFD by Kirk Kirkpatrick, Lockheed Martin Missiles and Fire Control; Maj. Shel Jones, US Army; Glenn Mazur, Japan Business Consultants, Ltd. The US Army must consider the requirements of many new fighting scenarios in order to build adequate com-bat systems. QFD is used to better understand and prioritize mission requirements, translate them into system requirements, and then select the most promising technologies for further design and development. Lockheed Martin, a major weapon systems supplier has collaboratively guided them in this effort.

QFD within a Command & Control Environment by Peter Kimber, Perspective Solutions, Inc., Sweden. The rapidly changing political-military situation in NATO's area of interest and adjacent regions creates a wide variety of risks to be considered across the full spectrum of military operations in peace, crisis and armed conflict. The multi-directional and multi-faceted nature of the resultant risks requires a flexible planning process with a high degree of responsiveness for the command and control coalition operations. This case study presents the essential role QFD plays in NATO's Guidelines of Operational Planning and Command & Control process.

QFD and The Office of Homeland Security by Glenn H. Mazur, QFD Institute, USA. The September 11, 2001 attack on the World Trade Center and the Pentagon and the passenger-led crash in Pennsylvania to avert an event worse catastrophe have led the President of the United States to form a new Office of Homeland Security. While QFD is not new to the US government, its use has mostly been within the command structure of a single entity, rather than across the very independent agencies of the Executive Branch or the Constitutionally independent Legislative and Judicial branches. This paper is a "call to arms" to the many QFD specialists within the government to use their talents to support the President's initiative to develop and implement effective homeland security activities.

QFD as Business Strategy 2001

Keynote address: Roles of Executives in QFD by Mr. David Harbourne, President, Fusion UV Systems, Inc. At this world's premier supplier of UV curing systems and services, QFD is positioned as a business strategy necessary to stay ahead of the rapidly changing business environment. Mr. Harbourne talks about the role of the executive as change agent in implementing QFD and the need for the executives to take risk and lead.

BEST Deployment: Desperately Seeking an Integrative Solution for Critical Times by Dr. Rick L. Edgeman, Robert H. Smith School of Business University of Maryland; Douglas A. Hensler, College of Engineering & Applied Sciences, University of Colorado - Boulder; Glenn Mazur, Executive Director, QFD Institute. This paper examines environmental, economic, social, and technical sustainability as a model for future business excellence. It tries to link best business practices as defined by EFQM, Baldrige, and even Deming to the future of humanity. QFD can light the path for both sustainability and customer satisfaction.

QFD in General Industry 2001

Special Lecture: Customer Segmentation and Identification of Market Research Factors for QFD by Greg Watson, Chairman, American Society for Quality. High tech products earn the bulk of their profits from the mainstream purchasers whose needs differ from those of the initial purchasers. This paper will use a new criteria - willingness to purchase - to segment customers, and links this to breakeven time, and a new dynamic interpretation of Kano's model. A case study of a computer switching system will be used to illustrate.

Customer Voice Boards by Frank Zeihsel, Ph.D., founder of *enbiz gmbh*, (Germany). The way customers communicate with business has changed dramatically in recent years. Gone are the days when the sales manager was the sole communication point. Today customer contacts occur at all levels and functions of an organization. This paper presents Customer Voice Boards, a systematic approach that connects the principles of systematic knowledge management with tools of computer supported cooperative work (CSCW). Knowledge management adds to the concept of Customer Voice Boards single processes of handling knowledge in the enterprise as well as the frame conditions needed for a successful implementation of these processes.

Measurement Dimensions within the Kano Model of Customer Satisfaction by Robert A. Spencer, Bergen Brunswig Corporation, California. In this ongoing research, the Kano model is used to further explore the relationship between customer perceptions about what they would receive and the satisfaction they actually get from the product or service. New findings concerning the weight of customers' expected requirements, how they affect purchasing decisions, what roles they play in customer defections and long-term customer retention and other issues will be re-reported.

Flash QFD! - An Interactive QFD Tutorial by A. J. Lowe, Ph.D., University of Sheffield (UK) and R.A. Hunt, Ph.D., Graduate School of Management, Macquarie University (Australia). Non-practitioners of QFD often perceive it to be a complex and difficult to implement method. This paper describes the development and testing of an interactive, Internet-based QFD tutorial, which was developed using Macromedia's Flash software and can be run on any Internet browser using free downloadable software.

2000: 12th Symposium on QFD (ISBN1-889477-12-5)

Aerospace / Aviation 2000

Measuring Competitiveness in Service Design; Decisions based on Customer's Needs. by Dr. Thomas Fehlmann, Euro Project Office AG, IT Quality Group, Switzerland. Fast decision making is key in today's markets, especially in the airlines industry. QFD, in conjunction with New Lancheater Strategy, provides a means to make difficult decisions right, in very short time. This approach has brought Swissair a means for continuous measurements and focused improvements with a clear and unambiguous metric and is now part of the regular marketing research process.

The Collaborative Innovation (CI) Process by Dr. Larry Zeidner and Dr. Ralph Wood, United Technologies Research Center, US. The Collaborative Innovation (CI) process, developed at United Technologies Research Center (UTRC), is an integrated collection of best-practice design methods (enhanced and simplified QFD and TRIZ) to support Integrated Product Development (IPD) teams during conceptual design. Over the past 3 years, CI has been applied to a wide range of UTC innovation efforts, enabling an IPD team to: a) focus their innovation efforts on opportunities of the greatest stakeholder value potential, b) use stakeholder value to guide concept evaluation and selection, and c) create a development plan that will reduce risk as quickly as possible.

Automotive 2000

Improving the Nissan "Crew" with Reverse QFD by Noriharu Kaneko, Service Quality Management

(Japan). *Japan*. The necessity to continue improving quality of a newly development product through QFD will be illustrated by Nissan Taxi Cab "Crew" customer satisfaction survey example. Based on market surveys conducted after the release of a new model, this paper suggests future improvements needed in the next model and a job flow to achieve them.

An Application of QFD to the Shop Floor Daily Routine Management by *Leonardo Pereira Santiago, Flávio de Aguiar Araújo, Lin Chih Cheng, Federal University of Minas Gerais, Belo Horizonte, Minas Gerais, Brazil*. How QFD was used for assuring the quality of shop floor management in the daily routine of a manufacturing firm. Shows how QFD can help the shop floor solve the negative voice of customer by selecting the main working place of the manufacturing process.

Enlarging QFD Methodology to Include Forecasts of Market Share and Profit by *Harry E. Cook, Head, Department of General Engineering, University of Illinois at Urbana-Champaign, USA*. Taylors expansion in market segment provides a rigorous phenomenological basis for making value versus cost trade-offs for new product development and yields a straightforward marketing research method for assessing the value of proposed product improvements. Using the first stage of QFD, a list of customer needs are identified and converted into product system attributes. Value curves for key system level attributes are used with cost estimates to make trade-off assessments and also to determine Taguchi's "cost of inferior quality." Through a variety of automotive and construction equipment applications, the paper reviews how well they achieved both variable cost and value needed to assure the bottom-line metrics of market share and profit.

Chemical 2000

Investigation and Research Concerning the Integration of TQM and ISO9000/14000/Responsible Care by *Masao Sukuya, Dainippon Ink & Chemical Inc., Yusuke Ito, Naoki Tanaka, Yasutaka Kato and Kozo Koura, Asahi University, Japan*. Integration of quality management (ISO 9000), environment management (ISO 14000), environment, safety and healthy management (Responsible Care: RC) and TQM through application of cross-functional management was tried and proved effective in this chemical industry research, conducted in cooperation with the Kashima Plant of the Dainippon Ink & Chemicals Inc, a certified ISO 9000/14000 organization which strives for RC.

Consumer Products 2000

A Study of Structure of Quality Contribution Degree in Customer Satisfaction by *Michiteru Ono, Professor, Tamagawa University, Tokyo, and Noriyuki Neil Takeuchi, Integrated Quality Dynamics, Inc., USA*. This paper presents a more efficient ways to improve customer satisfaction through use of QFD, by identifying attractive quality in satisfied factors, setting moderate quality in dissatisfied factors, and determining low-cost factors. Satisfied and dissatisfied factors are identified; their relationship and influence are analyzed through Factor Analysis and Covariance Structure Analysis for better product development process.

E-Commerce 2000

Continuous QFD - Employing QFD in Case of Fuzzy Development Tasks by *Georg Herzwurm, Sixten Schockert, University of Cologne, Business Computing, Germany*. When customer requirements are not well-defined and technologies are changing fast, traditional waterfall QFD is inappropriate for product development. Continuous QFD is a method to deal with this situation. This paper describes characteristics of unclear development tasks, translates them into QFD terminology and outlines consequences for the design of Continuous QFD

projects. A case study on web-site development applying Continuous QFD will be presented.

Education 2000

Application of QFD to Developing Education Products for Northern Australia Beef Producers by *Shane Blakeley, Rural Production Systems Pty Ltd, Mick Quirk, John Bertram, Felicity McIntosh, Queensland Beef Industry Institute, Department of Primary Industries, Bob Hunt, Graduate School of Management, Macquarie University, Australia*. In two separate projects, Meat and Livestock Australia and the Queensland Beef Industry Institute used QFD to determine the education needs of beef producers with regards to beef cattle nutrition and to grazing land management. The first time such a process had been conducted within this industry, the projects provide insights into issues critical to the success of North Australian beef production enterprises. These insights have enabled the organizations to design and deliver education products to enhance skills and consequently profitability of those producers.

Electronics, Computers, Telecommunications 2000

Inspection and Control of Raw Materials Applied to Electronic Ceramics Through the Quality Chart by *J.C.S. Dias and P.A. Cauchick Miguel, Quality Management & Metrology Group, Methodist University of Piracicaba (UNIMEP), Brazil*. This paper reports a study of raw material inspection by presenting a methodology to relate technical and managerial requirements. A quality chart has been developed relating technical and ISO 9001:2000 requirements and giving the level of importance of the relationships. This analysis identifies which ISO 9001 requirements have more impact on job functions.

Gemba Research in the Japanese Cellular Phone Market by *Eric Ronney and Peter Olfe, Nokia Mobile Phones*. The advantages for a mobile phone company of doing research in the Gemba are first explored. The paper then describes a research project that was carried out in Japan and describes how the research was designed to try to overcome the potential barriers posed by customer culture in order to obtain the maximum benefit from the research.

Healthcare, Medical Products, Pharmaceuticals 2000

Applying QFD in a Hospital Setting: A Study of Medical Quality by *Dr. Yoji Akao and H. Fujimoto, Asahi University, Japan*. The application of QFD in service industries concerns itself not only with quality as valued by the customer, but must also consider quality of the service operations themselves. Similarly, a medical facility must consider both the societal role of the hospital and the actions necessary to assure the health of the patient. This paper will demonstrate that metrics for clinical staff quality can be incorporated in the various QFD charts to clarify, evaluate, and manage medical quality.

Use of QFD to Develop Sales in a Medical Materials Market by *Fatih Yenginol, lecturer, Dokuz Eylul University Faculty of Business, Turkey*. A multinational medical materials producer, the major player in its market, is seeking ways to develop its sales. The sales department of the company has determined the gaps in the market. In this way, the company is going to be able to fill in these gaps with the help of Quality Function Deployment process.

Introduction of QFD Method to Our Original Medical Quality Improvement (MQI) Activity in Nerima General Hospital by *T. Takahara, M.D., Dept of Surgery, S. Iida, M.D., President, and M. Fujimori, Nerima General Hospital, Tokyo, Japan*. Since 1996, Nerima General Hospital has been executing their own Medical Quality Improvement (MQI) Process to improve quality and function of medical care. QFD

and FMEA are a part of this year's declared focus. This paper presents introduction of QFD to our MQI activities which resulted in good outcome in both external and internal customer demands.

Software 2000

Software Quality Improvement by Quality Function Deployment by Yen-Fang Chu, Graduate School of Resource Management, National Defense Management College, Huey-Der Chu, Department of Information Management, and Shan-Fa Wang, Taiwan, ROC. The cost of quality refers to the cost incurred due to compliance and non-compliance to requirements. Considering this imbalance among the cost of quality, this paper introduces Quality Function Deployment (QFD) into the Information System Planning to decrease the failure cost and improve the quality of the software development process.

QFD and RequisitePro by Stuart Lesley, SiloSmashers, USA. QFD is a powerful method for bringing the voice of the customer to the entire organization. We have developed a way to physically link the results of QFD into the beginning of the design process. This method not only preserves the QFD effort, but also provides traceability throughout the solutions design and development life cycle.

Software QFD by Richard Zultner, ZULTNER & CO., USA. The application of QFD to software development requires a combination of understanding users, project management, and software development tools to assure that by concentrating our limited resources on those aspects relating to the most important needs of the customer, we can deliver more value to the customer than our competitors.

Training and Consulting 2000

Implementing TQManagement in a Multiculture Ambience by Dr. Tarik Sulimani, Vice President, TQM & HR, Advanced Electronics Co., Dr. Nasreen Al-Dossary, Assistant Manager, Saudi American Bank, Saudi Arabia. Implementing TQM in developing nations with heavy reliance on foreign manpower is a challenge. It is a unique experience to maintain harmony among heterogeneous workers and experts from different continents, values and backgrounds. This paper points out cross-cultural sensitivities, highlights obstacles organizations may face and how to overcome cultural barriers. It describes the TQMization approach and implementation measures that can take place based on a study conducted in Saudi Arabia.

A Review of Applied Human Factors Techniques for Product Designers in Identifying the Voice of the Customer by Chee Weng Khong, Centre for Collaborative Multimedia, Faculty of Creative Multimedia, Multimedia University, CyberJaya, Malaysia. This paper addresses the human factors methods or techniques applied by designers throughout the product development process in identifying and to elicit customer trends and preferences, and map social and technological directions. A simple matrix diagram is proposed to support and aid the designer's awareness of appropriate human factors techniques to be applied.

General Model of Continuous Improvement Programs: Creating Fractal Organizations by Francisco Tamayo-Enriquez, Quality Assurance Department Chief, Axa Yazaki, Nuevo Leon, Mexico. Continuous Improvement Programs are generally models of organization and interaction between people with some emergent and some intended results. Recently, fractal models are achieving success in modeling complex natural phenomena. If organizational dynamics are natural phenomena, there is the possibility of having a Generalized Model of Continuous Improvement Programs based on a fractal model. This will lead to Fractal Organizations

through deployments, such as QFD and Policy Management, able to preserve the appropriate form and complexity at all different levels.

Minimum Information Loss Evaluations for QFD by Ed Dean, The DFV Group, USA. QFD has come under attack because of the means used for evaluation. Research has shown that individual preferences are not preserved by typical joint evaluation methods and has associated preference retention with information retention. This paper defines a generalized information for preferences, obtains the minimum information loss joint preference, and compares this approach in a QFD example with an evaluation approach recommended by voting research.

QFD is a Catalyst, not a Process; A New Way to Look at QFD by Dilworth Lyman, ViewPoint & Understanding Enhancement, USA. A new way to look at QFD, not as a process by itself, but as a catalyst to be applied to other processes. When QFD is applied to other processes, they are changed; old processes become more customer focused and proactive. We will look at the types of processes you can mix with QFD, what results and how it can even improve a bad process. We will look at the elements of QFD as they mix with the elements of other processes in many disciplines and show that there is no one right way to do QFD.

General Industry / Service 2000

Using the Gemba to Improve the Usefulness of FMEA by John Terninko, Responsible Management, Inc., USA. Using the different perspectives of a system provides different perspectives when visiting the Gemba. A system exists in time, space and relationships. A system's goal is to use its properties and functions to satisfy some need of its environment. Understanding these perspectives in the Gemba will yield a profound improvement on the usefulness of the associated FMEA. All potential failure modes and root causes often missed will be identified.

Hoshin and Strategic QFD Organizations: Where are they now? by Dr. Robert A Hunt, Graduate School of Management, Macquarie University, Australia. This paper reports on two organizations with more than three years applying Hoshin and QFD principles to their strategic transformation system (STS) and/or their offer innovation system (OIS). It addresses: How have these organizations benefited from applying QD? How have their systems evolved? What are their plans to further apply the principles? What would they have done differently and why? Have the QD systems become "the way we do business around here?"

The Quality Concert: A Multiple-Parameter Matrix Analysis by Jack ReVelle, ReVelle Solutions, LLC, USA. Several concepts, all QFD-related, are analyzed using a Y-shaped, multi-parameter matrix to determine the extent of their interrelationships. These concepts are the Kano Model and the Quality Concert composed of two parts, the Quality Quartet and the Quality Chorus. The Quality Quartet has four voices: that of the customer, engineer, manager, and the process. The Quality Chorus has three voices: that of society, government, and environment. The resulting model insures awareness of important factors in, around and about the marketplace.

The Universal Method for Technology Forecast: Does the Panacea Exist? by Iouri Belski and Vladimir Shapiro, Department of Communication and Electronic Engineering, Royal Melbourne Institute of Technology, Australia. This paper analyses the dependence of methodologies of forecasting on the requirements of the designer. The variety of outcomes of a process of forecasting is considered: from prediction of future characteristics of system elements to potential scenarios of systems and super-systems of the future.

Strategic Product Family Development by Extending the House of Quality by Juergen Hoffmann, Fraunhofer Technology Development Group, Germany. The extended House of Quality does not use single specifications to define product families - instead specification classes are formed. These specification classes encompass the area within which the specifications for all the products in the product family are contained. Experience has shown that it makes sense to form three specification classes, and combine these with factors such as cost and competitive comparisons for defining the specifications for product families from a strategic market perspective.

Customer and market input for product program development by Knut Aasland, Detlef Blankenburg and Jarl Reitan, SINTEF Industrial Management, Norway. One crucial question when developing product programs is: Which models and variants do we really need? To what degree can an attractive product make variation less necessary? To answer this, a deep understanding of customers and their behavior and decision patterns is important. Since this is not what designers and project managers in industry typically excel at, methods and tools are necessary.

QFD 2000: Integrating Supporting Methodologies into Quality Function Deployment by Glenn Mazur, Japan Business Consultants, Ltd and QFD Institute, USA. Competitiveness in the new millennium may belong more to those who can integrate a multitude of disciplines into a system, rather than to those who expect a single tool to do it all. The House of Quality is really more of a "great room" to which various "outbuildings" and other structures must connect. This paper shows where well-known quality and other tools such as Consumer Encounters, New Lanchester Strategy, Kansei Engineering, Theory of Constraints, TRIZ, Voice of Customer Analysis, FMEA, SPC, and other methods can be integrated into the New Product Development Process.

Leveraging TRIZ to Combine Ideas into Implementable Concepts by Dana Clarke, Ideation International, Inc., USA. Enhance the value of ideas via the integration of QFD and TRIZ to create "super concepts." TRIZ offers newly-developed techniques for combining complementary or competing ideas, thereby raising the effectiveness of the QFD process to meet and exceed customer expectations.

QFD with an Attitude! - "Obsolete your products so your competitors can't!" by David Verduyn, C2C Solutions, USA. QFD is an exceptional framework to integrate some of the "best" product development "tools". This paper illustrates how QFD must incorporate leading innovation strategies to attain or maintain leadership. Integration of the following disciplines will be clearly illustrated. 1) Compelling Innovation and Value Optimizing Algorithms for breakthrough ideas, 2) Patented AI Semantic Processing tools to create & retain corporate technical knowledge, and 3) FMEA so your impressive ideas don't fail!

1999: 11th Symposium on QFD (ISBN1-889477-11-7)

Aerospace 1999

Variability Reduction: A Common Ground for Integration of Advanced Quality Tools and Processes by David Novick, Technical Advisor Electronic Systems & Missile Defense, The Boeing Company. A strong Variability Reduction (VR) plan is central to any organizational Continuous Quality or Process Improvement (CQI/CPI) effort. Without such a plan sorely needed resources, people and budget, are applied in the wrong place and at the wrong time. A "Total Approach" may be fashioned to guide planning, developing and managing such a

program using a toolkit developed and selected from Comprehensive QFD (QD and QFD), Taguchi Methods (Robust Design and Loss Function), Theory of Constraints (TOC and TP), Theory of Inventive Problem Solving (TRIZ), Statistical Process Control (Shewhart's SPC) and Kaizen. This paper presents how this author used these toolkits to establish a Variability Reduction Plan and Pathway.

Architecture 1999

The Use of QFD for Architectural Briefing & Design by Dirk Conradie, Project Leader & Kirsten Kusel, Research Architect Division of Building Technology, CSIR, South Africa. A unique fusion of technology in an unprecedented new system promises new possibilities in the complex world of architectural briefing and design. The system enables actual client requirements to be accurately translated by means of a new software system into architectural functions and final design solutions. The application of novel concepts such as QFD-in-depth and breakout methodologies will be illustrated. The paper describes the integration of the new QFD concepts with traditional methodologies from the domains of QFD and Systems Engineering and Concurrent Engineering within a software environment.

Automotive 1999

QFD for Manufacturing Technology Assessment by Edward Vinarcik, Engineer, Visteon Powertrain Control Systems. Choosing a manufacturing technology is difficult. Customer needs as well as technology limitations must be understood. This paper presents a case study in which QFD is used as an analysis method for evaluating manufacturing technologies for a specific product, automotive fuel rails. Included is a discussion of customer types and needs related to design, cost, delivery, and timing.

QFD Applications in Brazilian Autoparts Companies by Paulo Cauchick Miguel, P.T.M. deSouza, & C.J. deSouza, Quality Management & Metrology Group - Methodist University of Piracicaba (UNIMEP), Meritor do Brasil Ltda. - LVS Division, & Eaton Ltda. - Divisão de Transmissões. This paper describes QFD implementation initiatives carried out in two auto parts companies in Brazil. One company produces steel wheels and the other mechanical transmissions. The paper describes the framework and timetable to implement QFD, highlights the reasons for deciding to implement it, and it shows the results achieved so far. Difficulties experienced are also presented as well as the principal benefits.

The Product Development Process: Avoiding Pitfalls to a Successful Implementation by Bob Adams, Magna Seating Systems, USA. Organizations that utilize product and program management have consistently found difficulty in delivering on customer expectations while attempting to balance internal resources. Cost overruns and losses associated with unrecovered engineering changes are symptomatic of a process that doesn't work. Magna Seating Systems embarked on a concerted effort to revitalize the entire operation of delivering products from concept through obsolescence. What resulted is a process that has become world class in execution and achievement of both customer and company goals. This was accomplished by taking the architecture and designing into its basic framework safeguards that avoid common pitfalls that have plagued other companies. Changing the way things occurred and happened at Magna began a cultural revolution in program management and its execution that continues to this day.

QFD in Strategic Planning: An Exploratory Study by Paulo Cauchick Miguel & R.M. Vanalle Quality Management & Metrology Group, Methodist University of Piracicaba (UNIMEP) A.G. Alves Filho, University of São Carlos, Brazil. This paper examines an exploratory study in which QFD is used for strategic planning formulation. On the basis of corporate

strategies obtained in a previous study, QFD matrices are applied to relate business strategies and functional level strategies. The case study is performed in an automotive industry supplier which produces brake systems. A QFD matrix is used to identify the most appropriate functional strategies, including the relationships and correlations.

Consumer-Based™ Performance Benchmarking by *Kioumars Paryani and Terry Zalewski, General Motors Corporation GM Truck Group, Vehicle Integration Engineering, USA*. This paper presents a unique approach to benchmarking and target setting, including capturing, prioritizing or translating the voice of the customer. The assumptions are that an accurate translation of customer needs and wants is in place. The theme of the paper centers on a new methodology for setting performance targets for the product characteristics, initially and throughout the lifecycle of the product, and includes identifying areas that need to be technologically developed so that technology development takes on a market pull strategy rather than the traditional strategy of developing technology for technology sake. The methodology quantifies the level performance needed by the technology to ultimately exceed customer expectations. Tools utilized in this methodology are derived from established quality engineering practices and tools, such as the Taguchi Quality Loss Function, Quality Function Deployment, Focus Group Methodology in consumer research, and the critical path method (CPM).

Crisis and Disaster Management 1999

The Application of Augmented QFD to the Evaluation of Emergency Plans by *Chakib Kara-Zaitri & S. Al-Daihan, University of Bradford, UK and King Abdulaziz City for Science and Technology, Saudi Arabia*. A description of an augmented QFD methodology for the evaluation of emergency and crisis management is developed and presented.

Communications and Media 1999

Contextual Usability, Domestication & QFD by *Derek Nicoll, Research Fellow, University of Edinburgh Management School, UK*. QFD works well where there are strong product analogues easily recognized by representative samples of consumer-users. However, what happens if there is a lack of analogues providing the crucial metric? What if there is no easily definable representative sample? This paper considers the importance of context in capturing the voice of the customer, and enhancing it with information on how products domesticate into homes and offices.

Consumer Products 1999

Brand Engineering using Kansei Engineering and QFD by *Glenn Mazur, Industrial and Operations Engineering and Jeremy Brochtner, Interdisciplinary Program in Engineering and Industrial Design, University of Michigan, USA*. Traditional QFD methods have dealt with issues such as "appearance" for many years. But another, less known tool, kansei engineering is more suited for the task of translating "brand" into real product differentiators. Born in Japan like QFD, kansei engineering is the brainchild of Mituso Nagamachi, a leading ergonomist and quality professional. This paper will integrate kansei engineering with brand management, industrial design, QFD, and other quality tools to yield a more robust approach that can bring together the marketing, art, and engineering professions.

Education and Library Sciences 1999

Model Improvement Process in an Educational Environment by *Brian Stitt and John Sinn, Center for Quality, Measurement & Automation (CQMA), Bowling Green State University, USA*. QFD problem investigation and solving processes cannot be optimized without the introduction of teams and problems. A modified QFD problem solving

methodology was used by student teams to evaluate and improve a Technology course at Bowling Green State University. The research details how student teams used the QFD methodology to research, develop, and implement the plan to progressively deliver an improved Technology course in an on-line format.

The Application of QFD Principles to Student Learning using a Group Decision Support System in School Education by *Wilhelmina Hunt, Reading Insight, Australia*. This paper describes how through the use of a Group Decision Support System customer in schools (students) apply QFD principles to their learning. The students are able to develop a product that meets or exceeds their needs or wants. Teachers use Group Decision Support System to do long term strategy to satisfy the goals of their customers (students).

Solving Problems with Method of the Ideal Result (MIR) by *Iouri Belski, Department of Communication and Electronic Engineering, RMIT University, Australia*. This paper introduces an application of Method of the Ideal Result (MIR) to service. MIR is based on the TRIZ concept of the Ideal Final Result (IFR) and can be effectively used for service development and evaluation. This paper concentrates on a general MIR methodology, its relation with TRIZ and QFD. MIR application in finding ways of improvement of university student's satisfaction is presented as an example.

Improving the Scales Used in AHP for QFD by *Frank Moisiadis, Centre for Advanced Systems Engineering, Macquarie University, Australia*. The Analytic Hierarchy Process (AHP) is widely used in QFD for prioritizing stakeholders, their needs, competitors, and other data. Studies done in the field of Library Sciences and MBA education have revealed certain weaknesses in Dr. Saaty's 9-point scale, since many psychologists believe people do not mentally perceive attitudes as a single point, but rather as a range of acceptable values. Findings and alternatives will be presented.

Electronics, Computers, and Telecommunications 1999

Interpretation of VOC with Concept of Quality in Multi-Levels: An Enhancement for QFD for Innovation by *Chong Pui-yik, Steven School of Design, The Hong Kong Polytechnic University*. With too much change and newness of attributes, it is hard to thoroughly implement QFD for innovation. A view is raised in this paper that the concept of quality in multi-levels, Owen's Quality Pyramid Model, can be used to establish the usable information of desired quality attributes as enhancement to turn the vibration of voice of customer (VoC) into certain manageable newness. Thus the context of QFD for product innovation can be extended.

Deploying Corporate Vision using a Structured Methodology by *Steve Seeman, Director of Quality Assurance EFDData & Alan Leeds, EFDData Subsidiary of California Microwave, USA*. Challenged by a newly appointed CEO to improve operating cost and increase customer satisfaction, California Microwave embarked on three initiatives to achieve quantum improvements toward world class operating levels: 1) Develop and deploy a methodology that would provide focus for each employee and link activities throughout the organization. A Hoshin planning process was adopted to achieve this objective. 2) Define and initiate scorecards in the areas of quality, operations and engineering. This allowed bas- lining current performance levels and would be used to monitor trends, track improvement and set goals and take actions based on benchmark world class operations. 3) Implement a customer satisfaction survey and corrective action process. A customized software program was developed to access customers opinions. Responses from customers resulted in identifying and forming teams to address the top three attributes. Results included

focus on real customer needs, reduced non-value added activities, improved quality, and shorter cycle times.

Interface of Lanchester Strategy & QFD by John Schuler, *Lanchester Press*. Brief overview of Lanchester Strategy, Lanchester Equations, Lanchester's principle of concentration, Koopmans global warfare and development in Japan of total marketing warfare. Significance of the Japanese development in application to other fields of activity, military, marketing, politics and understanding of individual achievements - the "performance guru model." Advances over the popular "Sun-Tu" model of marketing. Explanations of gaps in popular texts such as the Moore series on product introduction. Cases discussed include HP-Xerox-Canon in a fight over the copier market and mergers and acquisitions in the CMP sector of the semiconductor market.

Entertainment 1999

Jurassic QFD by Andrew Bolt, *MD Robotics and Glenn Mazur, Japan Business Consultants, Ltd.* Universal Studios Florida has just opened its Jurassic Park amusement park. One of the highlights is the Triceratops Encounter, a "live" animatronic interactive dinosaur "petting zoo." The animatronics were built by the company that makes the robot arm for the Space Shuttle, and you can imagine the difficulty in moving from that industry to an amusement attraction. QFD allowed them to move from the original concept story boards to system and component development to operator instructions for the on site "attendant." Hear a gemba visit story only QFD could have created. Further, significant time and cost savings were achieved due the focus that QFD brings. One visitor called this "totally convincing... it flinches, breathes, snorts, drools, moves, blinks just like it were alive." You won't believe what other body functions it does! We hope to have a video of the design, build, and execution process. See for yourself at www.usfinfo.com/islands/jurassic.shtml.

General 1999

Hoshin Planning, QFD & TQM by Robert Hunt, *Director, Centre for Management Innovation and Technology, Graduate School of Management, Macquarie University, Australia*. QFD, Hoshin Kanri and related methodologies are often considered to be at the opposite end of the spectrum from traditional Management By Objectives approaches to management. From field analysis of 47 organizations, this paper develops a diagnostic that positions an organization's strategic planning system along this spectrum. It then goes on to use the diagnostic to provide some important insights into the relationship between success, and the adoption of quality principles, hoshin kanri and QFD.

QFD as a Corporate Memory Structure by Greald Henstra, *Faculty of Management and Organization, University of Groningen, the Netherlands*. Parallel to creating products the R&D process results in knowledge. Usually a great deal of this knowledge remains tacit. Tacit knowledge obviously is a concealed source of competitive advantage. To reveal their findings employees need a means of communication. QFD will be suggested to serve as a communication structure, incidentally upgrading its role within the play of product development.

Experiences with the reliability and Validity of the Kano Method: Comparison to Alternate Forms of Classification of Product Requirements by Elmar Saurwein, *Assistant Professor, Department of Management, University of Innsbruck, Austria*. Reliability and validity of the Kano Model have not yet been tested thoroughly. This paper tries to examine the reliability of test-retest, alternate forms and stability of interpretation. Furthermore concurrent, predictive and convergent validity were tested. Other methods of classification were tested, too. The results are supportive for the Kano model.

Making QFD Efficient by Robert Hales, *ProAction Development*. This paper will present the sometimes-heretical lessons that the author learned by applying QFD over nine years with essentially the same team and on multiple product generations. It will cover preparing for market research, collection and prioritization of requirements, the use of QFD matrices, target setting for product differentiation, and design concept creation and selection.

The Politics and Partisanship of VOC by M. Larry Shillito. Next generation strategic thinking will be concerned with, "which customers will get us into the future?" and "How will we excite them?" Acquiring processing and deploying Voice of the Customer (VOC) will be paramount to the success of an enterprise. Obtaining good VOC is not easy because it involves people, teams, organization structure, emotions, politics, and power plays. The success of a VOC project is enhanced if organizational, political and behavioral aspects of the project are addressed early. Interdisciplinary teams are indispensable to the success of a VOC project. We must understand how the various disciplines process information and view the customer chain in order to provide a common understanding and forge a unidirectional effort to obtain good VOC. This paper discusses the company-customer balance, VOC principles, vertical VOC, evolutionary/revolutionary VOC, customer chains, supply-demand model of VOC, VOC fit to the commercialization process, and acid test questions for initiating a VOC study.

Industrial Products and Heavy Industry 1999

Customer Chart: An Efficient and Effective Way for Structuring Customer Needs by Juergen Hoffmann, *Head of Department, Fraunhofer Technology Development Group, Germany*. Since customer needs are the vital input for any QFD process Fraunhofer TEG has developed a new promising method for structuring customer groups and their needs. Combining elements of the Akao with the well-known ASI approach a new effective and efficient way for dealing with diverse customer needs of different target groups is achieved.

Application of QFD in Conjunction with the Goal Function Modeling within the Automation Systems Industry by Prof. Tilo Pfeifer & Dipl.-Ing Rolf Reinecke, *Laboratory for Machine Tools and Production Engineering (WZL), Aachen University of Technology, Germany*. This approach changes the way automation systems are engineered with the specific purpose of reducing cost and enhancing quality of the delivered systems, thus, leading to excellent customer satisfaction. This paper presents a combined customer and functional oriented methodology based on QFD and Goal Function Modeling (GFM) as well as the first results of application on real life automation projects.

Socially Responsible QFD by John Terninko, *Responsible Management, Inc., USA*. Centuries ago, the Seneca Nation of northeastern North America made decisions by considering the consequences for the seventh unborn generation of their people. It is time to apply this ancient wisdom to our own times with the aid of 21st Century tools like QFD and TRIZ. By looking at the needs of the super-system in which a product, service or software resides - the super Gemba, so to speak - the probability of future environmental and health disasters will be minimized. A combined methodology using both QFD and TRIZ is proposed to achieve this higher level perspective.

Using Soft Systems to Identify and Diffuse Cross Functional Conflicts by Jim McMahon, *Fresh Venture Limited, UK*. Should the marketers dictate requirements to the manufacturing function, or should operations limit what can be brought to the market? Marketing may give undertakings to customers that operations just cannot accommodate. These undertakings may include lead times and delivery quantities incompatible with the manufacturing system. There exists

therefore the potential for conflict. The successful resolution of these conflicts is important for the long and short-term success of organizations.

Basic Elements of QFD as Key Factors in Life Cycle Engineering by *Christiane Rauch-Geelhaar, Manager and Frank Zeihsel, Institute of Manufacturing Engineering and Production Management University of Kaiserslautern, Germany.* Although QFD evidently is a very good method for transforming ambiguous customer demands into concrete measures for product and processes there are still problems with its usage. Success strongly depends on flexible application of the most important elements of QFD. These are key factors for several kinds of requirement transformations not only in product development but also in the whole product life cycle. In this article the basic elements of QFD, their successful application in industrial practice as well as useful enhancements are described.

Logistics 1999

Aligning the IT Framework to Corporate Strategy by *Thomas Fehlmann, IT Quality Group, Switzerland.* ew Lanchester strategy and QFD are used in an integrated approach to define standards for the IT framework in large organizations. The standardization approach is based on competitive advantage, user needs, security policy and technology selection. We measure productivity gains using an enhanced Total Cost of Ownership (TCO) – model in medium to large distribution centers to retail businesses and in public administration.

Software 1999

Risk-based Deployment of Standard Software Rollout Processes by *Dr. Georg Herzworm, University of Cologne, QFD Institut Deutschland e. V. and Dr. Wolfram Pietsch, ExperTeam GmbH, QFD Institut Deutschland e. V. Germany.* QFD is employed to the tailoring of rollout processes. The risk of project failure is evaluated by means of a set of risk factors. The result is used to select the tasks that address the risk properly, leading to an efficient rollout process.

Defining Customer Needs for Brand New Products by *Richard Zultner, Zultner & Company, USA.* Is it useful to have an approach for products the customer has never seen before (as opposed to model upgrades)? This paper will review the existing approaches in QFD for brand new products, and discuss the Theory of Constraints "Snowflake" and "3 Clouds" methods for finding the customer's core problem, and core conflict, respectively. This will show the synergy between TOC and QFD as well (tweaking the deal vs. tweaking the details).

Training and Consulting 1999

How to Measure the Performance of the Overall Deployment Process by *Fatih Yenginol, Research Assistant and Ali Sen, Associate Professor, Dokuz Eylul University, Turkey.* Various forms of deployment processes are being used to solve specific problems in different situations. At the end of these applications, a performance measurement of the overall deployment process has to be made. Thus, a backward revision deployment may be realized. With this paper; a model is proposed for performance measurement and revision of the overall deployment process.

A Statistical Approach to SQC Target-Setting by *Kaushik Ghosh, Principal Research Scientist and Lynnette Blaney, Research Scientist, Systems Analysis and Engineering Group, Battelle Memorial Institute.* The basic premise of the House of Quality is an implied cause and effect between the Substitute Quality Characteristics and customer satisfaction. Little is usually done to verify this impact mathematically. As a result, target setting is very subjective in nature and may be of very limited value. We present a statistical model for use in target

setting and an alternative calculation for Technical Importance based on "satisfaction-sensitivities."

Training and Instructional Techniques for Teaching QFD by *Karen Becker, Becker Associates.* At some point in a QFD practitioner's life, he or she will be asked to conduct a class in QFD. This presentation will cover planning for training and instructional techniques based both on classical learning theories (Blooms Taxonomy) and on new ideas to increase the effectiveness of materials and the instructor's ability to build group rapport. These new tools are Hoshin Planning and Neuro-Linguistic Programming theories. Using Hoshin planning as the means for documenting training planning makes plans become more visual and effective and better linked back to organizational objectives. Finally, it is essential for an instructor to be able to build interpersonal rapport in a group. This can be done quickly in a group by simply understanding how people store and access information. We will conclude with a brief discussion of representational systems in Neuro-Linguistic Programming.

Virtual QFD; Better Comprehensive QFD Training by *Dilworth Lyman, ViewPoint & Understanding Enhancement.* This paper discusses the different options for teaching Comprehensive QFD, looking at the primary three axes of Depth, Time, and Applicability. These three axes give eight different scenarios for instruction. All eight will be discussed briefly, as they are based in the corner of real and the corner of unreal. An option called Virtual QFD will be explored in detail. It offers a way to quickly train users in comprehensive QFD, correctly meeting the needs for appropriate depth (many matrices) and applicability, all without using very much of a team's valuable time. When to use Virtual QFD is also explored.

TRIZ/Medical Device 1999

Using TRIZ as a Creative Process for Breaking Patterns by *Tore Wiik, Senior Scientist, Sintef, Norway.* Two successful cases in which TRIZ has been used extensively are discussed. Triz has first been used as a tool to stimulate group creativity so that a large number of alternatives have been generated. Then the methodology has been used as a tool to find actual solutions using the classical TRIZ tools for sterilizing equipment for drugs and next generation cutting tool holders.

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Aerospace

The Synergistic Alliance of Systems Engineering and QFD by *John M. Marzec of Rocketdyne Propulsion and Power - Boeing North American.* Rocketdyne Propulsion and Power, a business unit of Boeing North American, has developed a Systems Engineering Process. QFD has been identified as a key process within that discipline. This paper will primarily focus on the role of QFD in the Requirements Management aspect of Systems Engineering. The presentation will include a case study involving a transfer orbit propulsion system.

QFD in Aerospace Applications: A Training Exercise by *Jack Barke of the Information, Space and Defense Systems, The Boeing Company.* This paper explains a teaching exercise that introduces one to the mechanics of QFD. The basis of the exercise is an actual advertisement and specification for a "heavier-than-air flying machine" put out by the Army Signal Corps in 1908. Twelve exercises are covered that walk the reader through the 4 ASI matrices and also the Pugh Concept matrix.

[Poster Paper] Method for Optimizing Resources

Allocation by James Afarin of NASA Lewis Research Center.

This is a nonlinear model which represents a structured approach to make capital investment decisions based on the priorities of the organization and the quality of outputs. This procedure was applied to a multidivisional organization for the proof of the concept at the NASA Lewis Research Center in Cleveland, Ohio.

Automotive 1998

Application of Quality Functional Deployment to

Automotive Fuel System Components by Edward J. Vinarcik of Visteon - Powertrain Control Systems Division. With most products, consumers define quality. Complex products, however, contain components which often are never thought about by consumers. At the component level, quality must be defined internally. The purpose of this paper is to apply QFD to an automotive component, specifically a fuel rail. Included is a discussion of needs for internal customers related to design, delivery, and timing. Dynamic Characteristics / QFD by Shin Taguchi of the American Supplier Institute. The integration of Taguchi Design of Experiments and Quality Function Deployment.

QFD Methodology and its Application in an Automotive Industry Supplier

by P. A. Cauchick Miguel, N. C. Maestrelli, and L. G. Lopes, Jr. of Methodist University of Pircicaba (UNIMEP) and Meritor do Brasil Ltda., Brazil. This paper presents a work on QFD carried out in an auto parts industry in Brazil. It describes the implementation steps as well as some of the achievements. This work also outlines the relation of QFD with aspects of QS 9000 certification. Finally, it points out the principal benefits of QFD application.

Concept Development & Ideation 1998

Consumer Encounters and Idea Development and

Concept Optimization by Brian Barton and Cathy Rings of Rubbermaid, and Glenn H. Mazur of Japan Business Consultants, Ltd. Getting better products faster to customers is critical to the financial success of a company. Traditional approaches to ideation and concept development and optimization begin with product ideas developed internally and then validated through consumer screening and concept testing. By observing consumers in the process of living their lives in their own homes, a deeper understanding of their needs can more accurately drive the ideation process, leading to a better acceptance of concepts in the screening process, more accurate consumer testing, and better volumetric and profit forecasting. This paper reports on Rubbermaid's Consumer Encounter Form which was designed to facilitate a brief 2-hour encounter, prioritize product categories and within those, prioritize consumer needs based on the Voice of the Customer, and lead to product ideas. This form flows directly into our Concept Testing Board for use in the consumer concept tests.

Cost Deployment 1998

Cost Deployment to Improve Customer Satisfaction and

to Reduce Product Cost by Gerd Streckfuss of Institut für Qualitätsmanagement and Dr. Weigang. During QFD sessions, companies in "high-cost" countries request from this method not only to address customers' requirements but also to consider the cost issues. Although often published, there are few case studies, which demonstrate the cost deployment. Our approach: Using comprehensive QFD Deployment and Target Costing, the results of case studies are documented and evaluated. Special considerations: 1) There is a relationship between customer requirements and the actual cost; 2) The Value Graph can be used to start the improvement path. 3. This improvement path is documented in various HOQ's, but some important rules must be watched.

Computer & Software 1998

Introduction of QFD to "What to Design" Process In

Super Design Technology by Kunio Noguchi, Keisuke Nomura, Yuji Kyoya, Yoshifumi Ueda of Toshiba Systems & Software Research Laboratories. The development of an advanced product design process dubbed the Super Design Technology to achieve "product on demand" is underway at Toshiba. We have added QFD to this new method in the form of a database that we can quickly access critical information which is often beyond the scope of typical QFD.

Software Availability Reporting System

by Ann Burtner of Hughes Aircraft, USA. This paper investigates the establishment of an availability reporting system using QFD as a tool to translate "the Voice of the Customer" (VOC) into a product design. The goal of this study is to develop a software reporting product that customers and the computer vendor may easily view for any anomalies, problem trends, and cyclic outages. This report focuses on just one portion of the final product which is the output report the customers view. This report will then become a template for the remainder of the project. The methods used with QFD are VOC, DOE, and SPC.

Using QFD for Computer Aided Design Software Selection

by John Chapdelaine and Linda Coveney of The Wiremold Company. In 1990, Wiremold transitioned to a JIT manufacturing process. In addition, Wiremold had institutionalized Quality Function Deployment (QFD) as its product development methodology. In 1997, Wiremold recognized that its current Computer Aided Design (CAD) system would not meet the needs for future product development. This paper discusses the use of the QFD process to hear the "voice of the customer" for selecting a new CAD system. It details the process of differentiating and weighting the various customers and the methods for collecting data through surveys. Also discussed are the introduction of decision analysis tools into the process, the final results obtained from technical benchmark data, and lessons learned.

[Poster Paper] Business System Analysis

by Joseph Craig of Qualisoft Corporation and Thomas F. Teel of Business Effectiveness, L.L.C., USA. A business system utilizing QFD ensures that customer and business requirements are met and Business Functions / Product and Services are effectively and efficiently managed. Business Functions (How) and the Products and Services Processes (What) of a business are defined and correlated by a Team of subject matter experts and facilitated by Business Effectiveness, LLC.

Education 1998

Using QFD to Research the Demanded Quality of Students

for Lectures by Professor Kozo Koura of Asahi University, Japan. Today, improvement and innovation in education at the university level has begun to spread through Japanese universities. We are seeing a more market-in style of lectures as a two way street between teacher and students instead of a one way product-out style from the professor to the students. Students should be recognized as consumers and the lectures need to meet their requirements. This research is a case study of analysis of "opinionaires" for lecture production control using QFD. The voice of the students was translated into demanded quality deployment and measures deployment was developed from teacher experiments. A quality chart combines both deployments. Importance and weights of planned and designed quality were calculated and a Pareto Analysis implemented. The results were very useful information for the professor.

Using Service Blueprinting and Quality Function

Deployment in Restructuring Educational Service Processes by Dr. Klaes Eringa of The Christelijke Hogeschool

Noord-Nederland, Leeuwarden and Ms. Isolde L. J. Boer of Rijksuniversiteit Groningen, Faculty of Business Administration, the Netherlands. The Christelijke Hogeschool Noord-Nederland has launched a TQM project aiming to restructure educational processes tailored to students' needs. Service Blueprinting maps both the students' learning process and supporting organizational processes. QFD translates students' needs into service process specifications, emphasizing the service encounters. The integration of QFD and Service Blueprinting attempts to improve the student perceived quality of service processes.

[Poster Paper] QFD in Education: An Instructional Case by Dr. P. A. Cauchick Miguel and Dr. A. Weidmann of Methodist University of Pircicaba (UNIMEP) and SKF GmbH. QFD is a powerful development methodology with a wide range of applications. This case study presents a simple case which has been used for both undergraduate and post-graduate engineering courses as well as special industrial training courses. The paper shows the feedback from the participants in some of those courses.

Healthcare 1998

A Hospital-Based Service Example of QFD by Edward Chaplin, M. D., Medical Director of Continental Rehabilitation Hospital of San Diego. The presentation will review a project to incorporate a customer-focus to a rehabilitation hospital service that provides multi-disciplinary evaluations of complex and/or catastrophic injuries. The service is low in volume, complex, provider-intensive and involves multiple business entities (suppliers). The presentation will include the following: (1) Classic Quality Function Deployment - Customer Deployment, capturing the Voice of the Customer, Quality Deployment, Functional Deployment, Reliability Deployment, New Process and Task Deployment. (2) An example of using reinforcing (positive) feedback to self-organize and self-regulate the management of provider commitments which, in turn, enhanced the effectiveness, reliability and robustness of a deployed process. (3) An example where the use of the concepts from ARIZ broke through apparent incompatibilities between demanded qualities of the injured person and the insurance regulations.

House of Quality 1998

An Intelligent House of Quality by Prof. Xiaoqing Frank Liu of the University of Missouri-Rolla. The House of Quality (HoQ) is an important and successful tool in QFD. However, manual development of a HoQ is usually time-consuming and error-prone. We have been developing an intelligent HoQ to relieve users of all calculations involved in developing HoQs manually, detect implicit trade-off and impact relationships and maintain their consistency based on fuzzy logic, and enable automatic archival and management of HoQs based on a database system. In addition, it will not impose any restriction on the way the HoQ is currently used.

Fast QFD: First House of Quality in Half the Time by Mark Farrell of Nortel, Northern Telecom Limited, Canada. A common reason for not using Quality Function Deployment (QFD) is it takes too long. We have developed a method that completes the first House of Quality in half the usual time. We did this by defining two teams, one dedicated to defining customer needs and another dedicated to defining product characteristics. The first house of quality was completed in half the usual time because both customer needs and the product characteristics were defined simultaneously.

ISO and QFD 1998

Environmental Management System on ISO-14000 Combined with QFD by Yoji Akao, Ph.D. and Tetsuya Hayazaki of the Graduate School of Business Administration, Asahi

University, Japan. ISO-14000 is combined with QFD in order to build a better environmental management system. The paper is based on a case study of a construction company with a focus on environmental issues. Environmental requirements were developed through construction work image deployment and combined in a matrix with critical operational functions involving the installation of communication lines, which were then deployed to environmental quality assurance.

Kano Model and QFD 1998

Automated Kano Model Implementation by Kaushik Ghosh, Sanjay R. Mawalkar and Lynnette Blaney of the Battelle Institute. Automation of some tasks involved in using tools like QFD and the Kano model for new product development have contributed to their popularity in recent years. This paper presents a software application that allows for the prioritization of customer requirements by classification into the Kano categories and also allows for subsequent use of the generated data in exercises like QFD.

Medical Device 1998

Using FMEA and QFD to Improve the Design of a Medical Device by Phil Price of Novartis Pharma AG and Ian Ferguson of Ferguson Associates, United Kingdom. The Paper will show the steps taken to question Functionality, Cost, and Reliability of a medical device. This involved a multi-disciplined Team subjecting the proposed concept to a detailed Design and Process FMEA. The results of this evaluation highlighted areas of improvement for the mechanical Design and Patient handling characteristics. The Patient handling evaluation was supported by an ergonomic appraisal, which also yielded information concerning Patient preferences. These results and preferences were incorporated into a QFD led Project which ensured an improved medical device with the required horizons of Cost, Performance, and Reliability. The Paper will show some of the steps taken in the FMEA and QFD process, which led to these improvements.

An Application of Quality Function in the Medical Device Industry by Dr. Shihab Asfour, Dr. Eleftherios Iakovou, Gilbert Cortez of the Department of Industrial Engineering, University of Miami. Medical devices encompass all articles used in the treatment, prevention and diagnosis of disease. We first present the critical quality characteristics specific to the medical device industry. We then proceed with the presentation of a novel application of QFD and robust design in a real-world case study for the design and development of a medical device. Utilization of QFD and robust design in the development process will supercede the regulatory requirements of developing a safe and effective product. The employment of these techniques further leads to shorter time-to-market along with significant cost savings in R&D, manufacturing and service costs.

Quality Assurance 1998

Using QFD to Establish a Quality Assurance Network by Antonio Carlos Ferreira Gomes, Ilka Vilardo, Marcus Vinicius Torres, Murilo Pirozzi, Paulo Roberto Villas, and Renato Machado Vilela of Poligran Polimeros Plasticos Ltda, and Fundacao Christiano Ottoni, Brazil. This paper will describe the infrequently seen but essential aspect of QFD called the Quality Assurance Network. A real case of applying QFD to Quality Assurance in the polymer package industry will be presented not for redesign of the product or changing the specifications, but to assure the actual specifications improving the process capability (Cpk). This network allowed us to optimize the activities related to the Quality Assurance Function based on the voice of the customer and their priorities.

Schedule Deployment 1998

QFD Schedule Deployment: Doing Development Faster with QFD by *Richard E. Zultner of ZULTNER & CO., USA*. QFD traditionally addresses issues of quality, technology, cost, and delivery. For many development projects, the time or schedule of the project is also important. Schedule Deployment is the QFD subsystem that addresses the schedule directly. With Schedule Deployment, by better management of variation, a shorter development project plan can be made--usually 15-25% shorter--with no increase in risk. An example will be presented for software development.

Service 1998

Information Service for the Manufacturing Industry by *Elize Potgieter, Francois Smit, Heleen Snyman, and Johan Strydom of Aerotek, Division of CSIR South Africa, and Ben van Vliet of TechnoSolve*. QFD has been used to upgrade a service, called Infopak, which provides information to the manufacturing industry. Infopak is intended to help firms become more competitive, and to keep them updated on technological trends, topical issues and events in their respective manufacturing domains. Infopak has service, as well as tangible product dimensions. The QFD exercise included a voice-of-the-customer analysis, which circumscribed the definition of information vehicles, packaging and delivery features, functions, and reliability factors.

Strategy 1998

Strategic Planning Process for Welfare Reform using QFD by *Jack B. Re Velle, Ph.D. of Aerojet and G. Kevin McDonald of Raytheon Missile Systems Company*. In 1997, the United Way of Tucson partnered with Hughes Missile Systems to initiate a community-wide, strategic planning process for welfare reform. The process was designed to develop a "high-level," collaborative response to Federal and state legislative changes. A diverse group representing all sectors of the community met for 3 1/2 days to develop a comprehensive, consensual, prioritized plan. The study introduces a national model for similar community actions.

Strategy, QFD and the Balanced Scorecard by *Robert A. Hunt of Graduate School of Management, Macquarie University, Sydney, Australia*. QFD principles when applied to the development and deployment of an organization's strategy naturally develop a tailored set of key performance indicators that will provide the appropriate insights and measurements for predicting future performance that are sought by the Balanced Scorecard method developed by Kaplan and Norton. This research is based on a major four year study of 127 applications of QFD principles to innovation of physical products, services, software, processes and strategy in forty-nine companies in the South-west Pacific Rim. The paper will examine the development of balanced scorecard performance indicators by these organizations, and looks at the association between their use and corporate success.

Transportation 1998

QFD Technique for Composite Railway Sleeper by *M. R. Joshi of Research and Development Establishment (Engineers), Pune, India*. For the development of Railway Sleeper, The Product Development Team coming from three different organizations depended upon the experiences of the team members. Qualitative Requirements stated by the customer were translated into a FRP sleeper product and process characteristics using QFD approach. This work can prove to be a demonstrator for QFD in Product Development Process in India.

TRIZ and QFD 1998

A New Model of the Conceptual Design Process using QFD/FA/TRIZ by *Dr. Noel León-Rovira, Humberto Aguayo of Instituto Tecnológico y de Estudios Superiores de Monterrey,*

Mexico. A comprehensive model of the Conceptual Design Process is presented, which integrates QFD, Functional Analysis and TRIZ. Instructions are presented on how to use TRIZ, starting from the QFD Diagram and continuing through Functional Analysis during the conceptual design stage of new products. The information obtained during the Functional Analysis is used to identify the product structure which reveals the technical parameters needed for the QFD process. Actual examples are shown on how the "roof" of the "House of Quality" may be used as an interface to the Technical Contradictions Table in TRIZ, as contradictory parameters are identified and the design conflicts may be solved based on the Technical Contradictions.

Innovation and Customer Focus: A Medical Marketing Success Study Demonstrating TRIZ and QFD by *Ellen Domb of The PQR Group, and David Corbin of Delcor Interactive International, Inc.* This case study illustrates the iterative combination of QFD, TRIZ, and entrepreneurial intuition that have gone into a successful new business venture. Through use of the technical tools of product development with the founders' intuition and experience, the development and marketing of a unique family of medical products and services has rapidly gone from concept, to prototype, to test market, to nation-wide distribution and sales.

[Poster Paper] Application of TRIZ to Solve a Reliability Problem of a Hard Drive by *Zinovy Royzen of TRIZ Consulting, Inc.* This paper describes TRIZ approaches to identify the best opportunities for development of products. TRIZ will guide you from understanding of the functions of your product to better utilization of its resources. Using TRIZ at the beginning of your project you will save your time and efforts in your search for the ideal solutions. A case study describes application of TRIZ to a difficult problem.

Value Engineering (VE) 1998

Adding Value to CIDM by *M. Larry Shillito*. The last decade has seen a proliferation of tools and best practices for use in product design and company commercialization processes. Each tool by itself can be helpful and effective. Combining these tools with other best practices allows us to expand the application and effectiveness of each. The enhancement of Customer Integrated Decision Making (CIDM) matrices using Value Engineering (VE) is a prime example of such a merger. The enhanced and/or hybrid model can expand team creativity and allow teams to discover new relationships and interactions. This paper will examine the use of value indices, value graphs, value targeting, Customer Oriented Product Concepting (COPC), a variant of VE, to enhance the application of CIDM. The result is an improved balance between customer and company needs and the price cost ratio.

Voice of Customer 1998

The Fuzzy Front End of the New Product Development Process by *Dr. Thomas Hsiang of Universal Foods Corporation*. By now you might have heard many buzz words related to new product development. Examples include Concept Engineering by Shiba, Voice of the Customer, Quality Creation by Kano, Creativity and Innovation, Strategic Quality Planning to name a few. But the bottom line is what are keys to new product success? How can you increase the odds of successful product launches? This presentation will discuss candidly the best new product strategies, particularly focusing on the "fuzzy front end" of the new product development process.

Using Neural Networks to Analyze the Voice of the Customer by *Robert L. Brass of Development II, USA*. There are three steps involved in the process of creating successful Utility products and services. The first is to identify the problems that exist. The second is to characterize the value of those problems as perceived by your target market while the third is to create a product or service that effectively solves the

high priority problems. The key to the process is defining the problems and knowing the priority of those problems or issues in quantitative terms so that they can provide a valid benchmark. The second step, the prioritization and quantification of those problems is the main subject of this paper. This process involves market research but the uniqueness lies in the analysis of the data and the structuring of the questions to enable that analysis. The third step is left to those rare creative individuals who, given the prioritized problem, have the unique gift to develop marketable solutions.

General 1998

Managerial Implications for Customer Focused Product Development by *Anders Gustafsson, Torbjörn Forsberg, Lars Nilsson and Mattias Elg of Linköping University, Division of Quality Technology and Management, Sweden.* Several case studies on Swedish companies with great experience in the use of QFD, including Volvo, SAAB and SKF, have been conducted. This paper draws conclusions about some managerial implications on the use of QFD and draws comparison with results from other studies (Hunt, 1997). The foundation for the paper is two case studies, TA Control and Mölnlycke, two companies with positive effects of using QFD. The paper describes the effects of using QFD and scrutinizes driving forces behind some identified differences, e.g. environmental variables and approach. The result may serve as a guide when implementing QFD.

Selecting the Best Direction to Create the Ideal Product Design by *Dr. John Terninko of Responsible Management, USA.* The number of practitioners who go beyond remapping customer information into engineering information by using the House of Quality matrix is slowly increasing. Few try function analysis, reliability deployment or use the negative feedback of the gemba. This paper presents the integration of failure modes and function analysis to identify breakthrough development concepts. Reduction in the failure modes and increases in reliability are natural consequences. AHP prioritizes the projects using the priorities from the House of Quality. The driving force is the ideal final result as defined by the function associated with the most important performance measure in the House of Quality.

The Virtual Corporation and QFD: The Key to Effective Breaking of Boundaries by *Dilworth Lyman of ViewPoint & Understanding Enhancement, USA.* The virtual company is the dynamic alliance with other companies that already possess the resources required to synthesize new productive capabilities very quickly. QFD structures, methods, tools, and systems can provide the basis for meeting the critical need for understanding within and throughout all of the various points of view. We will also discuss the part QFD plays in moving beyond asset management to resource leverage.

Will Your QFD Add Value to Your Operation? How to Find Out by *Allan J. Sayle of Allan Sayle Associates.* QFD aims to enhance corporate results through improving product and service quality. Properly applied, it can be a valuable tool. But it can only be truly effective if implemented within a well-constructed framework of effective data gathering, business systems and processes. This paper describes how that framework can be assessed to determine whether or not QFD will deliver the results desired and value-adding operations will be obtained. Matters to be addressed and examined are described together with their relationship to requirements of business performance, ISO 9000, QS 9000, customer expectations and market conditions. How management can use the assessment results, to ensure not only that the method of performing QFD will be effective but also its desired outcome will be achieved, is discussed.

Value Management: Integrating QFD in the Product Value Deployment Process by *Horst R. Schoeler of Schoeler & Partner.* In the continuing search for new ways of securing a

competitive edge, it becomes more and more important to be able to demonstrate that the own product or service offers better value for money than the competition. This target will be achieved through the Value Management approach. The concept of value lies in achieving a balance between the satisfaction of many different customer needs and the resources used. The presentation shows the framework of Value Management and the systematic combination and involvement of different methods like Value Engineering, QFD, Target Costing. Not a single approach of a method or methodology is responsible for successful products and services. It is necessary to achieve the best process and apply appropriate methods in a holistic view.

Moderated Knowledge Mapping - Forming Breakthrough and Knowledge Transfer! by *Janice Marconi of Marconi Works, International.* Moderated Knowledge Mapping is a powerful tool that helps teams create new ideas and form knowledge into accessible organization learning. Initially pioneered by Larry Smith, it has been further developed and codified. Moderated Knowledge Mapping is a highly interactive kinesthetic and visual process with a unique synthesis of: Mind Mapping, Functional Analysis, and German Moderation / Metaplanning techniques.

[Poster Paper] An Intelligent Systems Approach to Quality Function Deployment (QFD) by *Ms. Vivianne Bouchereau and Dr. H. Rowlands of University of Wales College, Newport, South Wales, United Kingdom.* This paper will discuss how techniques such as Taguchi Method, Fuzzy Logic, and Artificial Neural Networks could be incorporated within QFD to resolve some of its drawbacks, such as the complexity of the QFD charts, ambiguity in the data collected and determining the interrelationship between processes. These proposed techniques will be adopted to produce an intelligent systems approach to QFD.

[Poster Paper] Quality Planning in the Existence of Multiple Customers: A Scoreboard Design Case by *Gülser Köksal of Middle East Technical University and Özlem Fındıkoglu of Ayдын Software and Electronics Inc.* In this study, an approach is presented to identify and prioritize multiple customers' requirements for the design of a scoreboard used in basketball games. Four main customer groups are identified: Audience, referees, bid evaluation committee, and the QFD team. Analytical Hierarchy Process is used to determine weights of customer requirements for each of these groups as well as the final weights.

[Poster Paper] Don't Bank Just on Methodologies by *Detlef Blankenburg, Marit Ranæs, and Tore Holmboe Wiik of SINTEF Material Technology & Nordak Innovatikk, Department for Design and Product Development, Norway.* The project was planned to give the case company a new product generation. The product development process was concerned with Voice of Customer, QFD analyses, Pugh analyses, DFM and even concurrent engineering. External industrial designers and usability testing was used to secure both style and user-friendliness. After two years of extensive work the project was stopped due to the dramatic change in both product design and production system. The paper will try to describe the process performed until the final decision was made to stop the project, and to analyze some of the weaknesses of the methods mentioned when not taking into account human factors.

[Poster Paper] Merging Two QFD Models Into One: An Approach Of Application by *Luiz C. R. Carpinetti, Ph.D. and Manoel O. C. Peixoto of School of Engineering of São Carlos, University of São Paulo, Brazil.* This paper presents an approach to the application of Quality Function Deployment that brings together the models developed by Don Clausing (Enhanced QFD) and Akao. It utilizes some of the tables and matrices proposed by Akao (1990) along with the basic four phases product and process deployment proposed by Clausing (1993). The steps involved in the proposed approach are depicted and justified and a discussion is made on the benefits of the

proposed approach.

[Poster Paper] Assigning Importance to Hows: Analysis of Two Competing Methodologies by R. Alan Kemerling of *Ethicon Endo-Surgery, Inc. (division of Johnson & Johnson)*. This paper and underlying research looks at two different methods (a simple arithmetic calculation and one that uses a weighted Whats importance value) for calculating the importance of Hows in the project. Using Monte Carlo simulation, hundreds of different QFD matrices were developed and the two distribution methods compared for their affect on the resulting priority of key Hows.

[Poster Paper] Using QFD to Develop a Planning Budget Linked to Organizational Objectives by Vito Wasniewski of *INFOnetics, Inc.* Annual Budgets or Operating Strategies are one of the least favored and time-consuming activities performed by Directors or Department Managers (except for perhaps employee reviews). Using QFD can speed this process, but more importantly, drive more co-ordination, communication, and agreement of projects among a management team. This case study presents the process that developed the priorities for over 180 projects, drove rapid agreement among directors, and resulted in a business model.

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Blitz QFD® 1997

Using the QFD Blitz for Making Better Proposals by Dr. Thomas Fehlmann and Dr. Ernest Wallmüller of *Unisys (Schweiz) AG*. Writing proposals is a critical step for the success of a project involving external suppliers. It initiates the process of synchronizing the value chains between suppliers and customer. This paper describes the adaptation of Blitz QFD® to proposal drafting and writing, and the demonstrated results of better competitive position, higher success rate, reduced cycle time for preparation and more understandable proposals.

QFD as a Support System to the Identification of Key Ideas for Technological Changes/Innovation by Antonio Di Zanni of *Piaggio Veicoli Europei S.p.A.* This paper describes Piaggio's use of QFD to identifying areas of technological innovation and product concept innovation based on the BLITZ QFD® technique. The presentation will describe the results to date including, the definition of a needs tree of European two-wheeler customers, definition of product function tree, identification of priority market segments, and the identification of innovation areas peculiar to market segments.

Construction 1997

Using Post-Occupancy Evaluation and QFD Methodologies to Improve Quality in Building Construction by Elizabeth K. A. Londe, Carlos Alberto Nunes Cosenza and Monica Santos Salgado of *Universidade Federal do Rio de Janeiro*. Post-Occupancy Evaluation (POE) analyzes the relationship between the built environment and the user behavior. It's primary usage is to evaluate the performance of buildings while QFD provides a systematic approach for the analysis of customer demands. This paper presents how to integrate POE and QFD in a consistent way so when used together they are effective way to listen to the voice of client in building construction.

Consumer Products 1997

Developing an Integrated Model of Designing the Ideal TV for the Consumer through QFD: A Consumer Electronics Case Study by Taylan Özsipahi and Haluk Ünsal of *Beko Elektronik*. Beko Elektronik is the leading consumer electronics manufacturer in Turkey. This paper presents a case study on the application of QFD methodology to the development of a new series of televisions main chassis in order to obtain the optimum picture quality with competitive price characteristics. In addition, the integrated product development process used at Beko Elektronik is discussed.

Defense 1997

Modeling Knowledge Integration, Extending House of Quality to Meta-Fusion by Kevin Marler of *Raytheon E-Systems*. This paper will demonstrate how the House of Quality (HOQ) models within QFD can be extended through Meta-Fusion to evaluate teaming arrangements. Meta-Fusion is the effective integration of knowledge from industry partners, educational institutions, and government agencies. A team from Raytheon E-Systems' Garland facility will demonstrate how Meta-Fusion HOQ was used to propose a teaming arrangement to produce a virtual-reality training system.

Systematic Application of Quality Management Principles in a Military Organization by Master Sergeant Ronald G. Ferrick and Staff Sergeant John D. Marshall of the *U.S. Air Force, 16th Logistics Group*. Introducing quality management principles to military organizations produced some real challenges for this quality integration office. Foremost of these challenges were the acceptance of quality principles such as customer, vision, process, teams, empowerment, and metrics into a military environment. This paper describes the results of this effort and a strategic planning approach to tie all the principles together in a systematic application.

Function Analysis (FA) 1997

Function is the Foundation by Larry Shillito of *Eastman Kodak*. Function analysis (FA), born in value engineering, has proven to be a valuable tool in the world of QFD. Function is the interface between the customer and product. If we understand the interface between product function and Voice of the Customer (VOC), FA can be used to augment the VOC collection process. This paper will illustrate the use of FA for VOC acquisition and product design and technology selection.

General Industry 1997

Task Deployment: Managing the Human Side of QFD by Glenn Mazur of *Japan Business Consultants, Ltd.* This paper will discuss the history of Task Deployment, its structure based on the 5W2H3C formula plus flow charting, and give examples of applications in QFD from determining project teams, defining market segments based on product usage, guiding customer visits, analyzing customer's business problems, creating job descriptions and plant requirements for service operations, and redefining the New Product Development Process itself. This paper is based on the pioneering work of the late Dr. Shigeru Mizuno (co-developer of QFD with Dr. Akao) and the author's own work over the past twelve years.

20 Ways to Make Sure QFD Will Fail in Your Organization by Mike Wilson of *OSW Cornerstone Associates*. This paper will draw on extensive experience in the application of QFD to manufacturing and service organizations to report on a composite of customer interactions. Included will be a discussion of success stories, applications of QFD to new industries, unique problems and solutions, and new or supporting techniques that will lead to the successful application of QFD.

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QFD: The Swedish Experience by *Fredrik Ekdahl and Anders Gustafsson of Linköping University, Sweden*. The results from a survey covering over 30 Swedish companies regarding the type of Swedish companies that are using QFD, how they use it, the difficulties they have encountered and the benefits they have realized. Selected case studies will be presented from companies on the leading edge of QFD usage in Sweden.

Confirming Expert Judgment through Correlation by *William Slabej of IVON Corporation*. This is a paper about a key supporting technique that elevates the relationship matrix from one based solely on expert judgment to more thorough methods. Use of correlation techniques to identify relationships allows expected relationships to be confirmed as well as identifying other unexpected measures that may drive customer perception. For people who are new to QFD, this advanced technique improves the core process of QFD which is the translation of customer requirements into company requirements. Advanced users will appreciate the helpful hints, tips and pitfalls to using R2 correlation methods to confirm relationships.

A Non-Traditional Use of QFD: QFD Integrated with Management Systems to Determine Organizational Structure and Performance Evaluation by *Richard A. Jacobs of Columbia Gas of Ohio*. QFD can be defined as a matrix analysis which can be used to prioritize expectations and resolve conflicts. Management can be viewed as a system comprised of six primary components: leadership, power, culture, accountability, interactivity, and responsibility. By merging these two premises a new technique for determining organizational structure and performance evaluation can be developed. This paper describes this non-traditional use of QFD.

Expand, Collapse, and Subset - The Keys to Small Matrices by *Dilworth Lyman of ViewPoint & Understanding Enhancement*. Large matrices have been the death of more QFD efforts than any other single cause. This presentation describes how to focus efforts where they are most needed with an increasing level of detail. The methods to accomplish this are Expand, Collapse and Subset. This paper will show how and when to use each of these methods, explaining the mathematics and rigor necessary to preserve the value and accuracy of the matrices.

Systems Thinking Simulations as an Aid for Design QFD by *Joe Miller of Quality Process Consulting*. Systems Thinking based simulations of proposed product and service concepts provide a powerful extension of QFD. This paper presents specific approaches and examples for defining models from QFD identified functions and quality characteristics, and demonstrates software aided execution of those models. These simulations have proven useful to expand team and management understanding of product concepts and have aided more realistic design target setting.

Accelerating QFD by *Gershon Blumstein of Electronic Data Systems*. The effect of Trade Off Studies on vehicle development has been successfully applied to developing automotive subsystems. The results have been dramatic in supporting the Concurrent Engineering process. The objective of this paper is to explain how to use the information generated from the Trade Off Study in order to choose the best concept alternative that meets the requirements (needed functions) of several customers. This is used to accelerate the QFD process.

Improving Quality Function Deployment Through Customer Feedback: A Case-Based Reasoning Approach

by *D.A. Adams, Prof. C. Irgens and Dr. E. MacArthur of University of Paisley*. It is proposed that it may be possible to learn by correlating historic QFDs with customer feedback data. Identification of similarities between QFDs and historic QFDs should enable the reuse of solutions - or partial solutions - which worked, the omission of unsuccessful solutions, or the improvement of solutions. This paper develops this concept and discusses a prototype system which adopts an artificial intelligence technique known as Case-Based Reasoning to identify similarities between new and historic QFDs.

Healthcare 1997

Prioritizing Customer Requirements in a Rapidly Changing Marketplace by *Bill Naccarato of Dade International, Inc.* Changes in health care financing methods have led to substantial changes in health care delivery, which provide a significant challenge for new product development in the industry. Using a structured process for product definition, Dade is now developing an analyzer that will facilitate workstation consolidation within hospital clinical laboratory. This talk presents an overview of how the change in the health care market affect design of analyzers. Using actual data, the presentation will demonstrate the techniques used to process information and prioritize customer requirements.

A QFD-Based Evaluation of Prevention Services by *Robert F. Hales, ProAction Development, Inc., Pamela Clark and Don Lakes of TriHealth*. With financial incentives changing in the healthcare environment, healthcare organizations, physicians, and employers need to become focused on developing and offering health services that are designed to prevent, or minimize the impact of illness or injury. This paper will describe the process used to develop an overall corporate strategy, structure and service based solely on the benefits TriHealth's customers' desire from a Prevention Services provider.

Hoshin Planning 1997

Hoshin Planning and QFD by *Ian Ferguson of Ian Ferguson Associates, UK*. This paper discusses the organizational and cultural needs required of a company before considering implementing Policy Deployment using a Hoshin Kanri methodology. A step-by-step process is described to make a company mission and values a reality by directional strategies and goals being deployed through targeted policies, into plans with measurable control items.

Manufacturing 1997

A Competitive Advantage by *Pamela Dunham formerly with AIDA-Dayton Technologies Corporation*. This paper describes how a manufacturer of metal forming presses and auxiliary equipment utilized QFD, Strategic Planning and Policy Deployment to address the basic business questions of: What is important to our customers?, What activities should be our focus in the next 1-5 years?, How do we focus associates on the company strategic objectives? and How do we gain and sustain a competitive advantage in the marketplace?

Reliability 1997

Reliability Function Deployment - RFD: A Systems Approach by *Jayant Trewn and Dr. Kai Yang of Wayne State University*. The purpose of this paper is to provide a conceptual framework to be used to deploy reliability characteristics into the functional design of a system (component, part, or a product as a combination of components or parts). Integration of reliability requirements into the design of a system, product or process is achieved through an integration of QFD techniques with Fault Tree Analysis.

Software 1997

Deploying Software QFD Within Large Organizations by *Thomas Gorham and Mark P. McDonald of Andersen Consulting*. This paper is a summary of approximately 30 case studies where QFD has been used for software development. The paper will discuss success stories and areas for improvement spanning utilities, financial services, manufacturing, telecommunications and other industries, as well as around the world including the U. S., Canada, Australia, and Germany.

Project QFD Managing Software Development Projects by *Richard E. Zultner of ZULTNER & CO*. Blitz QFD, a "maximum value for minimum effort" approach to QFD, can be used by project managers to concentrate on those project tasks that add the most value to customers. Application of such "efficient customer satisfaction" for a software development project is shown.

Strategy 1997

Strategic QFD for Product Platform and New Technology Planning by *Karla Kuzawinski and Dave Zawadzki of Xerox Engineering Systems*. As corporations strive to leverage investments in technologies, core competencies, and resources, greater emphasis needs to be put on linking these investments to strategic direction, and getting greater returns by leveraging these investments across families of products. This paper will present how QFD can be used to align both near and long term advanced technology research efforts and corporate strategic direction.

Applying QFD Principles to Strategic Transformation by *Robert A. Hunt of Macquarie University, Australia*. Based on a major four year study of 127 applications of QFD principles to innovation of physical products, services, software, process and strategy in forty-nine companies in the South-west Pacific Rim, this paper outlines some of the major findings of the study. Among others it gives insight into the importance or otherwise strategic connection and organizational culture for success in innovation and transformation.

A Strategy Formulation Methodology Based on QFD for Traditional Manufacturing Companies by *Antony Lowe and Prof. Keith Ridgway of the University of Sheffield, UK*. In order to encourage a market focus, innovation and the adoption of modern manufacturing techniques within local companies, a strategy formulation/review methodology using adapted QFD has been developed at the Manufacturing Research Group at Sheffield University. This paper outlines the basis on which this methodology was built including current thinking in strategy research, innovation techniques and QFD. A step-by-step process for its implementation is described, and a case study where the methodology was applied within a manufacturer of coal mining equipment is given.

Telecommunication 1997

Advanced QFD Techniques for Creating a Competitive Edge in a Deregulated Telephone Market by *Martin Lossie of Coopers & Lybrand Management Consultants*. This paper presents a success story of the application of QFD in the area of telecommunications service provider. Deregulation enables a cable TV operator in The Netherlands to introduce telephone service to residential and business customers. The ability to compete with the incumbent telephone company required an insight to customer satisfaction drivers. QFD was successfully used to identify a comprehensive portfolio of company ingredients that form the basis for creating customer satisfaction.

QFD As a GIDE to Product Realization by *David Bowen of Lucent Technologies Network Systems and Patrick G. Brown of*

Lucent Technologies Bell Laboratories. This paper illustrates the successful application of QFD to an internal process alignment between historically warring functions. Network Systems' use of a QFD approach to frame and translate these stakeholders' voices into Guidelines for Installation, Design & Engineering (GIDE) in a cross-organizational setting has enabled Network Systems to foster product designs that are better-aligned with the entire value creation chain, helping ensure lower end-to-end costs and faster product introduction & change cycles.

Training and Education 1997

Training Function Deployment: Applying QFD to Staff Development by *John Stampen of Home Savings and Leveraged Learning*. Training Function Deployment (TFD) is a specialized application of QFD that helps assure organizations that their employees are able to perform important job functions. This paper describes the TFD process which begins by building a position profile that prioritizes development goals and identifies related knowledge and skills. It then determines the learning options that will have the greatest likelihood of impacting job performance. The profiles that TFD generates can also be used for recruitment and hiring performance feedback, career planning and training curriculum development.

TRIZ 1997

The TRIZ, QFD and Taguchi Connection by *Dr. John Terninko of Responsible Management, Inc*. Taguchi's approach to robust designs has been in North America since 1981. QFD arrived in 1984 and the new comer TRIZ arrived publicly in 1991. They each have their strengths and weaknesses but together they become an unbeatable powerhouse of Customer Driven Robust Innovations. This paper discusses the linkages between these and other powerful quality tools. The synergy formed becomes the ideal design process.

TRIZ and Integrated New Product Development by *Steve Ungvari of SPI, Inc*. In today's fiercely competitive marketplace, companies must find new strategies to fuel sustainable competitive advantage and growth. New product development coupled to innovation provides organizations unique opportunities to shift the competitive balance in their favor. TRIZ is a powerful new tool that will leverage the power of innovation into the new product development process. This paper will provide the rationale for the use of the tool and explain how the specific TRIZ tools are to be used to vastly improve the new product development process.

TRIZ: Acceleration of Conceptual Design in Product Development by *Zinoviy Royzen of TRIZ Consulting, Inc*. Understanding and forecasting of the inevitable evolution of a product accelerates its development, eliminates overlooking of the most promising concepts, helps to develop the strategy of innovation, protects the market by umbrella patents and helps to avoid some very expensive mistakes. This paper describes some of TRIZ approaches to accelerate conceptual design in product development.

Application of TRIZ for Design of New Materials by *Semyon D. Savransky of West Coast Quartz Corporation*. TRIZ is used for the innovative resolution of various technical and physical contradictions in the artificial systems. This paper will illustrate the use of TRIZ principles, such as SuField Analysis, for the design of new materials for electronic applications and the novel class of superconductors - chalcogenide glasses and even melts.

Anticipatory Failure Determination (AFD): The Application of TRIZ to Risk Analysis by *Stan Kaplan of Bayesian Systems, Inc*. Today there is burgeoning interest in quantitatively assessing risk. This interest ranges over a huge spectrum from food safety and environment to transportation, power generation, business risk, investment risk, military risk, etc. One new method is Anticipatory Failure Determination

(AFD) and is an application of Russian theory, TRIZ, of inventive problem solving. This paper will present an exposition of AFD in comparison to and within the context formed by the conventional approaches.

Voice of Customer 1997

Using VR-Based Conjoint to Capture the Voice of the Customer by Lisa Wood, Mohan Bala, Dean Hering of Research Triangle Institute and Todd Romig of Volvo GM Heavy Truck. This paper describes how Research Triangle Institute used an innovative new tool - TradeOff VRTM - to incorporate the voice of the customer into the product planning process at Volvo GM Heavy Truck. Volvo used TradeOff VRTM - which combines conjoint analysis and virtual reality - to gather customer preferences for feature of a new truck early in the product design process without using physical prototypes.

1996: 8th Symposium on QFD and 2nd International (ISBN1-889477-08-7)

Conjoint Analysis 1996

Conjoint Analysis - A Useful Tool in the Design Process by Professor Bo Bergman, Fredrik Ekdahl, and Anders Gustafsson of Linköping University (Sweden). This paper presents conjoint analysis as a tool to help elicit customer's priorities. It illustrates a possible work flow for conjoint analysis and provides an example of the information collected.

Reusable Medical Device Development - Creatively Meeting Customers' Needs (Applied Conjoint Analysis & QFD) by George J. Marcel, Heidi Youngkin, and Bob Anthony of Guidant - Origin Medsystems, Inc. (USA). This case study provides the initial results on integrating marketing and quality tools in a medical device application - a reusable (partially reusable, partially disposable) instrument used in Minimum Invasive Surgery. It addresses how use of combined disciplines can provide an improved product that meets or exceeds the customer requirements in quality, cost, and timing.

Construction 1996

QFD in Building Design by Petri Laurikka, Antti Lakka, and Mikko Vaino of VTT Building Technology (Finland). Rapid and quality completion of buildings tailored to individual needs of customers is setting new challenges to methods of building design. Success in temporary project organizations may require systematic working procedures and appropriate tools. This paper reports three construction projects that applied QFD as a team decision-making tool to listen to the voice of the customer to achieve common understanding, consensus, and commitment in design objectives and design solutions. The depth in which QFD was applied followed the tradition of the construction industry - "quick and dirty." Nevertheless, the result were encouraging: QFD provided a systematic method for the analysis of the customer demands. Each case project resulted in several design changes that were appreciated.

QFD on a Construction Project Process for a Multi-compartment Silo by Luiz Roberto Prates of M. Roscoe S.A. Engineering (Brazil). This paper reports a construction project of a multi-compartment silo for a cement industry that used the QFD processes. The main objective was to assure quality as well as reduction in project time and cost. The project team was composed of a civil construction company, project office, mechanical assembly company, and the cement company (the client). The relationship among the phases of civil construction

methods, control parameters, mechanical assembly, and the silo project quality characteristics were analyzed. New solutions and execution methods were developed.

QFD in Building Construction by Syed M. Ahmed and Roozbeh Kangari of The Hong Kong Polytechnic University (Hong Kong) and Roozbeh Kangari of the Georgia Institute of Technology (USA). This paper proposes a QFD model for the construction industry which consists of: 1) Client Requirements Diagram that identifies the top, intermediate, and basic client satisfaction events; 2) Responsibility Matrix which identifies clients, architects/engineers, and contractors responsibilities; and 3) Quality Charts based on the necessary and sufficient conditions required for quality work in planning, design, and construction. The model can be applied to keep track of the interdependencies and interrelationships of different parties involved in the industry. By closely monitoring these complex and often grey areas of responsibilities, a continuously improving process can evolve, ultimately resulting in increased client satisfaction.

Design of Experiments 1996

QFD Implementation in DOE by Dr. Eli A. Glushkovsky of TelRad (Israel). At the stage of DOE planning, QFD may successfully provide: Cause-and-Effect Diagram analysis, selection of appropriate factors and number of factor levels, choice of DOE type and resolution. At the state of DOE execution, advanced QFD makes it possible: 1) to create visual models based on expert rules such as "if factor A is high, then response variable is low"; 2) to apply three models for "what-if" simulation and optimization.

Electronics 1996

Product Development System Using QFD and Other Methods at Kinpo Electronics by Jyh-Ren Yang and Chen Hsiu Li of the China Productivity Center (Taiwan). Kinpo Electronics, one of the world's leading manufacturer of calculators and facsimile machines, used QFD to construct a product development system of their own that would connect related activities through their 28 departments as well as shorten the product development cycle.

Improvement of Memory Product Development System Through Quality Function Deployment by Ju-myung Lee, Semiconductor Business, Samsung Electronics Co., Ltd. Samsung began QFD in 1994. In the second application project, a small cross-functional team was composed to complement the development system of the memory products and to reduce the development time through defining the requirements for product development and systematizing QA activities. This paper presents a Comprehensive QFD project within the Samsung Semiconductor Business.

Food 1996

Exploring a New Market for Sausage Using QFD by Francisco M. Ormenese, et al of Sadia Concórdia (Brazil). This study was to develop a new fresh pork sausage for the southern areas of Brazil. Through qualitative consumer research and supermarket supervisors direct interview, consumer and market needs were identified. Good understanding of these needs simplified prototype development. The quantitative consumer research found the newly developed prototype obtained superior performance in comparison with the product of the main competitor. The consumer voice was efficiently translated to the QC process chart using QFD methodology.

Food Product Upgrade Using QFD by Ioanis Athanase Sarantópoulos et al of Sadia Concórdia (Brazil). Sandia, the largest meat processor in Brazil, used QFD to regain market share, reduce costs and improve intrinsic quality of the product as perceived by the consumer. The conceptual model was

developed viewing the production flow process from downstream to upstream, starting with the quality characteristics of raw materials, followed by quality characteristics of auxiliary raw materials, of intermediate products, and finally , of the finished product. The final response of consumers after launching the product clearly indicated fulfillment of the proposed goals and the benefits of QFD method for the company.

Bagel Sales Double at Host Marriott with QFD by Steve Lampa, VP Quality of Host Marriott and Glenn Mazur of Japan Business Consultants, Ltd. (USA). Three recent trends have led to changes in the way travelers view airport food: 1) Healthier and lighter food; 2) more women travelers; and 3) fewer on-board meals being served. Host Marriott, which operates 70% of the U.S. airport food and beverage market, wanted to assure that its product offering were keeping up with customer demands. What they discovered was that their traditional approach to new product and service development was penny profit driven and not customer focused. QFD was employed to make quality and customer satisfaction more important. Within one month of completion, sales doubled.

General Industry 1996

The Keys to Successful Selling of QFD: Helping Management Choose to "Do QFD" by Diworth Lyman of Viewpoint & Understanding Enhancement (USA). Successful use of QFD on a company-wide basis requires a significant commitment of resources. This paper addresses the issue of getting management buy-in to QFD by selling QFD as a solution, not just a new technology.

Strategies to Implement QFD in the Basque Country of Spain by Mikel Sorli and Alberto Gomez Telletxea of LABEIN (Spain). The implementation of QFD in Spain, and in particular in the Basque Country has been slow and without the expected successes. A new strategy based on the synergy between Quality Assurance System ISO 9000, is doing the QFD process backwards, starting with manufacturing and ending with the House of Quality or A-1 Matrix. At first look, this flow is completely opposite to the current view of QFD, but the reason is found in the early beginnings of QFD.

Customer and Product Profiling in the "Fuzzy Front End" by M. Larry Shillito of Kodak (USA). Company and customer focus are too often lacking in the front end of the commercialization process. This causes significant downstream course corrections which increase unit manufacturing cost, extended cycle time, and offset the balance between company and customer needs. This paper proposes the Customer Profile and Product Profile, two front-end, macro-level converging tools to focus product and projects, that can be applied before application of QFD, to reduce mid-stream design engineering process changes.

How to Connect Technology Seeds to Customer Needs by Dr. Kozo Koura of Asahi University (Japan). "Seeds" is defined here as a material or technology that was developed based on the social and technological trend forecast (anticipated needs) or in the course of R&D. This research paper discusses "Seeds-derived QFD," a focus of a research committee at the Japanese Union of Scientists and Engineers since 1988.

Conflict Management in Design by Stephan Jacobs and Michael Gebhardt of Ericsson Eurolab Deutschland (Germany). Conflicts are not necessarily destructive. They motivate, stimulate, and initiate improvement. Effectively managed, conflicts are a necessary precondition for creativity. This paper presents a conflict management theory and a toolkit for conflict management support that are based on the QFD principles.

Product Differentiation Through QFD by Robert Hales of ProAction Development, Inc. (USA). QFD teams should use QFD

to create product differentiation by avoiding certain failures. This paper discusses the benefits and how to use QFD in product development to create differentiation from competitors.

Why QFD Fails and What to Do About It by Gershon Blumstein, EDS. Many individuals would like to view QFD as just another management fad. This paper proves that this perspective is seriously flawed. As a methodology to support Concurrent Engineering, QFD is even more critical than it was originally introduced in North America. This paper explains the common mistakes that organizations make in implementing QFD and provides guidance to avoid those mistakes.

Integration of Total Quality Methodologies with Simultaneous Engineering Concepts in a Comakership Frame

by Mikel Sorli and Alberto Gomez of LABEIN (Spain). This paper is on the importance of rapid reaction to market requirements and meeting or exceeding customer expectation and reducing lead time and cost. Based on experience developed from 1993 to 1995 within the frame of a Brite European Project.

Healthcare 1996

A Customer Integrated Decision Making/QFD Project by a Multi-function Team of Health Care Providers Planning a Treatment System for Adults with Attention Deficit Disorder (ADD) by Douglas W. Penz, PhD, Judith Daniels, MD, Thomas E. D'Erminio, LISW, BC, and Bill Barnard, BS, CS, CPIM (USA). A team including a physician, clinical psychologist, and clinical social worker is using CIDM/QFD to identify customers and their needs for treatment of adult ADD. The treatment facility is expected to open in the summer of 1996.

Information Systems 1996

IT Support for QFD: An Innovative Software Concept Providing Project Management and Team Tools by T. Pfeifer, Albert Neumann, Robert Grob of Laboratory for Machine Tools and Production Engineering, University of Technology in Aachen, Germany. This paper describes a new and innovative IT approach to support QFD efforts. Deriving from observation of failed QFD projects in Europe, the paper proposes factors for a successful QFD implementation and shows the general software concept for project management and team tools.

The Role of QFD in Quality Information Systems by Syohei Ishizu of Aoyama Gakuin University and Noriharu Kaneko of Service Quality Management (Japan). Information systems and databases are important to product planning, design, manufacturing, etc. QFD can be used to help construct those systems.

Manufacturing 1996

QFD in a Brazilian Steel Company by Carlos Augusto de Oliveira of Belgo-Mineira Steel Company (Brazil). One of the largest Brazilian manufacturers of wire rods and drawn wires used QFD to reduce costs and increase market share in rods and bars for car suspension springs. Matrices of quality, cost, reliability deployment, FMEA, Taguchi Methods and regression analysis were combined. This effort resulted in 23% cost reduction, 90% customer complaints, and a steady increase in market share.

QFD at Kawasaki Heavy Industries by Susumu Yamamoto, Kawasaki Heavy Industry (Japan). Kawasaki, a major manufacturer of heavy machinery, ships, vessels, cars, motorbikes, and plant equipment in Japan, presents their unique approach to QFD with special focus on product liability and safety through improvement of the upstream design quality. Exemplary QFD charts are included.

Beyond the First Chart: QFD for Process Improvement by Mike Graetz of 3M Tape Manufacturing Division. This presentation demonstrates some techniques especially useful for process industries and improving the existing product and process. Specifically, the QA/QC planning chart, process stage chart, and process control strategy charts are proposed, and their purpose and usage are explained.

How to Apply the Power of Computing to the QFD Process by Karla Kuzawinski, Xerox Corp. (USA). Implementing QFD requires collection, distillation, and organization of many sets of data. This paper presents recommendations on when to consider and how to use computers to support various parts of the QFD process. Not all aspects of the process should be automated since group discussion and interaction is a very valuable part of developing a common level of understanding of customer requirements. The recommendations in this paper also include a look at existing off-the-shelf computer tools that can be applied to QFD and thoughts on other aspects of QFD team support.

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Medical Device 1996

Reusable Medical Device Development - Creatively Meeting Customers' Needs (Applied Conjoint Analysis & QFD) by George J. Marcel, Heidi Youngkin, and Bob Anthony of Guidant - Origin Medsystems, Inc. (USA). This case study provides the initial results on integrating marketing and quality tools in a medical device application - a reusable (partially reusable, partially disposable) instrument used in Minimum Invasive Surgery. It addresses how use of combined disciplines can provide an improve product that meets or exceed the customer requirement in quality, cost, and timing.

Reliability 1996

QFD and Product and Process Reliability by Ian Ferguson of Ian Ferguson Associates (United Kingdom). This paper shows how post-House of Quality data can be used for reliability, test planning, and risk analysis with such tools as Fault Tree Analysis; how it can be used with experimental design, product and process design to ensure robustness to uncontrollable events. The point is illustrated using examples from automotive, health care, and software engineering industries.

Service 1996

QFD Implementation in Hospital Housekeeping Services by Noriharu Kaneko of Service Quality Management Ltd. (Japan). One of the greatest threats to patient health is infectious disease. Hospitals must go to great lengths to see that disease does not spread from one patient to the next. Mr. Kaneko, one of the first to apply QFD to services, shows how his company is pursuing ISO9000 compliance to assure cleaning crews to the job right the first time.

Bagel Sales Double at Host Marriott with QFD by Steve Lampa, VP Quality of Host Marriott and Glenn Mazur of Japan Business Consultants, Ltd. (USA). Three recent trends have lead to changes in the way travelers view airport food: 1) Healthier and lighter food; 2) more women travelers; and 3) fewer on-board meals being served. Host Marriott, which operates 70% of the U.S. airport food and beverage market, wanted to assure that its product offering were keeping up with customer demands. What they discovered was that their

traditional approach to new product and service development was penny profit driven and not customer focused. QFD was employed to make quality and customer satisfaction more important. Within one month of completion, sales doubled.

Experiences from QFD Techniques in Service Development by Niklas Hallberg and Toomas Timpka, Linköping University, Sweden. This research paper presents a study on the impact of QFD in services and development of a QFD model for service department. The use of QFD in service development was evaluated in three project experiences: Development of customized socio-medical services, development of computer support for teamwork at primary health care centers, and determination of support methods for participatory design projects. The result showed the House of Quality and QFD were useful in service development.

Software 1996

Developing Multimedia Integrated Circuit Solutions Using Customer Integrated Decision Making (CIDM) by Carrie Richardson of Motorola (USA) and Bill Barnard of Barnard-Norman Associates (USA). This is a case study involving an internationally located team using CIDM to interview customers and focus on value and choice in order to arrive at technical specifications for multimedia solutions, leading to the development of an integrated circuit, its software and development tools.

Measuring the Success of a QFD Project by Dr. Georg Herzworm of The University of Cologne (Germany). A QFD pilot project with the biggest German software house, the SAP AG, included the development of a method for measuring the success of QFD. This method is based on a structured questioning of all project members concerning their personal factors of success and attitudes before and after the QFD.

Making the Millennium Decision: Applying QFD to the year 2000 Century Change Issue by William J. Jagrowski, Andersen Consulting; Robert L. Pike, Consumers Power Company (USA). The century change date poses one of the greatest development challenges ever for software engineering. Literally, billions of lines of software code will have to be evaluated and extended pulling developers away from developing new software products. This lost production may never be regained. QFD has helped a major utility develop its strategy for next few years to cope. The case study offers an example of how QFD and the analytical hierarchy process (AHP) techniques can be used to facilitate a decision facing a company grappling with legacy system obsolescence, including the Year 2000 problem.

QFD Software 1996

How to Apply the Power of Computing to the QFD Process by Karla Kuzawinski, Xerox Corp. (USA). Implementing QFD requires collection, distillation, and organization of many sets of data. This paper presents recommendations on when to consider and how to use computers to support various part of the QFD process. Not all aspects of the process should be automated since group discussion and interaction is a very valuable part of developing a common level of understanding of customer requirements. The recommendations in this paper also include a look at existing off-the-shelf computer tools that can be applied to QFD and thoughts on other aspects of QFD team support.

A Computerized Database to Assist QFD by Larry A. Stauffer and Linda J. Morris, University of Idaho; Dileep V. Khadilkar of Project Advisors International, Ltd. Based on QFD, a computerized database was developed to assist design teams with the product definition process. The database provides a framework for eliciting and managing customer information, the associated engineering information, and the resulting product specifications. A the heart of the database is a taxonomy of

consumer and manufacturing issues. A case study of an industrial application is presented along with experiments to validate its usefulness.

Strategy 1996

Building and Sustaining an Industry Leader with QFD by Robert Hunt of Macquarie University Graduate School of Management and Fernando Xavier, Deve Hydraulic Lifts Pty. Ltd. (Australia). After finding their TQM activities were running out of steam and lacked focus and fearing increased competition, Deve Hydraulic Lifts Australia (DHA) adopted a QFD-like approach to setting corporate strategy and aligning all the major improvements of the organization toward achievement of the vision. Gemba visits by the DHA's top management team and multiple matrices and function trees were used.

Applying the Power of QFD to Strategic Planning by Karl Hummel of The Change Factory (USA). In the past three years, the Change Factory applied QFD to a variety of planning tasks ranging from service design to strategic planning. This paper discusses the application of QFD to the creation of a strategic plan for the University of Vermont so that it can be initiated across all departments and functions.

Taguchi Method 1996

A Robust Quality Design Model that Integrated QFD and Taguchi Methods by Yann-Fang Chu of National Defense Management College (Taiwan). This paper proposes a two-phase robust quality design model and process that integrates enhanced QFD and parameter design. It uses QFD to be the transformation and communication interface of customer's requirement and system design. It also uses AHP to evaluate the character importance of the requirement and analyze the major quality character and related design parameters. It then uses the experiments of Taguchi Methods to get the optimal sets of robust quality design or to revise the value of requirement goal in accordance with the major quality character.

Telecommunication 1996

Motorola's Six Pack QFD Total Customer Satisfaction Team by Fred Stickel, Sherry Bosserman, John Forsberg, and Fred Stickel of Motorola, American's Parts Division, Land Mobile Products Sector (USA). A case study for a Motorola Total Customer Satisfaction Team for the America's Parts Division, this project focused on improving unacceptable customer satisfaction ratings in the areas of product and pricing information for the company's aftermarket components. Voice of customer analysis yielded seven critical misinterpretations of customer needs. Today, customers are 60% more satisfied.

TRIZ 1996

Enhancing the Value of the Correlation Matrix through Utilization of the Theory of Inventive Problem Solving, TRIZ by Dana W. Clarke, Sr. of Ridge Tool Co. (USA). This paper shows how correlations in the roof of the House of Quality can be used to enhance innovation and how this can lead to significant innovative opportunities.

TRIZ/Ideation Methodology for Customer Driven Innovation by B. Zlotin, A. Zusman, S. Malkin, L. Kaplan, G. Zainiev, S. Vishnepolskaya, V. Oleynikov, V. Prosyanic of Ideation International Inc. The purpose of this paper is to introduce and provide understanding of the TRIZ/Ideation Methodology to QFD theoreticians and practitioners and how this method can be applied to the QFD process. It contains an overview of the main tools, problem formulation process,

system of operators, anticipatory failure determination, and directed product and process evolution.

1995: 7th Symposium on QFD (ISBN1-889477-07-9)

Aerospace 1995

Parametric Cost Deployment by E. B. Dean, NASA Langley Research Center. Parametric cost analysis is a mathematical approach to estimating cost. Parametric cost analysis uses non-cost parameters such as quality characteristics, to estimate the cost to bring forth, sustain, and retire a product. This paper reviews parametric cost analysis and shows how it can be used within the cost deployment process.

Architecture, Building, Construction 1995

Quality Function and Cost Deployment in Ceramics Industry: A Case Study by P. Sophatsathit, National Electronics and Computer Technology Center, T. Chuenchom, International Institute of Technology, Thammasat University, and N. Nisapakultorn, Quality Training (Thailand) Ltd. This study looks into current obstacles encountered by a selected ceramic tile manufacturer with the goals to 1) reduce design and development time for a new ceramic product, and to 2) optimize the product cost and quality to concur with the requirements. These goals were accomplished by means of a quality/cost chart derived from customer's requirements and target costs using Quality and Cost Deployment. The result show a 30% reduction in the design and development time, as well as the product cost by a significant factor.

QFD and ProVE: Applications in the Building Industry by James F. Meredith (AIA), Dennis O'Bierne (AIA), Giffels Associates, Inc. While there have been precedents in the architecture and engineering practice which would lead to QFD implementation, its deployment throughout the construction industry is generally non-existent. The authors believe, however, that QFD in the construction industry practice could yield many benefits such as higher owner and customer satisfaction, better coordination among a construction team members, and reduced disputes and litigation associated with the design and construction process. This paper presents a window into QFD-like practices in the local industry, indicates a process for further integration of QFD principles and practices, and shows a direction for further development.

Automotive 1995

QFD Status in the U.S. Automotive Industry by Harold Ross and Kioumars Paryani, GM Systems Engineering Center, NAO Engineering Center, General Motors Corporation. As Dr. Akao has stated in many of his lectures, mass production has caused a great separation between the workers and the customer, both in distance and in layers of management. In large organizations that cannot deal on an individual basis with the customer, QFD is being used to translate customer's wants and needs into technical requirements. This paper attempts to provide a brief description of the current usage, integration, and understanding of the QFD process within the context of General Motor's product development process.

Fuelguard Lower Tie Plate Product and Process Re-Design Using QFD and Robust Design by D. Adams and G. Waymire, Siemens Power Corp., S. Macfarlane, Black Sheep Engineering Services, and P. Walsh, Ehrhardt Tool and Machine. A multi-functional team from Siemens and vendors redesigned a fuel assembly component, using QFD and Robust Design. The initial product design met an important customer requirement, while improvements in the manufacturing process

were being considered. The team used quality deployment and Pugh Concept Selection to generate a new concept and Robust Design to optimize the product. Process deployment using QFD further enhanced the manufacturing capability. The new design reduced manufacturing costs and time by approximately 40% and improved the quality and strength of the component.

Lessons learned From A QFD On A Decklid System by G. Blumstein and H. Graves, *EDS*. A QFD of a Decklid system was conducted over a five month period by a small cross-functional team with an aim to assist in defining the requirements of the system. The study, which incorporated VOC analysis and many different engineering disciplines, showed a direct relationship between downstream engineering decisions and upstream VOC statements. It also determined if the design decisions had a high interaction with the Hows that was carried over from the previous houses. As a result, the final design optimized the Decklid system instead of optimizing the Decklid's subsystems and sub-optimizing the Decklid system.

Computer and Software 1995

Quality Function Deployment - Integrating Product Development into the Systems Development Process.

Mark P. McDonald, *Andersen Consulting*. This paper examines the need for incorporating product development activities related to customer satisfaction into the software development process. QFD is an established technique for understanding and satisfying customers that is readily applicable to software development. This paper provides an overview of QFD, its role in the systems development process and an example for study. The case study offers an example of how this advanced quality technique applies to software development.

Business Process Reengineering with Quality Function Deployment-Process Innovation for Software Development.

R.E. Zultner, *CQE, Zultner and Company*. Many software organizations are considering Business Process Reengineering (BPR) to dramatically improve their core business process - software development. There are great risks associated with such reengineering efforts, and QFD can help by supplying a value-driven comprehensive framework, with powerful tools and techniques. An approach for applying BPR with QFD to the software development process is described, and two case studies reviewed.

Integrating QFD with Object-Oriented Software Design Methodologies.

Walter M. Lamia, *Software Engineering Institute, Carnegie Mellon University*. Object-oriented methodologies have emerged as a popular paradigm for software design and analysis, both in research and practice. Several variants of Object-oriented methods are in use, but they all share significant similarities in their approaches to modeling the application domain. QFD is also a design analysis and domain modeling technique with many parallels to Object-oriented methods. This paper gives an overview of Object Oriented design concepts, and shows how familiar QFD techniques are an effective aid for the Object-oriented analyst. QFD is a much easier way to approach to the initial information collection and provides easy to understand structuring tools that do not require extensive training in Object-oriented concepts and methods.

Defining the Unknown Customer Wants and Needs-Applying the Reflector Method into QFD

by Noriyuki Neil Takeuchi *Integrated Quality Dynamics, Inc.* In software development, quality requirements frequently change depending on the wants and needs of the customer. Once a durable system has been decided upon, the specifications will ultimately transform. The Reflector is a new method for QFD that defines the demanded quality items perfectly with the voice of the customer analysis. It develops the necessary information, such as demanded quality and function based on the customer voice, which is defined by the mirror that can cast

future customers' wants and needs. This paper introduced how to use the Reflector in the QFD software field.

Effecting Customer Satisfaction through the use of RHI[®], Triple Triangle[®], and X Factoring[®]

by Robin Yap, *Solutions Group*. Being a technical support engineer involves not only software issues but sometimes personal problems that cannot be solved with technical solutions. To address this dilemma, the author has created several QFD-related tools. This paper presents the use of these tools in the study of effecting customer satisfaction.

Quality Function Deployment (QFD): An Effective Technique For Requirements Acquisition

by Tuyet-Lan Tran and Joseph S. Sherif, *Jet Propulsion Laboratory, Software Assurance, California Institute of Technology*. A general accepted understanding of how to capture requirements, allocate or flow-down top level requirements, verify and validate lower level requirements is not rigorously sought in practice. Often the customers are blamed for not properly articulating their requirements or understanding their own needs. However, the problem is deeper than that, and it involves not only the customers but also the system analysts or engineers, and designers as well. This paper puts forward QFD as an effective tool for the acquisition of customer requirements.

Education 1995

QFD-Building Quality Into English Universities

by M. Clayton, *Aston University*. Aston University is testing the power of QFD as a tool to ensure that customer needs are reflected at each stage of the design, development and execution of degree programs. Initial experimentation is taking place in the Dept. of Vision Sciences. Market share issues are being addressed through planning cost-effective, high-quality learning for optometrists throughout their career, beginning with undergraduate study. This paper reports on progress, including definition of "quality" in universities.

Using QFD for Curriculum Design

by J. Hillman and F. Plonka. QFD principles are being applied to design an engineering education curriculum. To determine a reasonable 'product life cycle,' i.e., a typical career for a manufacturing engineer in this case, four elements - career, competencies, roles, and knowledge - were examined as well as their relationships. The paper reports the application process of this on-going project.

QFD in the Development of Engineering Studies

by Per Nilsson, Bengt Lofgren, and Gunnar Erixon, *Centre of Industrial Engineering and Management, CITU, University College of Falun Borlange, Sweden*. Shorter development time, the need to satisfy customer needs and demands, and increasing competition. These are common requirements of today's products and product development processes. The same kind of requirements might also be put on the engineering students passing through an educational system. This analogy has been used in the planning of engineering studies at this Swedish university programs. This paper reports the use of QFD in developing an education a system that provides high quality engineers well adapted to a productive life and capable of life-long learning.

Electronics 1995

QFD for Prediction of Phased-in Customer Benefits

by Carol Boehm, *Motorola, Inc.* and Ted Squires, *Effective Product Foundations, Inc.* The Quartz Products Division of Motorola utilized QFD for developing a long-range improvement and implementation plan for the Division's computer integrated manufacturing system. The end deliverable in this project was a long-range road map for the implementation of the system over multiple phases where essentially system modules would be developed at each phase. The QFD team developed a technique, whereby the impact on the customer for each phase could be

projected directly from the information gathered from the QFD. This technique was instrumental in getting customer buy-in to the system concept, by quantitatively showing the customer benefits on a phase-by-phase basis.

Energy & Utilities 1995

QFD and Deming Prize Activities at FPL by Bob Bodziony, *Florida Power & Light*. This paper reports the FPL's commitment to quality that began in 1981, its quality improvement program, TQM initiatives, and Deming Prize activities and the role of QFD in the Deming effort, as well as the challenges and benefit, the resulting cultural changes, and post Deming QFD activities.

Food 1995

The Introduction of Quality Function Deployment At A Large Food Company by J. Rodriguez, *The Q2000 Group, Inc.* As a part of the TQM process at this \$5 billion food manufacturer, the management decided to try QFD. A unique piloting process was used which entailed volunteer teams and the simultaneous development of tailored QFD training. Some new market research approaches were used. Successful new products and packages were developed using these methods.

General Industry 1995

Quality Programs and Quality Profits: Using QFD to Evaluate the Profit Impact of Customer Satisfaction by B. Klein, *Applied Marketing Science, Inc.* Program managers and product developers need to assess the profit impact of programs and actions aimed at customer satisfaction in order to determine the best way to spend scarce corporate resources and to avoid expensive marketing. EPICS (Evaluating the Profit Impact of Customer Satisfaction) is an interactive, PC-based model that uses QFD as the paradigm for linking programs to customer satisfaction, customer behavior and profitability.

Evaluating QFD Relationships Through The Use Of Regression Analysis by B. Yoder and D. Mason, *EDS-Management Consulting Services*. The "relationship strength" approach is inadequate in providing a clear indication for the input and output relationships as well as what level of output performance is optimal in targets setting. Regression analysis provides a more useful and defensible picture when sufficient data is available. This paper describes the details and advantages of the regression analysis, a methodology for incorporating regression analysis into a common QFD methodology, and examples of the output and lessons learned from a QFD study using this process.

Determination of Design Parameters Using QFD by Anwar-ul Islam and Ming C. Liu, *Wichita State University*. This research paper proposes a methodology that combines various customer inputs through Analytic Hierarchy Process (AHP) and multi-attribute utility function to provide a sound theoretical basis for determining product design parameters. A linear programming model is developed to maximize customer satisfaction and to optimize design parameters that satisfy customer attributes.

The Balancing of QFD Matrices: The Key to Understanding Your Customer Needs by D. Lyman, *International TechneGroup, Inc.* Just as VOCT can move you from hearing what the customer said to finding the root customer needs, balancing of QFD matrices can move you from a cursory mapping of customer needs and measures to a deep team understanding of what the customer really needs from three different viewpoints. This paper shows how to look at three different viewpoints using three matrices, how to check these matrices mathematically for misunderstood or misrepresented information, how to use computerized tools to find the problems

and the point of diminishing returns, and how to extend these techniques to other parts of the QFD process.

Comprehensive QFD by D. Powers and R. Harter, *CSG Card Services Comprehensive QFD*, D. Powers and R. Harter, *CSG Card Services*. Doing the House of Quality (A-1) or 4 Phase QFD may not be enough to get the results required from the QFD process. Comprehensive QFD allows the QFD project to include customer, cost, reliability, technology, and other requirements in the study without overpowering each other and losing important information. This paper describes the similarities and differences of 4 Phase and Comprehensive QFD.

Are They My QFD Rules or Are They New QFD Rules? -or- How to change a Technology by D. Lyman, *International TechneGroup, Inc.* Changing a technology is the key to successful application of any technology, including QFD. This paper discusses how we can adapt QFD and adapt to QFD for successful outcome, how to know when you have improved or changed it, and how to know when you have created something new.

An Investigation into Quality Function Deployment (QFD) Usage in the U.S. by John J. Cristiano, Jeffrey K. Liker, and Chelsea C. White, III, *Department of Industrial and Operational Engineering, University of Michigan*. This research paper provides a general overview of the results of the U.S. portion of a QFD survey being conducted in the U.S. and Japan. The objective of this paper is to describe the traits, attributes and general approaches to the usage of QFD in the U.S. Based on the preliminary results, it reports some basic differences in the application of QFD in the U.S. and in Japan and seemingly conflicting results between the reported benefits of using QFD in the two countries. Hypothesis of perceived cross-cultural differences in QFD implementation between the U.S. and Japan will be tested. In addition, a prescriptive model for organizing and supporting successful QFD projects will be explored.

VOC with a Future Dimension by Larry Shillito, *Kodak*. To remain competitive, it is necessary to periodically reevaluate customer needs along with changes over time. To do this, Delphi inquiry, Molecular Explosion Model, impact analysis, and monitoring are integrated into an effective model to explore the future customer voice. This paper reports the tools and how they can assist in locating sensitive areas and explore the effects of interactions, impacts, and trends on the business as well as on products and services.

Electronic QFD In A Geographically Distributed Development Network by M. Mehta, Ph.D., *Environmental Research Electronic*. This paper discusses a unique application of QFD to the electronic planning, execution, monitoring and stat, using of multiple technical tasks in the Composites Automation Consortium. Current and future customer requirements for advanced aerospace composite structures were defined at the top level, and used to drive the machine conceptualization through preliminary design. In addition to adapting the QFD methodology across a consortium, considerable effort was expended in implementing TQM tools over the CAC's concurrent engineering electronic collaboration infrastructure and to link various technical tasks and deliverables by QFD. This paper describes how the process of team building, interaction among remotely-located CAMI contractors, and program coordination was achieved in one of the nation's first paperless industry groups.

Quality Function Deployment and Quality Policy Deployment In The South West Pacific Rim by R. Hunt, *Macquarie University Graduate School of Management*. This research paper presents the framework and preliminary insights of research into some 80 QFD projects that responded to questions "how successful has QD been in Australia?," "in what areas has it been successful and unsuccessful and why?," and "what are the lessons to be learned for the future?"

Incentive Pay For Customer Satisfaction by Bob Klein, *Applied Marketing, Inc.* An emerging trend in many industries is to base a portion of an employee's incentive compensation on the satisfaction of the customers served. While theoretical results show this practice can maximize a firm's profit, the process of surveying customers to determine satisfaction and compensation has too many problems to be useful. But if internal metrics can be linked to customer needs and satisfaction these matrices can form the basis for a compensation program that achieves all the goals of a satisfaction-based system.

Healthcare 1995

QFD Robust Design and Professional Services: Hospital Emergency Room Case by S. Macfarlane and K. Eager, *Black Sheep Engineering Services.* This paper describes what the authors believe is a new application of Robust Design Methods. This study challenges the paradigm that Robust Design does not apply to a service or social science. The point is made through a case study involving optimization of the process of a hospital emergency in which average patient length of stay was reduced by 25% without major capital investment for an expanded facility. Confirmation runs also showed excellent repeatability, proving that Robust Design Method can be used to optimize processes outside the product development arena.

Happy Feet, Part II: The Return of the Princeton Foot Clinic -or- The QFD Viral Strategy by J. Gibson, *Baptist Health System.* A hospital-based foot treatment service was developed, using QFD principles to identify the spoken and unspoken needs of customers, including comprehensive patient self-care, and timely follow-up on patient outcomes to referring physicians. This paper reports the QFD process and the results, that not only enabled the clinic to overcome internal political hurdles, but also led to greater awareness of the customer among all parties involved with the clinic and strengthen the customer focus in the larger rehabilitation services and the entire outpatient scheduling system.

Reconciling Different Customer Needs by I. Ferguson, *Ferguson Associates, UK.* For a product to compete and to contribute to company market share, requires various differing features of the product to be highly evaluated by different levels of customer. These differing features can often require what would appear to be conflicting values for the product to have high evaluation. This paper shows the identification of the internal/external supplier - customer - supplier - customer hierarchy as illustrated in the healthcare industry. An effective two stage mechanism is described that evaluates the design features at each level of deployment, by linking the relative level needs, enabling a rational choice of values to be made at each level that will result in high satisfaction at each level of customer.

Hoshin Planning 1995

QFD and Hoshin Planning: A Look at the Synergies by J.F. Colletti. This paper explores the synergy between QFD and Hoshin Planning, two new methodologies that were introduced to the North America a few years ago. It describes examples of how these two methodologies can be integrated to create synergy.

Human Resources 1995

QFD for Quality of Work Life by B. Harries and Matthew Baerveldt, *TELUS.* This paper outlines the theory and its application in improving the quality of employees' work life. The application was done in three stages: a Quality of Work Life survey to find out what employees want, QFD to design a system for improving the quality of employees' work lives and identifying and designing priority areas for improvement, and

SPC to maintain the gains made. The three states are described in terms of the Plan, Do, Study, and Act learning cycle. The study shows QFD can be applied to soft business issues. It redefines and clarifies the role of business leadership as purveyors of service to employees.

Kano Model 1995

Using an Objective Sales Point measure To Incorporate Elements of the Kano Model Into QFD by W.G. Robertshaw, *Arbor, Inc.* This paper describes ASCENTSM Model methodology developed by this firm that redefines the sales points and uses the sales point information to clarify type of Kano element.

Manufacturing 1995

Taguchi's Philosophy Helps Manufacturing Deployment by J. Terniko, *Responsible Management Inc.* Taguchi's philosophy of robust design is particularly useful for establishing the best operating conditions for manufacturing that is less sensitive to uncontrolled sources of variation. This paper presents a brief introduction to a comprehensive QFD project where the VOCT and the design matrix were used to define the desired quality and priority. This information, plus failure modes, were used to define the environment for an in-depth discussion of robust design applied to an injection molding process.

QS-9000 1995

QFD's Role in QS-9000 Automotive Standards by Chad Kymal and Dennis W. Hughey, *Omnex.* Presentation slides on the topic of using the QFD tool to satisfy the QS-9000 automotive standards.

Service 1995

Elicit Service Customer Needs - Using Software Engineering Tools by Glenn H. Mazur, *Japan Business Consultants, Ltd.* Recently, QFD has been augmented with new methods to enhance its front end power. Many recent extensions to QFD focus on better prioritization of customer requirements, but not as much attention has been paid to more systematic ways to define those requirements in the first place. This can be especially problematic for service organizations whose product is highly transitory and people-dependent. Since service consists primarily of processes, the author has been exploring other process intensive fields such as software engineering for more systematic techniques. This paper looks at use of the Sate-Transition Diagram, Data Flow Diagram, Event Table, and Event Tree to better define service customer needs. It should be noted, however, the goal is not to depersonalize or mechanize service providers, but to use the process analysis power of these tools to enhance understanding of customers interact with provides and how they make buying decisions. The paper presents examples.

Quality Function Deployment as a Tool for Creating Service Innovations by Alexander Held, *Catholic University of Elchstaff.* A dissertation paper on the development of a comprehensive framework for creating new services by means of QFD, as well as the guidelines on how to structure and create an entire process of innovating services.

Strategy 1995

Monopolize Your Business Strategy With QFD by Dr. A.R. Atkins and L.M. Crisafi. Utilizing a multi-tiered approach, McDonnell Douglas Technologies, Inc. has developed a novel use of a classical TQM tool to link the VOC to all levels of the company. Starting with the strategic 'whats,' the next level of management teams develop the 'hows' which become the 'wants' for the second tier set of QFD Houses. Continuing this process through several additional tiers has resulted in a

collection of Houses that are strength in integrated strategic planning.

Team Building 1995

Teaming Using Customer Integrated Decision Making CIDM/QFD In International Projects by *M. Holtzlieter and S. Nelson, Senco Fastening Systems and B. Barnard, Barnard-Norman Associates*. This paper is about the importance and value of teams having direct involvement with the customer, a process that will support these efforts, the results of two projects that required cross-functional and cross-cultural teams, and how they used a "customer integrated" approach to support the objectives during the project.

Telecommunication 1995

Voice of the Customer: Linking Your System of Measures to Customer Needs by *Lorraine Pennington and Gayle Sweeney, AT&T*. This paper shares AT&T FTS200 experiences in implementing the Voice of the Customer process and their application of QFD in defining customer needs and satisfaction for FTS2000 service quality. It also provides an insight on what they learned, pitfalls to avoid, and on techniques that were successful.

QFD and Training in a Reengineering Environment by *John Cominsky, Pacific Bell, Inc. and R. Norman Barnard-Norman Associates*. The success of the initial QFD training and project sparked interest for wider application of QFD at Pacific Bell. When reengineering was introduced, however, the resulting initiatives created training challenges as traditional job descriptions were reinvented and new ones emerged. This paper details the use of QFD as a planning tool to facilitate competency evaluation and overall training management in an evolving environment.

You Want What? You Want It When? - A Dual House of Quality Approach to Service Deployment by *Patrick Brown, AT&T Bell Laboratories, QUEST Partnership*. Recently, telecommunications service improvement teams have found a dual-HOQ approach valuable in defining both the attributes of a given service and its delivery process characteristics; the result: better coherence between definition and delivery parameters and reduced interval for total service deployment. This paper describes how one business unit is applying the dual-HOQ approach to services.

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Aerospace, Aviation, and Defense 1994

QFD Applications At NASA Lewis Research Center, *Y. Liou, Cleveland State University, D. Swec and D. Sender, NASA Lewis Research Center*. The Process Action Teams at NASA Lewis Research Center encountered colleague resistance when it began TQ process. Some of the teams used QFD to obtain personnel's wants and needs on the research center issues such as management information system, recognition system, and new employee pilot orientation program. The center also used QFD to capture the voice of rocket and thruster users and manufacturers. This paper presents the QFD tailoring processes and the difficult issues experienced in implementing QFD in a R&D environment.

Quality Function Deployment In Concurrent Engineering And System Development Process, *David L. Melton, ITT*

Aerospace/Communication Division. System Engineering and System Development techniques have been standard in the U.S. Department of Defense for decades. The QFD initiative in the US for hardware developed items follows a similar structured and disciplined process very analogous to the system engineering process implemented by DOD. This paper illustrates how QFD can be used to enhance the system engineering and system development process and provide a visual capture of the decisions and target values made as the program transitions from system development through to product and process design.

Integrating Quality Function Deployment (QFD) in to the System Engineering and System Development Process, *David L. Melton, ITT Aerospace/Communications Division*. This paper illustrates how QFD can be used to enhance the system engineering and system development process and provide a visual capture of the decisions and target values made as the program transitions from system development through to product and process design. It shows how QFD can be integrated into the system engineering and system development process to provide complementary benefits and aid decision making in defining and specifying a system.

Aligning Process Improvement With The Voice Of The Customer, *M. Zubeck, Space Systems/Loral; Frank Nibley, Leemak, Inc.* This paper provides an overview of how QFD tools were used to align the company's continuous improvement initiatives to the voice of the internal customers at Space Systems/Loral. QFD matrices were used to tie executive level requirements to directorate measures. Measures were then associated with critical processes within the organization to which process improvement teams were charted. This study highlights a 3-step roadmap for collecting the VOC and setting the direction for deploying a successful process improvement program.

QFD Addresses The Mobility Of NATO Tactical Aircraft, *S.P. Bergman, McDonnell Douglas*. NATO commissioned the Advisory Group for Aerospace Research and Development to conduct a study to determine ways of improving the mobility of NATO tactical aircraft. McDonnell Douglas introduced QFD to this study, and successfully facilitated the use of QFD to both decompose the problems associated with aircraft development and to generate and prioritize options for minimizing these problems. The paper describes the genesis of the 3 linked matrices and the lessons learned from applying QFD in a multi-national team environment.

QFD And Information Technology: Designing The C31 System1 System, *P.J. Hofman, CQE Air Academy Associates*. Designers of Command, Control, Communication and Intelligence Systems for the military consistently face the challenge of effectively applying the latest information technologies in systems that satisfy the user's needs as well as minimize overall life-cycle cost. This paper outlines how to use QFD to identify operational needs, evaluate different design options, highlight tradeoffs that should be optimized using Design of Experiments, and analyze the effect of certain failure modes on operational, design and functional requirements. The "Designer's Dozen," a systematic process of applying QFD that combines the structure of the Four Phase Method with the flexibility of the Matrix of Matrices is also included.

Automotive 1994

Making The Neon Fun To Drive, *J.E. Fernandez, J.L. Chamberlin, E.G. Kramer, J.H. Broomall, H.A. Rori, and R.L. Begley, Chrysler Corporation*. The paper recounts the QFD and PDCA efforts utilized by Chrysler's Small Car Platform teams in the development of the "Fun to Drive" steering and suspension characteristics of the 1995 Neon. Starting with customer requirements, the teams established the relationship of the requirements to engineering measurements at the vehicle level and identified which of the important vehicle characteristics

were associated with what vehicle components. The project resulted a profitable small car program in North America. The QFD process brought all parties to become of a single mind and work in concert toward a specific goal - Fun to Drive, QFD.

Utilization Of QFD Principles For Defining The Functional Objectives Of Future Jeep And Dodge Truck Vehicles, *TS. Zaydel, Chrysler Corporation*. This paper reports the application of QFD at Chrysler for deigning the functional objectives of future jeeps and trucks. It discusses an overview of the methodology in use at Jeep and Truck Engineering to provide the customer with a truck that is competitive as to application and price and still has the qualities that will influence the customer to purchase a Jeep or Dodge Truck over the competition. QFD principles served as the backbone for the process utilized to achieve this goal.

Using QFD To Improve Process Of Automotive Painting, *C. Miller, Ford Motor Company*. The pilot application of QFD to improve an automotive painting process is reported. QFD was used to understand the relationships between what customers want in a paint job and process variables, to focus resources on the most important process variables for measurement and control. The report from the on-going project focuses on the process of performing QFD on a manufacturing process.

Automotive Electrical Distribution System Junction Box-Current QFD (CQFD), *D.L. Fluharty, AFL Automotive*. AFL conducted a three-phase concurrent QFD (CQFD) to support development of its Junction Box for Ford's 1996 PN-96 light truck program. Engineering and manufacturing CQFD team participants found that the process gave them insight they would not have had without the CQFD. It enabled them to focus attention on customer priorities, make trade-offs apparent, identify several manufacturing opportunities and improve communication with key vendors.

Statistical Consistent Transformation Algorithm For Output Calculations Within The QFD Matrix, *R. Vrancken, Siemens Automotive*. The basic concept of the QFD matrix is to translate requirements of any kind (Whats) into controllable characteristics (Hows). QFD cascading systems use the How-importance ranking of a first matrix as What-importance ranking for a next matrix. Using the statistical probability distribution of What-values and the matrix elements to calculate the importance ranking of Hows, an algorithm was developed by a team at the Central Quality Division of the Siemens Company in Munich Germany. The paper describes this algorithm and report an application at Siemens Automotive Division in Ontario Canada.

Computer & Electronics 1994

Multiple Matrices For A Marketing QFD, *M. Ackerman, B. Buckland, Digital Equipment Corporation, Semiconductor Operations*. This study outlines a multiple matrix process used at a QFD facilitated for a marketing organization of DEC. Customers, business partners, and DEC sales and marketing personnel joined together to identify customer input into the quality, functionality, and deliverability of a hardware/software solution being delivered to a marketing segment. The study demonstrated how over a five day period, customers' input evolved into actions and resource requirements through the use of multiple QFD matrices.

Developing A New Generation '14' Color Set, *S. Salminen, Nokia Home Electronics and I. Ferguson, Ian Ferguson Associates*. Nokia approached the development of a new television set using the logical discipline of QFD, to bring the new product to market on time with excellent customer acceptance. The paper describes how QFD was used by a multi-disciplined team, in both a process design role and in complementary system role. The benefit was the smooth

introduction of the product onto the production line, and in the necessary ramp-up of production to meet scheduled demands.

Education 1994

Integrating The Customer's Voice To Improve Educational Services Through QFD, *M. Grimes, J. Malmberg, and G. LaBine, Lakeshore Technical College*. Lakeshore Technical College selected as a priority for 1992-93 school year to complete a comprehensive study, identify alternatives, and develop recommendations to address the school's facilities needs. QFD was chosen as the methodology to be used. The paper reports the progress made to date, the role of QFD in looking at a problem in a nontraditional way, and the unexpected outcomes that resulted.

General Industry 1994

QFD Outside North America- Current Practices in Europe, The Pacific Rim, South America, and Beyond, *Glenn H. Mazur, QFD Institute*. This paper summarizes QFD activities outside the U.S. to this day (1994). Overseas organizations that have been central to QFD dissemination, application and research are featured. Recent QFD research being conducted in Japan is also introduced. The countries covered in this report include: Germany, Italy, Spain, Sweden, UK, Japan, Australia, Taiwan, and Brazil.

Linking QFD To Planning, *M. L. Shillito, Eastman Kodak Company*. Even though QFD is a planning and design process, often it is not checked against company plans at all or after it is too late. This paper proposes the PQFD (Planning QFD) model in which three planning matrices are used to bridge the gap between business plan and product design. It shows a planning matrix chain from company mission to the House of Quality.

QFD For Small Business - A Shortcut Through The 'Maze of Matrices', *G. Mazur, Japan Business Consultants, Ltd.* A number of leading North American firms have discovered the powerful approach of QFD and are using it to improve their products and services and more. QFD can be even more powerful in small businesses because of the unique characteristics. This paper discusses why small businesses should embrace QFD; it describes the QFD tools and deployment steps for small businesses through customer satisfaction stories.

Prioritization Of Your Customer Wants Through The Use Of A Pre-planning Matrix, *B. Yoder and J. Sosenko, EDS-Management Consulting Services*. This paper describes the pre-planning matrix methodology including selection of criteria, relating these criteria to customer wants, and methods for incorporating these criteria into the final composite importance rating. It also present some of the methods for determining the influence each criteria has on the composite importance rating that are mathematically rigorous but provide more accurate input into further QFD work.

Quality Function Deployment In Concurrent Engineering, *Robert Hales, International TechneGroup Inc.* The QFD process which are commonly taught are not well suited to Concurrent Engineering and many actually encourage traditional serial product development. This paper describes a QFD process which concurrently addresses the need of all stakeholders. The means of integrating concept selection matrices into process will be also described.

A Road Map For Gathering Data From Customers: Lessons From Experience, *M. Liner, Raychem Corp., D. Daetz, HP, F. Laurentine, Sun Microsystems, R. Norman, TrailHead Learning Systems*. Members of the San Francisco Bay Area User Group, a collaboration among local company representatives and consultants, share a QFD-based roadmap to successful, structured planning and decision-making. The collaborative paper outlines a six-step process for ensuring team data-

gathering for a successful House of Quality as illustrated by their experiences.

How To Develop Correct and Significant Relationship In A QFD Matrix, M.J. Cooke, Electronic Data System, T.J. Zalewski, General Motors Corporation. In developing a QFD matrix, a team has to determine whether a relationship exists between two items. This paper describes how a facilitator can help a team successfully develop relationships by first aiding in the identification of the team's objective and then by asking specific questions that the paper discusses how different questions can influence the outcome of a matrix.

DFM2 Designing For Manufacturability and Marketability Designing For Manufacturability and Marketability, C. A. Kline, CIPM, QCS Limited. In 1991, Diagraph Corp. recognized an urgent need for new products and processes to enhance quality and functionality. A rapid engineering project was established with extensive use of QFD and concurrent product and process design techniques. This paper explains the development of customer and technical requirements into a product HOQ and the structure and evolution of the diverse teams throughout the concept, design and build phases.

Healthcare 1994

Applying QFD In Health Care Services - The Princeton Foot Clinic, J. Gibson, Baptist Health System. Increasing competition, shrinking bottom lines and the push for health reform are forcing hospitals to differentiate in the delivery of services. One way to achieve this is to consistently deliver what customers want and further, what will delight them. The paper reports how the Clinic's task force consisting of clinicians, marketers and TQM staff was able to design a new service with built-in quality with the help of QFD and ensure clinicians to hear the voice of the customer above the high tech din of healthcare.

Designing The Voice Of The Customer Into A New Hospital Surgery Center, S. Macfarlane and K. Eager, The Quality Advisor, Inc. Healthcare is changing. Kennewick General Hospital in Washington needed to stay competitive. But how do you change the process by which hospitals and their employees provide care in an efficient, customer oriented way? This paper reports the progress made at the hospital by a cross-functional QFD team to design the surgery process for their new surgery center. The method, what worked and what did not, and recommendations for others in a similar situation and hospitals wanting to remain competitive.

Cardiac Arrest! QFD On The Heart And Soul Of A Medical Center, V. Alterescu, D. Newhart, and F. Tiedemann, John Muir Medical Center. This is a case study involving three distinct QFD projects in separate clinical service areas: Cardiology, Oncology, and Rehabilitation, all undergoing radical market and governmental reform and competitor threats. Through the use of QFD, an interdisciplinary team was able to focus on developing services which are systematically tied to customer desires in each project. Had QFD not been done for these projects, the organization would have attempted a very different set of services built around the voice of single internal customer. The paper reports their QFD steps in three projects.

QFD In Health Care: Identifying Methods To Tailor QFD To A Service Industry. A Case Study At The University Of Michigan Medical Center, D. Erlich and E. Kratochwill, University of Michigan Medical Center. The University of Michigan Medical Center piloted QFD in a new unit which consolidated several diagnostic procedures into one unit. The objective was to learn when QFD is not appropriate for a hospital, and to stimulate service volume at the new unit. The paper discusses 1) UMMC QFD approach, 2) the difficulties experienced in applying QFD to healthcare, 3) the benefits derived from QFD, and 4) the ways to tailor QFD to healthcare and the service sector.

Human Resources 1994

Managing To Meet Employee Expectations, R. Woods, PHR, Dow Corning, USA. This paper describes the application of quality tools including QFD to the task of understanding and meeting the employee expectations of the employer and company.

QFD - A Service Application In Human Resources, L. Harper, T. O'Driscoll, T. Yardley, and M. Zapata III. The QFD process was used within the human resources department at North Carolina State University to perform existing process assessment. The research project led by the students provided a training tool for HOQ mechanics and an assessment tool for existing process. The exercise was effective in achieving buy-in for the QFD process from the HR executive management team.

Marketing 1994

Quality Elements To Consider In Deriving The Voice Of The Customer, Robert L. Brass, Development II. The fabric of QFD is dependent upon the validity of its inputs - the Voice of the Customer. And yet, often a clear understanding of the potential customer is inadequately done. This paper discusses the importance of valid market research that is based on solid disciplines and experience combined with carefully assessed quality criteria.

Manufacturing 1994

QFD in Existing Manufacturing Operations, Jim Folaron, 3M Company, Ultratec Tijuana, C.D. Ballon, AIA Raychem Corporation. Some of the basic elements of QFD - such as cross-functional teams, listening to and translating the Voice of the Customer, setting targets for both technical measurements and customer opinions, and displaying the information in a concise, understandable manner - are used to understand and improve existing manufacturing operations including outgoing product quality as well as communications between departments. Using three application examples, this paper details specific activities that were conducted using these QFD elements to identify and prioritize continuous improvement opportunities.

We Design It With Our Ears, S. Blondin, S. Cancellieri, D. Grace, and S. Maynard, The Wiremold Company, Inc. QFD provided the core competency for new product development at the leading manufacturer of wire management products. The paper reports how the QFD process reduced their new product development times by 75%, increased the ability to develop and market many more new products than before, produced higher quality products and increased sales and productivity.

Beyond The House Of Quality: Dynamic QFD, C. Adiano, IBM and A.V. Roth, University of North Carolina. The research paper presents a dynamic approach to QFD that translates customer wants and needs into relevant product and process parameters. Using feedback loops, this new approach incorporates updated customer satisfaction data and dynamically links evolving requirements directly back into relevant manufacturing and related process. Updated customer requirements then peg the key parameters in statistical process control charts. The paper describes the concept, conceptual illustration of the mechanics of the approach, and application case at Austin IBM assembly plant.

The Power of QFD in Designing a Manufacturing Facility, C. Douglas Ballon, Raychem Corporation. In this building project application, QFD served not only to facilitate gathering the business and technical requirements but also it helped establish inter-personal links that far exceeded expectations, building a broad consensus among a vast array of people from the factory floor workers to the company's top executives, architects, environmentalists, tax experts, industrial engineers,

real estate brokers, material supplies and the paying customers. The report describes the process used in adapting QFD to the task of planning a manufacturing facility.

Medical Device 1994

Additional Applications Of QFD Matrices, *A. Uber III and D. Gigler, Medrad Inc.* This paper reports two QFD applications at Medrad. The first was in relating parts to phenomena, and phenomena to phenomena in a complex electromechanical device. QFD proved to be a good method for organizing all of the relationships. The second was to assist Medrad's senior managements in balancing the choices among various potential projects. The methodology helped show which project combinations could be most effective and illuminated the assumptions hidden in previous decision making process.

Research & Development 1994

QFD Applications At NASA Lewis Research Center, *Y. Liou, Cleveland State University, D. Swec and D. Sender, NASA Lewis Research Center.* The Process Action Teams at NASA Lewis Research Center encountered colleague resistance when it began TQ process. Some of the teams used QFD to obtain personnel's wants and needs on the research center issues such as management information system, recognition system, and new employee pilot orientation program. The center also used QFD to capture the voice of rocket and thruster users and manufacturers. This paper presents the QFD tailoring processes and the difficult issues experienced in implementing QFD in a R&D environment.

Service 1994

The Ritz-Carlton Housekeeping System: Service QFD Application, *J.N. Kirk and A.F. Galanty, Ritz-Carlton, Dearborn.* Based on the customer-identified critical processes vital to continued patronage, the Ritz-Carlton Hotel Company established the reliability of the housekeeping system at their Dearborn, MI property. Incorporating QFD methods of focusing on customer wants and needs, the House of Quality was built by a cross-functional team consisting of the Housekeeping, Laundry, Engineering and TQM group. Process identification techniques led to a surprising paradigm shift and resulted in a 65% cycle time reduction. The paper discusses the journey of the efforts and the reality of change in a customer-centered luxury hotel operation.

QFD Applied To An Engineering Service Delivery Proposal, *G.D. Githens, MaxiComm Project Services.* This case study describes the design of a program management structure, based on a case of a proposal team responding to a Request for Proposal to provide environmental assessment services to the Army. The paper develops a QFD-based solution for design of a program organization structure and delivery system.

Software 1994

Implementing Software QFD On Large Projects, *D.S. Newton and M.P. McDonald, Anderson Consulting.* Software QFD is a powerful tool supporting the development of high quality systems that deliver business value. The capability to define value and communicate it to the project team makes software QFD ideal for large complex projects. This paper covers Andersen Consulting's recent success with software QFD in support of development project involving over 200 people.

Towards Better Object Oriented Software Designs With QFD, *E.S. Zawacki, Jet Propulsion Laboratory and Ellen Domb, GOAL/QPC.* QFD was used for the requirements and design analysis of a program in the Sequence Subsystem of the Advanced Multi Mission Operations Systems. QFD provided a methodical approach of capturing the voice of the customer across a diverse group of people and culture and played an

important role in developing and tracing requirements. The paper describes how QFD focused the team's effort to produce an internal product for internal customers with diverse needs and how it was expanded for use with modern object oriented design software technology.

Telecommunication 1994

QFD Introduction To Motorola-A Study In Change Management, *S. Bossserman and J. Stoner, Motorola.* This paper presents an overview of the experiences with the QFD process at Motorola since its introduction in 1980. As the QFD process may represent, which it did at Motorola, a major change in the way the development process is conducted; the paper also introduces several change management concepts. Described in detail is the first completed QFD activity at Motorola including a critique of the exercise from the perspective of the change management process. The change principles are then explored further building on the experiences and results from over ten additional QFD activities. The paper concludes by providing an assortment of tools and models for QFD professionals and enthusiasts to utilize in changing environment to greatly improve the opportunity for success with future QFD projects.

Textile 1994

QFD Study On Brake Chamber Diaphragm, *D.B. Wootton, Milliken Industries Ltd. and J. Newbold, Northern Rubber Company, Ltd.* The QFD process was worked through with a team consisting of personnel from Milliken and their customer Northern Rubber, to achieve full understanding of critical parameters and requirements of the materials as well as the final product, Air Brake Chamber diaphragms. The customer needs were established, the HOQ and other matrices were created up to part characteristics. Then a series of design of experiments were undertaken to optimize certain aspects of the process.

Tools and Methods 1994

Exceeding Customer Expectations, *A. Gustafsson and N. Gustafsson, Linkoping University, Sweden.* The purpose of this research was to determine where QFD fits into the development process when working with innovations. It describes conjoint analysis, another tool in customer communication process, and how it can be combined with QFD to bring a result that exceeds customer expectations.

Set-Based Target Setting With Precise Rate Of Improvement Weights In QFD, *J.J. Cristiano, C.C. White III, J.K. Liker, University of Michigan.* The research paper presents a process based on the QFD paradigm for determining a set of targets for quality planning and the quality characteristics of new product design. It addresses the basic challenge of producing customer preferred products by integrating multi-attributes decision analysis into the framework of QFD to aid the experience and judgment of the design team by providing a set-inclusion description of the preferred region of the parameter design space. By integrating multi-attribute decision analysis techniques with QFD, which provide an underlying mathematical and behavioral basis for the selection of targets, the experience and judgment of the design team can be enhanced.

Training 1994

Training Development Using QFD Curriculum Planning and Development, *K. Richter, Chevron USA and D. Lyman, International TechneGroup Inc.* QFD was used to establish a curriculum that properly supports the objectives and meets the needs of management. The paper describes how QFD helps plan the details of course development, how to use it to address

management's as well as employees' concerns about a new training.

1993: 5th Symposium on QFD (ISBN1-889477-05-2)

Aerospace 1993

Concept Selection "A Process For Aerospace Design Decisions", *D. Hamilton, McDonnell Douglas Aerospace - East*. Many recent quality-related initiatives at McDonnell Douglas Aerospace-East have focused on Integrated Product Development and Systems Engineering approaches to the design of their products. Within the scope of these initiatives, there was a clear requirement to develop a traceable, unbiased, repeatable, and systematic approach to innovative design development, particularly design or concept selection. This paper presents a concept selection methodology which has been adapted from Stuart Pugh's concept selection process and applied for several design selection activities at the company.

Quality Function Deployment For Large Systems, E. B. Dean, NASA Langley Research Center. This paper reports efforts to extend QFD to large scale systems within NASA. It links QFD to the system engineering process, the concurrent engineering process, the robust design process, and the project measurement process. It includes issues, project functions, and resource utilization as a part of a tightly linked project structure of high dimensionality which provides a high quality, low cost, and hence a competitive product. A pre-QFD matrix linking customers to customer desires and the decomposition and mapping of customer value as a means of project activity prioritization are described.

Use of QFD to Design a Simulation System, *David L. Molnar, McDonnell Douglas Technologies Incorporated*. This paper describes the use of QFD to design a scenario generator for a system that electronically generates test targets for radars. The explicit primary goal was to use QFD as a tool to formally determine design requirements. Additionally, QFD was used to facilitate team building among two groups of people who had different technical expertise and had not worked together before this QFD project.

Automotive 1993

QFD Implementation at Chrysler - The First Seven Years, *Robert J. Dika, Chrysler Corporation*. QFD appears to be a simple and rational method to translate customer requirements into appropriate company technical requirements. It is also the nature of QFD to challenge some of the basic assumptions and traditions of the new product development systems in mature organizations. Since it demands a change in the ways that we think and act as a company, it will meet resistance. This paper presents the story of successes and struggles that Chrysler has experienced in the integration of QFD into its development process. It reports the steady growth in both the number and significance of QFD projects over a seven year period, and shows that QFD can be a strategy in the movement toward a TQM culture.

Utilization of QFD Principles In Chrysler's 1995 Small Car Program, *Monte G. Myers, Chrysler Corporation*. Is it possible for an American automobile manufacturer to design and build an affordable, fun to drive small car, in North America and at the same time make a profit? Chrysler's Small Car Platform Team not only believes that this is possible, but is on the verge of proving it to the world. This team has continually challenged itself to "Dare To Be Different" in all aspects of the automobile design and development process in an effort to challenge this paradigm. This paper presents a case study of a large scale,

total vehicle program. It discusses the QFD process as used by Chrysler's Small Car Platform Team during the design and development phases of the new small car slated for an early 1995 model year introduction.

Application of QFD to Launch of G.M. D-Car Air Bag, *Leonard Pavia, Mexican Industries in Michigan, Inc.* As a tier two supplier for air bags, Mexican Industries does not interact with the end item customer to be involved in the first phase of QFD in determining the customers demands or wants and translating them into design requirements. However, the company does become actively involved in Phase Two "Part Deployment," Phase Three "Process Planning" and Phase Four "Production Planning." This paper explores the application of these three phases of QFD to a very unique air bag designed to meet the customer demand of protecting not only the regular passenger but also the third person sitting in the front seat.

Volvo's E.C.C. (Environmental Concept Car) - QFD applied to a Future Concept Car, *S. Voegelé, Volvo Monitoring and Concept Center*. While the majority of the world's automakers are involved in intense R&D of battery-powered electric cars that will meet the CAFE requirements, Volvo has taken a different view: Meet California's zero emission vehicle standard set for 1998 but also take the desires of Volvo customers into consideration. The voice of the Volvo customer guided the entire concept development process. Using QFD as a concept development tool provided product requirements that were surprisingly different from initial expectations.

Strategic Management of (Standard) QFD, *Keith B. Termaat, Ford Motor Company*. After five years of QFD, things right and things wrong with QFD were evaluated to specify a Ford standard process to achieve faster cycle time, reduced engineering workload and better direct marketing research and software institutional support. This paper describes a Ford proprietary QuickQFD™ process which relies on templates for wants, hows, and interactions to rapidly focus on no more than a couple of dozen each.

Aligning The Product Development Process Using Momentum^(R) QFD: A Case Study In Letting The Voice Of The Customer Drive The Conceptualization Of a New Leak Detector, *R. Norman, Leemak Training Systems, Inc.* Using a case study, this paper examines the phases a company went through to implement a process for concurrent product development. The first phase included Voice of the Customer alignment and tools, the second phase embodied the tools and techniques of QFD, and the third phase involved implementing the plan.

Computer & Electronics 1993

Optimizing QFD, *G. Brubaker and P. Dunham, NCR Corporation*. This paper traces the introduction, optimization process, and training of QFD that took place and has been going on at NCR since the methodology's introduction to the company in 1989. Barriers to success, high performance QFD teams, and improvements made in market research brought by QFD are also discussed.

Successful Quality Function Deployment (QFD) Application at Digital Equipment Corporation - Unique Approaches and Applications of QFD to Address Business Needs, *Michelle Ackerman, Bob Buckland, Digital Equipment Corporation*. DEC is applying QFD concepts to successfully improve internal business performance. Application of general QFD concepts to everyday business issues such as strategic planning, problem solving, and process development, in addition to more traditional software and hardware design and development, is shared.

Building Beyond the House of Quality: Concept Development, *Donald E. Demallie, Unisys Corporation*. Designing a product that satisfies customer

requirements has often been considered an art rather than a science. Using concept development changes that perception. By eliminating guess work, concept development applies a disciplined approach to developing products that best satisfy customer requirements. This paper describes the concept development process and defines the relationships between the process, the house of quality, the parts deployment matrices, and the use of Pugh's concept selection process.

Eliminating Customer Dissatisfaction Using Negative Relationship Matrix, *David H Green, Michael Cooke, Ian C. Wild, Electronic Data Systems Consulting Division*. This paper describes how to use customer feedback to make trade-off decisions so that product features are not offered at the expense of the important customer requirements. The methodology involves the use of a "Negative Relationship Matrix," which was derived from the QFD technique. The example used illustrates how an automotive company might provide the best possible fuel economy to its customers.

Beyond the House of Quality - Dynamic QFD, *Cindy Adiano, IBM Austin, Aleda V. Roth, Duke University*. The kaleidoscopic nature of today's environment has transformed the basis of industrial competitiveness. Prerequisite to superior manufacturing is the ability to create defect-free products that are right for the customers over time. Thus, the point of departure for market-driven manufacturing is the voice of the customer. Incorporating the voice of the customer into manufacturing is a multi-step process that poses the conundrum on how to link the voice of the customer with the manufacturing processes efficiently and effectively. The problem is technically solved through "Dynamic QFD," which is designed to optimize manufacturing's capability to enhance product quality and solution timeliness. The paper describes the method.

Construction 1993

QFD: A Step-Change Planning Tool for Engineering and Construction Projects, *Thomas H. Oswald, P.E., Quality Management Consultant*. This paper describes recent research into the use of QFD in the project management processes of the engineering and construction industry (E&C). It addresses the unique nature of large E&C projects as complex, customized packages in which joint planning, teamwork, and communication between customer and supplier are often as important as decisions regarding materials, systems, and other aspects of physical configuration. The paper discusses industry differences which create challenges in adopting QFD in the E&C process, and concludes by setting forth implementation issues currently being investigated by the author.

Defense 1993

The Application of QFD to a National Security Issue, *Greg A. Mann, Sandia National Laboratories*. On Aug. 4, 1990, the U.S. Senates passed a resolution requesting that Department of Defense investigate the feasibility of installing a post-launch destruct mechanism in all intercontinental and submarine-launched ballistic missiles deployed by the U.S. The feasibility investigation required the complex analysis of high level political, technical, environmental, operational, and security issues by a cross-functional team from DOE and DOD. Clarity and conciseness of the investigation results were of critical importance. This case study reports how modern quality tool, QFD, was modified and used successfully to organize the study, prioritize customer requirements, document decisions, evaluate technical options, and to identify critical system's characteristics necessary to respond to this national security issue.

QFD's role in Advanced Tactical Aircraft Development, *Suzanne Bergman, McDonnell Douglas Aerospace - East*. Advanced aircraft design requires solutions to postulated future problems. MacDonnell Douglas Aerospace - East has developed a process which uses QFD to aid in the

understanding of potential world futures and their implications. Beginning with national goals, successive matrices capture the flow down of requirements through the prioritization of technologies to be applied to advanced tactical aircraft. This paper describes how National Goals can be linked with successive levels of military policy in order to illustrate the impact of these policies on future aircraft force structure requirements. A method for examining the sensitivity of these requirements to eternal variables, such as the defense budget, potential U.S. and world futures, is also discussed.

QFD for Military Technology Development Planning, *Robert A. Fiske and William J. Adams, North American Aircraft Division, Rockwell International*. The U.S. Air Force and U.S. Navy crew escape communities are merging forces to develop requirements and technology programs intended to produce an advanced ejection seat for fighter pilots. With the participation of this joint-service team Rockwell International and LME, Inc. executed QFD for bridging the large set of conflicting escape system requirements to a technology development plan. The first House of Quality embodied 6 Customer Voices, 12 requirements as Whats, and 33 technology goals as Hows. Subsequent matrices revealed key technology projects and technology development programs and culminated in a Technology Development Roadmap planning document.

Using QFD to Establish and Improve Internal Customer Satisfaction, *Linda K. Hoffman, FMC Corporation*. Effective use of information resource technologies is critical to the success of a product development program. In June 1992, a TQM team was assembled to establish the desired interface between Information Resources and development program at a FMC Corp. in MN. Using QFD, the team analyzed customer data obtained from experienced development program managers. This paper describes the steps taken and products of using QFD.

An Application of QFD in Product Support Services, *Jeff Litwin, Rockwell International*. QFD for Military Technology Development Planning, Robert A. Fiske, Ph.D. and William J. Adams, Rockwell International, Walter R. Peck, LME, Inc. This study looks at the application of QFD at Rockwell International's Collins Avionics & Communications Division (CACD) in the product support area. Management had developed a goal of an average turnaround time for the repair of customer equipment. To address this target and identify opportunities for breakthroughs necessary to achieve such a goal, a QFD project was initiated. This paper reports the initial application of QFD of this project that is still in progress.

Education 1993

QFD in Academia: Addressing the Customer Requirements in the Design of Engineering Curricula, *Mahesh Krishnan, Cincinnati Bell Information Systems, Dr. Ali A. Housmand, University of Cincinnati*. Can the powerful methodology of QFD be used in academia? This paper describes a QFD model that can be used in the design of engineering curricula and how it can be implemented at a university setting. Specific success stories from the University of Cincinnati are used to illustrate the effectiveness of the model.

General Industry 1993

Using Fuzzy Set Theory To Derive An Overall Customer Satisfaction Index, *G. Wasserman, Wayne State University, Agus Sugjianto, C. Wisry Sanrow, Quality Engineering Consultants and Contractors, Inc.* This paper details on how one may construct an overall customer satisfaction index based on the use of the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) found in multi-attribute utility theory. The index is derived using competitive customer assessment information contained in the (A1) QFD planning matrix.

Measuring Improvements in Customer Satisfaction Through QFD, *Jose A. Santos, Universidade de Sao Paulo,*

Brazil. This research paper presents a unified methodology to measure product improvement, based on the concept of QFD.

Quality Function Deployment for Product and Service Improvement, *Daniel Hanson, Weyerhaeuser*

Company. Applying QFD to existing product lines, cross-functional team developed innovative design requirements which are now used to measure product and service performance. This paper outlines the steps the company took and processes used to build the initial house of quality. It describes the barriers the team faced and how they handled them, the breakthrough leanings that took place as a result of using QFD, and how this created an important link between external customers and the company's manufacturing facilities. Also discussed are the diverse resources used, how QFD allowed the company to consolidate vast amounts of information into a few clear, concise pages of the most critical information, and the realization that QFD, used well, can create a significant competitive advantage.

QFD And Selecting Best Design, *I. Ferguson, Ian Ferguson Associates.* The balance between quality of design that ensures market share, cash generation for investment payback requirements, and the assurance and confidence of reliability is a fine one. This paper shows how QFD, particularly beyond the House of Quality, can reconcile these demands by generating eight sets of benchmarks that make a selection of Best Design one that will meet pre-set targets.

Quality Function Deployment - A Systems View, *Dr. S. Nelle, Decision Management Australia, Bryan Frew, Global Strategies.* This paper explores QFD from the perspective of General Systems Theory. Examining QFD from this perspective helps explain the major reasons for the failure of the process and QFD projects. General Systems Theory provides a structure from which to teach and present QFD to ensure the process is understood and used successfully. The paper draws on experience from consulting assignments in Australia.

The Strategic and Tactile Use of QFD in the product Planning and Development Process. *Kenneth L. Pia, Creative Research Services, Inc.* The benefits of QFD can be greatly enhanced if the strategic direction for product development is defined by the organization prior to the actual technical development of products by R&D or engineering. This paper details the process developed by this consulting firm to define and integrate strategic focus with tactical development of new products, using QFD as the platform.

Healthcare 1993

Applying QFD to Health Care Services: A case Study at the University of Michigan Medical Center, *Deborah M. Elrich, PH.D. and Dennis J. Hertz, University of Michigan Medical Center.* The University of Michigan Medical Center piloted QFD in a new unit which consolidated several separated diagnostic procedures into one unit. Based upon early TQM success, the organization employed QFD to realign resources to meet the valid customer requirements of the combined groups in order to stimulate service volume by better satisfying customer desires. The team is now completing the A-1 matrix. This paper discusses the Medical Center's approach, reports experiences learned, identify changes which have been implemented, quantify the financial benefits which have resulted from these changes, and offer ideas on how best utilize QFD at a referral hospital.

Market Expansion Analysis Through QFD, *J. A. Miller, Quality Processing Consulting, H. N. Tucker, Clintec Nutrition.* This paper presents the approach and findings from a House of Quality based analysis of how the market leading company could cause expansion of the entire clinical nutrition business worldwide.

Human Resources 1993

QFD for Improving Employee Morale, *Gary Ekstrom, IBM Skill Dynamics.* This paper illustrates the use of QFD for improving the overall morale of employees within a company. The process used by the QFD Team is illustrated along with the top employee wants and needs and a prioritized list of characteristics. A complete QFD diagram provides the team results and the subsequent actions taken based on those results.

Research & Development 1993

QFD Applied To R & D Activities, *M. Soril and Z. Goifi, LaBein Centro de Investigacion Tecnologica Quality.* This paper reports the LaBein's efforts in application of the QFD methodology to its R&D lines and services by a qualified Quality Improvement Team in order to a) identify the customer's current and future needs, b) improve the accuracy of its own projects, research guidelines and other activities, and c) help its management to adjust the organizational long-term vision, customer driven master plan and yearly strategies, d) improve employee satisfaction and motivation while matching their profiles and academic careers to the market requirements, and e) launch a TQM program with the short term goal of accomplishing ISO-9000 accreditation.

Safety 1993

Application of QFD to a "Soft" Issue, *Jonh Crossley, The Clorox Company.* The Clorox Technical Center Health and Safety Team had a concern. But an unusual application of the QFD process quickly solved the problem. The paper describes how QFD was able to surface the cause of the H&S committee's problems and allow them to develop a recommendation, that in combination with other data from the analysis, resulted in a much improved system.

The Application of Quality Function Deployment In the Los Angeles River Rescue Task Force, *Kathleen Butler, Robert Litwin, John Marzec, Rocketdyne, Rockwell International Tony Ennis, Los Angeles City Fire Department.* Each year, on the average, six people drown in the L.A. area flood control system. After a highly publicized tragedy in 1992, the City Council formed the River Rescue Task Force. One of the objectives was to develop new technology as may be necessary to assure rescue of people from the flood channels. QFD was used as a means to sort through the various concepts. Rocketdyne provided training and team facilitation to the Task Force as they worked through the QFD process. They have completed the House of Quality and the Pugh concept selection. Prototypes will be tested and recommendations made to the City council.

Service 1993

QFD for Service industries: From Voice Of Customer To Task Deployment, *Glenn Mazur, Japan Business Consultants.* Traditional quality approaches to assuring service quality often focus on work standards, automation to eliminate people, or Quality Improvement Teams to empower employees to solve problems. As manufacturers are finding out, however, consistency and absence of problems is not a competitive advantage when only good players are left. Exciting, positive quality must be created that adds value to the customer. This paper discusses why the service industry should be embracing QFD to stay ahead of the game. It includes an excellent explanation of what the Kano model really means, what is QFD, how to identify key customers, how to implement QFD steps, what are the deployments of Service QFD and how QFD can be successfully implemented in small businesses. A 1985 case study of a translation business is used to illustrate the points, in which the use of QFD increased the revenue by 28.5% in the first year, 150% the second year, and 215% the third year.

Strategic Planning 1993

Does QFD Support Corporation's 35-Year Vision? *J. Terninko, Responsible Management.* Why and when should QFD be used? The Check-Act-Plan-Do cycle is the critical process connecting an organization's vision to the design process. The design process defines the tasks and functional assignments which may require QFD activities. This presentation formally connects vision, TQM, design process and QFD, providing a road map for the practitioner. A service application for healthcare consultation is used to present the idea.

Team Building 1993

QFD and Personality Type - The Key to Team Energy and Effectiveness, *Dilworth Lyman, International TechnoGroup, Inc., Ken Richter, Chevron Chemical Company.* This paper discusses the company's use of MBTI as an aid to improve the effectiveness of QFD teams. The paper shows how the MBTI was used as a tool to educate teams and improve the effectiveness of their QFD efforts.

Concurrent Engineering and the Entire QFD Process: One Year After Start-Up of a New Mill, *D. M. Scheurell, Ph.D., Kimberly-Clark Corporation.* In the previous year's symposium, the company reported a paper that emphasized how their company went about forming the QFD team, the strategies to get around the barriers, results, and the transformation. This year's paper follow up on the program and postulates what they believe are the keys in obtaining all possible benefits from QFD. The importance of the team charter, a shared vision, and the team empowerment is stressed.

Just Do it!, *John Stitt and Cheryl York, Kimberly - Clark Corporation.* This paper describes the obstacles to implementing QFD in an older Kimberly-Clark mill, the team dynamics used to overcome the obstacles, and the changes that took place within the QFD team and spread to other departments within the mill.

Supporting Technique to Improve Cycle Time When Using QFD, *William J. Riordan, Howard Hohnson, Catherine Olin, Tom Salyers, GDE Systems Inc.* The QFD enhancement discussed in this paper is based on Delphi theory and aims at balancing individual efforts and team needs while minimizing the time needed to achieve mutual understanding and group solidarity. The paper describes the theoretical basis of the method, the integration of computer tools, and the mechanics of the total process and how the enhancement was used in two QFD efforts (service and management related projects)

Telecommunication 1993

QFD Adaptation Under Changing Business Directions - An Application for Product Fulfillment Systems, *Sherry M. Bosserman, Motorola, Inc.* After four years since the introduction of QFD and 12 completed QFD projects in various applications, the QFD facilitators at Motorola began to see the patterns of successful QFD teams vs. unsuccessful ones. Why did some QFD projects succeed and others fail? And what can be done to enhance success rate in the future? This paper reports detailed analysis of the various factors that were present in the past QFD efforts, and identifies a several key points that are critical to successfully bringing QFD into a technology-driven culture.

DMOQs: Measuring Yourself Against the Voice of the Customer, *Patrick G. Brown, Dianne M. Thompson, AT&T Bell Laboratories.* The QFD toolset is a superb mechanism for driving all aspects of an enterprise by the voice of the customer. At AT&T, QFD techniques have been used to define service offerings, strategic plans, quality improvement programs, and business metrics that are closely aligned with customer needs and expectations. This paper describes how the QFD approach has been used at AT&T to generate customer-focused metrics

called "direct measures of quality," to help ensure that the aspects of the products and services that are most relevant to satisfying their customers' needs are measured.

Enhancing Customer Service Through QFD, *Lori A Frantzve, Mahesh Krishnan, Cincinnati Bell Information Systems.* This paper describes the use of QFD to improve customer service at Cincinnati Bell Information Systems. It looks at the process of handling external customer calls related to product/service information, on-line systems support and other customer and product needs. The paper also speaks to how QFD fits into the TQM cycle.

Tools and Methods 1993

Priorities: the Analytical Hierarchy Process in QFD, *Richard Zutner & Company.* An approach is presented for applying an Analytical Hierarchy Process (AHP) in Quality Function Deployment to improve the accuracy of priorities and make QFD better fit particular projects. A more accurate development of priorities can be accomplished by the consistent use of ratio scales, such as produced by the AHP, throughout QFD. The Figures presented illustrate the application of these concepts to the A-1/House of Quality matrix.

Utilities 1993

QFD at PG&E - Applying QFD To The residential services of Pacific Gas & Electric, *A. Tessler, N. Wada, PG&E, R. Klein, Applied Marketing Science.* In 1992, PGE began using QFD to identify programs and services that would improve customer satisfaction and overall favorability. The first application focused on residential customers system-wide with the San Jose division as a test site. The pilot program went so well that the company expanded the program to other geographic divisions and customers. This paper reports the use of the Voice of Customer to link market research, SPC, continuous improvement teams, systems modeling, and information systems design and development, as well as the resulting benefits of using QFD.

1992: 4th Symposium on QFD (ISBN1-889477-04-4)

Aerospace 1992

QFD and Aerospace: A Success Story, *Thomas B Buell, American Supplier Institute.* The principles of QFD were successfully applied at Rosemount Aerospace division in 1990-91, for a number of tasks in addition to product development and improvement. Case studies illustrate the many applications of QFD to the aerospace industry.

Use of QFD in Liquid Rocket Engine Power Cycle Selection, *Arthur H. Weiss, Kethleen N. Butler, Rocketdyne.* The National Launch System is a joint NASA/Air Force program to develop a flexible and reliable launch capability. The NLS will be a heavy lift launch vehicle which will provide assured access to space for significantly lower space transportation costs. The goal of the program is to reduce current costs without sacrificing reliability. The power cycle for this engine was selected by using QFD in new ways. The paper describes in details the use of the GOAL/QPC A-1 matrix, evaluation of the cycle selection criteria, the cycle values, a cross-check against the validity of the technique, evaluation of each cycle at the component level and the results of the three approaches and the team's recommendation.

Automotive 1992

The Utilization of QFD in the LH Powertrain Program, Glenn W. Czupinski, Don H. Kerska, Chrysler Corporation. The LH was the first major program at Chrysler Corporation to use QFD beginning at the total vehicle level and then prioritizing critical system areas for more detailed study. The LH powertrain project was one of five strategically identified areas requiring further analysis. As a result of the QFD study, four critical subsystems of the LH powertrain were identified needing extra design attention in order to ensure customer satisfaction. The paper discusses the challenge to the engineers and the major benefits of implementing QFD in this project.

Reducing Time to Market for New Products: QFD in Action, Kevin O'Brien, Ph.D., Raychem Corporation. This project illustrates how QFD can be used to significantly reduce the time to market required for the development of new products. Focusing on the automotive industry, the paper explains how this can be achieved using the matrix approach to analyze critical processes to determine critical process parameters and coupling the information with designed experiments and SPC to assist in improving the final product delivered to the customer.

Chemical 1992

QFD in the Design of a Pipeline Distribution Center. James W. Cole, Ph.D., Process Management International, Gary Williams, Chevron Pipe Line, Co. This paper reports a case study describing an effort to blend the voices of the customer (four populations) and the voice of the engineer, while developing multiple houses to support the design of a pipe line distribution center. The design of a supervisory control and data acquisition pipeline distribution center posed unique problems that QFD appeared to address. The new center to be build had to have increased capacity and better data information handling Design (construction) houses were developed to support the design of a new replacement control center. Concurrently, service houses were developed to support quality management of the control center.

Listening to the Customer, John Crossley, The Clorox Company. Understanding what the customer is really saying is not an easy task. Understanding how these customers' wants fit into the business needs present an even more difficult problem. But the success at translating the voice of the customer into actuality can be obtained. It requires developing a well defined process prior to any contact with the customer. Such a process is described in this paper.

QFD In Strategic Planning - A Study In Product Direction, D. Lyman, International TechneGroup, Inc., R. Beusinger, J. Keating, Chevron Chemical Company. This paper examines a case study in which QFD was used to help a business unit to choose what products to develop. First, the position of the business unit within the company was considered. Next the market issues, existing manufacturing capabilities, and the status of the company technology were considered. The paper discuss how all of these considerations were applied to the choice of product to pursue.

Consumer Products 1992

Taking QFD through to the Production Planning Matrix: Putting the Customers on the Line, Diane M. Scheurell, Ph. D., Kimberly-Clark Corporation. Most QFD efforts to date within the Divisions of the Kimberly-Clark have focused on the House of Quality. This paper discusses a program in which the company undertook the development of the 2/3 and 4th matrices for a new product and process. Barrier to forming the QFD team, the strategies used to get around the barriers, and the transformation of the QFD meetings from matrix development tasks to strategy development for the program are also discussed.

Defense 1992

Use of Correlation Matrices in Quality Auditing, Alan B. Rothman, Department of Defense. Traditional quality audits is based on a bean-out approach, where every deficiency stands alone, carrying equal weight, and contractor performance is judged solely on numbers of defects found, instead of a systemic view of the quality system. This paper proposes a new better way to do quality audit, in which correlation matrices were used to weigh individual findings against each area reviewed, to get a factor of relevance of deficiencies to the system. It also explains a method to track real-time audit performance and a 2-step auditing method under development.

Education 1992

Flowing Customer Demanded Quality from Service Planning to Service Design, Greta Stamm, Educational Services Institute, Inc. This paper reports a case study that used QFD for the design of a guidance program at a large Midwestern high school.

Using the QFD A-1 Matrix to Identify software Development Risks, Walter M. Lamia, Carnegie Mellon University. The Risk Program at the Software Engineering Institute is investigating the problem of how to manage the technical risks inherent in the design and implementation of large software-dependent systems. While DoD policy mandates identifying major risks in programs, little guidance exists, particularly for the software components. In hope to develop systematic ways of identifying and resolving technical risk, an adaptation of the QFD A-1 matrix is being used. This paper describes simplifications made to standard QFD practice to facilitate its use when only a brief time is available to interact with program staff. Heuristics have been developed with which to analyze the matrix to identify risks that threaten the success of a program.

General Industry 1992

Gaining the Strategic Advantage: Implementing Proactive Quality Function Deployment, Satoshi Nakui, GOAL/QPC. A former student of Dr. Yoji Akao and a TQM and QFD consultant to many Japanese companies, Satoshi Nakui shares in this paper the process of QFD and how to create matrices. It explains what is QFD, how to hear and interpret the Voice of the Customer and how to fine-tune the customers message (VOCT) and analyze them, together with the purpose and objectives of each phase.

Using Quality Function Deployment to Align Business Strategies and Business Processes with Customer Needs, Bill Barnard, NCR. This paper explores the use of QFD to align a company's strategies with the business processes. The author's recommended process to be followed when involving QFD in accomplishing these objectives is explained.

Quality Function Buying, Vincent F. Elliott, Elliott Affiliates, Ltd. Quality Function Buying (QFB) is a TQM, continuous improvement approach to meeting the needs of the customer through acquisition, rental, leasing and buying means. The paper describes the QFB which uses the structure of QFD.

Integration of Quality Assurance Into Business Functions, Stuart Chalmers, KAIZEN Institute of America. The U.S. companies have been bombarded with improvement processes over the last few years, such as Quality Circles, TQC, JIT, TPM and more. Many companies have tried to integrate this barrage by trying certain ideas out and blending them. This paper explains that these ideas are coming from the same base - the continual push to improve the way a company works. It shows that Kaizen, or continual improvement, is at the core of the thinking of all these new ideas.

Using QFD to Prioritize Design Resources, Gary S. Wasserman, Wayne State University. Designers need to know how to evaluate the costs and benefits associated with each

design requirement, a planning model is introduced which makes use of the information content of the normalized QFD product planning matrix. This research paper shows the model is equivalent to an integer relaxation of the classical knapsack problem in operations research, thus a sample ranking of technical importance to effort required index is sufficient for deciding how to best allocate design resources.

QFD: A TQM Cornerstone For Quality Business Operations and Consolidation Factoring: A QFD Enhancement for Quality Business Decisions, *A. L. Weisbrich, ENECO*. QFD, if used appropriately, is proposed to be a principal cornerstone in the broad-based pursuit of a TQM culture. This paper attempts to show why and how QFD can be used to improve business operations. A specific QFD improvement, the Consolidation Factor, will be introduced and illustrated for enhanced QFD use in making comprehensive business decisions.

Customer Oriented Product Concepting: Beyond the House of Quality, *M. Larry Shillito, Eastman Kodak Company*. QFD and the HOQ may not always be the appropriate technology for designing products. Customer Oriented Product Concepting was specifically developed for designing new or revolutionary products and services. This paper explains this method, the steps to use and matrices.

QFD, Program Management and Product Development Process, *Mark D. Gavor, Colgate-Palmolive Company*. The Product Development Process is one of the critical processes for any business. For many companies, this process needs to be formalized. Both QFD and Program Management are methods for influencing and improving the Product Development Process. This paper compares and contrasts the two methods and explores how they may be integrated into the Product Development Process.

The Customer Process Table: Hearing Customer's Voices Even If They're Not Talking, *Dale L. Nelson, dale Nelson Consulting*. The customer process table is a tool that can enhance the understanding of latent customer needs and lead to the development of differentiable products. This article describes the customer process table, how it works and how it can be used to enhance product development efforts.

Healthcare 1992

Hospital Marketing's Role in TQI: QFD, *Duane Loller, Meadville Medical Center*. With the advent of TQM programs in hospitals, the marketers have a unique opportunity to both further the objectives of marketing effort and develop a close link to operations. This paper examines the experience of the Meadville Medical Center with the development of a research system using QFD tools. The linkage of existing market research programs with a QFD matrix has yielded improved quality of customer research and improved acceptance of the output.

Multi-phase QFD Studies for Product and Services Development, *Joe A. Miller, The Focus Consulting Group, Inc., Armando Bombino, Baxter Healthcare Corporation*. When QFD is implemented as a structured component of a customer satisfaction driven TQM process, it helps link the basic concepts of TQM into the product and service development processes. Training cross-functional product or service development teams in multiple phase applications of QFD and facilitating those teams to rapidly develop all of the QFD matrices pertinent to the full cycle from concept through product introduction enables critical decision and information needs to be identified earlier in the development cycle. This is demonstrated through a range of applications in this paper.

Medical Device 1992

How QFD Saved A Company - The Renaissance Spirometry System, *O. Kaellin, P. Bennett, R. L. Klein, Applied*

Marketing Science, Inc. The Boston Division of Puritan-Bennett, a maker of spiro-meters, faced a crisis in 1990. A competitor had introduced a new product priced at half of their product's current price. The company chose to fight and used QFD to develop a product that would meet this threat. This case study reports how a small company identified the Voice of the Customer, linked it to engineering characteristics, and then used that information to guide the development of the product that has saved the company.

Related Tools 1992

Synergy of Taguchi's Philosophy with Next Generation QFD, *Jonh Terninko, Responsible Management, Inc.* QFD has an improved understanding of market segmentation and the environment of application of the product or service. The technical evaluation in the house of quality is enhanced by Taguchi's loss function. The customers environmental impact upon performance can be reduced by robust designs. A single concept may be able to satisfy several customers segments using dynamic characteristics. With increasing levels of sophistication and refinements in understanding for QFD and Taguchi, it is time to take advantage of the synergy between these two systems of design.

Service 1992

Task Deployment of Service, *Richard E. Zultner, Zultner & Company*. The Task Deployment subsystem of QFD brings the power of QFD to any process, such as a service, which requires the execution of a sequence of tasks for customers. Process QFD is essential to QFD for Service, and is very useful for many process improvement applications.

QFD in Emergency Road Service, *Dr. Adnan Aswad, k Diana I. Glowski, the University of Michigan - Dearborn, David J. Zink, Ford Motor Company*. QFD was applied for the improvement of emergency road service for an organization. Competitive service must be accurate, efficient, timely and courteous. A case study illustrates the benefits of using QFD in customer service.

QFD in the Service & Administrative Environment, *K. Hofmeister, American Supplier Institute*.

Use of QFD IN Market Driven Education Service Study, *Allen I. Sharkey, Thomas W. Suther, IBM Corporation*.

Software 1992

TQM and Software Engineering: A personal Perspective, *Barbera Liston, Equal Partners*. Software engineering and manufacturing can mutually benefit from each other's best practices and may even wish to benchmark each other in areas of key strengths. This paper outlines some of the similarities in the quality efforts in the two industries, offers techniques used in software development to obtain and verify the voice of the customer, and then looks at additional best practice tools and techniques used in software development. It concludes with an analysis of some of the critical issues pertaining to the voice of the public.

QFD as a Structured Design Tool for Software Development, *Takami Kihara, Charles E. Hutchinson, Dartmouth College*. This paper introduces the concept of QFD for software development utilizing QMIII (Quantification Method of Type III) to organize the complexity of requirements. A focus is given on the requirement analysis phase of the software development cycle, the most important phase of software development. Citing a case study, QFD is introduced as an approach for structured design of software and QMIII is introduced to facilitate organizing the requirements.

Team Building 1992

Quality Teamwork for Quality Deployment, Bruce L. Dockstader, Ph. D. *The Goodyear Tire & Rubber Company*. QFD requires cross-functional teamwork. But effective teamwork does not always happen by accident. Teams must be carefully organized and managed to obtain their best results. The model discussed here considers the organizational factors of team vision, mission, goals, roles, procedures, interpersonal influences and communications, as these factors contribute to team effectiveness. Also discussed are the five stages of team development: forming, norming, storming, performing, and ending. Application of the team building model can move a team quickly through the early stages to the performing stage.

Telecommunications 1992

QFD as a Process Redesign Tool: An AT&T Case Study, Catherine (Kate) Mellina, *AT&T Bell Laboratories*. This paper describes how an AT&T team used QFD in the redesign of a complex order fulfillment process. It explains 1) a set of QFD matrices useful for process applications, 2) how customer, benchmarking, and process data were collected and integrated into charts, and 3) lessons learned about applying QFD to the reengineering of a complex process.

Training 1992

Developing Company Specific QFD Training: A Customer Driven Approach, M. Liner, *Raychem Corporation*. This paper outlines the process used at one company to develop a culture-sensitive QFD training system and to integrate QFD methods into product development. The results of research into success factors are presented, and the system under development is described.

QFD Training Program, Jude Heimel, *AT&T Bell Laboratories*. One of the reasons for companies having difficulty implementing QFD can be attributed to lack of appropriate training support. This includes inadequate training, the wrong type of training, and too much training. AT&T Bell Laboratories Kelly Education and Training Center addressed this problem by providing a QFD training program using an integrated understanding of 1) TQM and organizational change, 2) adult learning models and instructional technology, 3) training management, and 4) QFD. The paper provides QFD champions on other companies with description of the development and delivery of AT&T QFD training.

1991: 3rd Symposium on QFD

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Aerospace 1991

Using QFD with Dynamic Customer Requirements, J. B. ReVelle, Ph.D., *Hughes Aircraft Company*. Existing explanations of QFD presume that the customer importance value for each of the customer requirements are constant. Recognizing that customer requirements are dynamic and cannot be controlled by a supplier, this paper uses the Taguchi inner-outer tableau to achieve a robust requirements matrix. A simulated case study has been created to demonstrate the methodology.

Automotive 1991

Overview of Quality Function Deployment, R. J. Dika, *Chrysler Corporation*. Within the community of quality and reliability professionals, there has been an explosion of interest in QFD, study and discussion on the subject. This paper presents in a global way, a statement of what QFD is and a brief description of its universal elements, essential principles,

and mechanics and definitions, with intent to set a common starting place for all Symposium participants.

Concept Development Through Teamwork - Working for Quality, Cost, Weight and Investment, Robert J. Dika and Ray L. Begley, *Chrysler Corporation*. This paper presents a method for developing a product design and manufacturing process concept, before project final approval, which integrates several other methodologies and uses cross-functional teams. It is a method for completing a "paper" study which quickly considers many of the downstream stems of product development, which will be conducted in greater detail later. It results in a selection of the best design and process for the overall product application and supports this selection with sound numerical targets for quality, cost, weight, investment and process capability.

Application of a QFD and Other Quality Tools to a Trunk System, Bill Biondo, *General Motors*. A QFD application case study presented by General Motors. The project goal was to produce a quality trunk system which meets or exceeds the customer's expectations by understanding the customer's requirements, and the resulting product, process and production floor requirements. The process began with the VOC, translation of the voice into product characteristics, and assessment of strength of the characteristic relationships. Competitive benchmarking was done to determine the priority of each characteristic and the level of complexity. The processes continued from system to component to process to production floor. At each level, the critical elements were focused on and studied.

Computer 1991

Requirements Gathering Techniques Used with Quality Function Deployment, A. I. Sharkey, *IBM Corporation*. Presentation slides on four basic steps in gathering wants and needs, cross-functional management system, VOC process, account selection guidelines, customer input gathering and analysis, etc.

General Industry 1991

Getting the Voice of the Customer, Glenn H. Mazur, *Japan Business Consultants, Ltd.* Presentation slides. What is the Voice of the Customer?; Who is the customer?; When to get VOC?; How to use VOC data?; and VOC Table samples.

The Hows, R. F. Hales, *International TechneGroup*. Presentation slides. The House of Quality or Product Planning Matrix; Purpose; Guidelines; Types; Sources; Problems; Results.

Total Quality Management and Quality Function Deployment, S. Ungvari, *American Supplier Institute*. This paper discusses 1) What is TQM?; 2) What is QFD?; 3) Dynamic TQM; and 4) QFD and the TQM Tools.

Comprehensive QFD System, Satoshi "Cha" Nakui *GOAL/QPC*. Comprehensive QFD system is detailed in this paper by one of the students who studied directly under Dr. Yoji Akao, co-founder of QFD, in Japan. It includes Voice of Customer Tables, how to enter data, what is demanded quality, rules, demanded quality deployment, function analysis, function deployment, failure mode analysis, reliability deployment, concept deployment, capability deployment, plus many example charts and matrices.

Building QFD into a Comprehensive Product Development System for Competitive Advantage, C. Nicholson, *Oregon Cutting systems Division - Blount Inc.* The international construction and manufacturing company describes how they began QFD to bring customer focus to their improvement activities and shift to "market in" approach from "product out"

thinking which they traditionally held. The strategic product development system resulted, achieving measurable improvement in their product development and market share.

Filling in the Blanks: QFD & Technical Optimization, *J. Quinlan, ITEQ International, Ltd.* The work of Dr. Taguchi offers technical theories and processes that provide the methods by which technical personnel can accomplish upstream development work that leads to high performance products downstream. It provides technical concepts and processes by which the real benefits of QFD and concurrent engineering can be realized. Using a toy suction cup dart gun as an example, the paper explains how this can be done.

Structured vs. Non-Structured Approach to QFD, *W. H. Slabey, American Supplier Institute.* Presentation slides on the key customer demands, myths about QFD, and American Supplier Institute (ASI) approach to QFD vs. GOAL/QPC approach to QFD.

Using the QFD Concept in Non-Product Related Application, *R. G. Day, Total Quality Management, Inc.* People who have used the QFD concept for product planning frequently find that the QFD matrix concept has natural extensions to other planning applications. This article explores a few such examples of the use of the QFD concept in non-product related applications based on the experience of several organizations.

Concurrent Engineering a Harris - Lessons Learned, *J. A. Lugo, W. J. Vitaliano, J. S. Lutz, Harris Corporation.* During the 1990 fiscal year, the Concurrent Engineering Team of the Corporate Engineering Productivity Group at Harris set an ambitious goal: the creation of a concurrent engineering training course, including QFD methodology, and the initiation of two concurrent engineering pilot projects. The goal was successfully met and exceeded, and seven pilot projects were started. This article summarizes Harris experiences and future plans.

QFD Assumes You have an Imagination, *J. Terninko, Responsible Management.* A skilled QFD practitioner is not restricted by ASI's four-phase approach or GOAL's matrix of matrices. The examples from actual cases which are presented in this paper use neither approach. They do use Taguchi's loss function in the house of quality for technical evaluation. Product mix is selected by simultaneously looking at market segments and needs.

Enhancements to the QFD Process, *E. H. Vannoy, P.E., Product Engineering & Reliability Engineering Consultant.* Presentation slides on QFD study, product planning matrix, paired comparison matrix, QFD matrices.

Before the House: The Voices of the Customer, *Richard E. Zultner, Zultner & Company.* An approach is presented for applying QFD to complex products and services with multiple types of customers. This "customer deployment" occurs before the A-1 or "House of Quality" matrix. In addition to enhancing the ability of developers to hear the "voices of the customers" more clearly, a more accurate deployment of weights can be accomplished by the consistent use of ratio scales, such as produced by the Analytical Hierarchy Process (AHP) throughout QFD. The figures presented also illustrate the mini-matrix method - a series of simple matrices and tables providing an easy-to-learn but very extensive, tailor-able structure for QFD. Some guidance is provided for applying these concepts to the A-1/House of Quality itself, and beyond.

Who Needs QFD User Groups? *R. Norman, R. F. Hales, D. Lyman, International TechneGroup.* QFD is rapidly becoming a powerful decision-making process in many business. Much has been written about QFD, what it is, how it works, and its benefits, but practical case studies are not usually published. This is primarily due to the fact that companies consider the

QFD data highly proprietary. One approach to a more open sharing of implementation information is to form localized user groups. This paper discusses the concept, some examples of how user groups have been started successfully and the implications for QFD's future.

Amplifying the Voice of The Customer, *M. C. Lyons, J. A. Alexander, Impact Group, Inc.* QFD has achieved its most dramatic applications in the world of heavy manufacturing. From the VOC to translating that through cascading houses of quality into the shop floor, the QFD process has been thoroughly tested, documented, and proven. However, the roadmap for the trip back to the customer, i.e., how it convinces the customer that it is worth the money asked, is largely unmapped. This paper focuses on the use of Voice of the Customer information within the more traditional "telling and selling" role of marketing and sales. It gives concrete examples of how marketing and sales assess broad customer expectations in a simple "report card," and then utilize that information to correctly "position" in the customer's mind the value of the products and services that the selling organization already delivers.

Manufacturing 1991

QFD Study of CATV Connector, *M. Liner, Raychem Corporation.* QFD offers significant benefits as a tool for bringing new products efficiently to market and increasing customer satisfaction. This paper describes a product development team's use of QFD on an indoor coaxial cable connector for the cable television market. Both the 4-Phase and the Matrix of Matrices approaches are used. A summary of the team's evaluation outlines advantages, key problems, and suggestions for future work with QFD. Significantly higher customer satisfaction at product introduction resulted from using QFD.

Medical Device 1991

The Strategic Approach to Market Research, *D. A. Ginder, Mech Group, Inc.; N. Donforio, G.E. Medical Systems.* This paper discusses a new approach to market research using QFD to focus research activities on Key Customers and how GE Medical applied the tool. Systematic definition of company requirements, focused market opportunities, customer definition, and customer requirements become the driving factors for new product development or validation of an existing product line. This approach enables Marketing to perform research which is more meaningful, economically focusing resources on customers with the greatest potential opportunity to meet the company's long and short term goals. This strategic approach to is replacing the more traditional market research approaches such as conjoint analysis, which are more of a statistical shotgun.

Software 1991

Quality Function Deployment to Gather Customer Requirements for Products that Support Software Engineering Improvement, *J. Moseley, J. Worley, Texas Instruments.* During late 1990s and early 1991, the QFD process was used to gather customer requirements for products to support software engineering process improvements for Texas Instruments. These requirements were compressed into twenty customer need categories and were given the priorities as received from the customer using the QFD process. These needs were further developed into twenty-two measurable characteristics, which were then analyzed and five key characteristics were identified for further development. The QFD process provided an effective means of gathering and categorizing customer requirements for software engineering process improvement products.

Electronic Exchange of QFD Data, *R. F. Hales, D. Lyman, R.*

Norman, International TechneGroup. The time has come for vendors of QFD software to establish a common exchange format. This paper discusses the requirements for this type of standard. It also proposes a preliminary format.

Generalized Approach to Adapting QFD for Software, *A. I. Sharkey, IBM Corporation.* Presentation slides on QFD approach used in IBM, QFD software translations, QFD software samples charts, market segmentation and QFD deployment, and implementation at IBM.

Training 1991

The Need for Quality Function Deployment Quality Function Deployment, *K. R. Hofmeister, American Supplier Institute.* An excerpt from the ASI's 3-day workshop manual based on a four-phase model for auto industry suppliers.

Taguchi Method 1991

QFD & Taguchi for Design with Environmental Elegance, *Dr. C. M. Overby, Ohio University.* There is growing recognition that one of the best ways to reduce pollution and to minimize waste is to prevent them from happening in the first place. A most important place and time to carry out this "prevention" is when products and processes are first created - at the beginning of the design process. This paper illustrates how Taguchi and QFD ideas, ideas about "defect prevention by design" have parallels in concepts of "pollution prevention and waste minimization by design," and how these "quality" ideas might help us move toward environmental elegance in design for the entire life cycle in engineering practice and education.

Voice of Customer 1991

Voice of the Customer Analysis & Other Recent QFD Technology, *G. Mazur, Japan Business Consultants, Ltd.* This paper details what is the Voice of the Customer, why it is important, and how it is gathered and analyzed. Other technologies and applications included in this paper are Kansei Engineering, QFD for regulatory and environmental compliance, QFD for chemical processes, and QFD for service industries.

1990: 2nd Symposium on QFD (ISBN1-889477-02-8)

Aerospace 1990

Lessons Learned from a QFD on the Space Transportation Engine, *D. Lecuyer, Pratt & Whitney.* A QFD of the Space Transportation Engine (STE) was conducted to assist in defining the requirements for the main liquid propulsion engine for the Advanced Launch system. This paper describes the QFD processes that took place, the resulting outcome, several situations that arose during the course of the QFD project that adversely affected the QFD, how they were successfully addressed, and specific recommendations and lessons learned to assist in future QFD efforts.

Automotive 1990

Overview of Quality Function Deployment, *R. J. Dika, Chrysler Corporation.* Within the community of quality and reliability professionals, there has been an explosion of interest in QFD, study and discussion on the subject. This paper presents in a global way, a statement of what QFD is and a brief description of its universal elements, essential principles,

and mechanics and definitions, with intent to set a common starting place for all Symposium participants.

Steering Column Concept Selection for Low Cost and Weight, *R. L. Begley, Chrysler Corporation.* Most engineers approach the "Design" sequence in fashions which they have learned while on the job. Very little formal training exists at the university level which translates directly into how an engineer might choose the appropriate design for the task at hand. Additionally, very few corporations offer courses instructing the engineering community on what techniques should be used to select an appropriate design and then to improve it. Through an example of the selection process for a steering column assembly experience at Chrysler, this paper demonstrates the application of QFD, Competitive Benchmarking and Value Engineering as very powerful tools for the engineer to use in the design process.

Ford - GE Blower Motor Project, *H. Wadke and A. Palumbo, Ford Motor Corporation; M. Cicala, American Supplier Institute.* Presentation slides on an application of QFD in the Ford-GE blower motor project.

Quality Improvement - Start at the Beginning with QFD, *W. H. Selecman, Ernst & Young.* Most companies in the Automotive Industry are having great difficulty implementing SPC. They are typically satisfying Big 3 requirements but harvesting few benefits. This article discusses the rationale and impact of changing the approach for attaining quality improvement to employ QFD to focus more heavily on refining activities that must be done precisely. A series of lessons learned in instructing and applying QFD to automotive products are included. The linkage between QFD and other elements of the quality tool kit are explored.

Chemical 1990

Quality Function Deployment and Total Quality Excellence, *M. G. Gavoora, Colgate-Palmolive Company.* Colgate-Palmolive is in the process of adopting a TQM philosophy and style based on the teachings of Dr. Deming. A corporate Quality Office was established and staffed by experienced professionals from outside Colgate. Much thought has been given to the structure of the program entitled Total Quality Excellence (TQE). This paper reflects the thinking to date (June 1990) on the structure of TQE, the primary tools and techniques associated with it and the coordination of those tools and techniques. Special attention is paid to QFD within TQE.

Defense 1990

QFD on a Defense Contract, *P. L. Bersbach and P. R. Wahl, GM - Hughes Electronics.* This paper describes a real life application of QFD to a factory of the future in the Aerospace and Defense industry that is high rate low cost microwave hybrid manufacturing facility. More a diary than a historical account, this paper describes an application that is still in progress (the completion of the project is planned for 1992), the resources required by QFD, the QFD tools and matrices needed, and in in-depth look into the obstacles encountered, including ignorance toward QFD and the approaches used to educate all.

Energy & Utilities 1990

Quality Function Deployment at FPL, *J. L. Webb, Florida Power and Light, Inc. and W. C. Hayes, Qualtec, Inc.* This paper discusses both the macro and micro application of QFD at FPL. In service industries, it has always been difficult to identify customer requirements and then to evaluate the organization's performance in meeting them. FPL has successfully used QFD at a higher level to identify customer requirements and basic

quality elements. These were then deployed through all levels of the organization into each job function. Through customer segmentation, FPL has also begun to identify more specific applications of QFD in service, software, and product development. The first example provided here describes the "Customer Needs Table of Tables" and its use in deploying their Corporate Quality Elements. The second example shows how QFD was used to redesign the way in which the company responds to customer requests at their regional phone centers.

General Industry 1990

Applying QFD in Various Industries, *K. R. Hofmeister, American Supplier Institute.*

Fanatic QFD User, *J. Terninko, Responsible Management.* This paper identifies many tools that responsible practitioners should use artistically to make QFD and quality initiatives effective. These include Taguchi, Control Charts, Group Dynamics, Fishbone Diagram, Process Decision Program Chart, and Fault Tree Analysis. Use of the tools is the core of this presentation.

Introducing QFD into an Organization, *R. Stoy and D. McDonald, Beckman Industries, Inc. and James Naughton, Expert Knowledge Systems.* This paper describes one practical way of establishing a supportive environment for the successful integration of the QFD process to the product life cycle. A concurrent QFD pilot project involving a management support team identified two organizational needs that would be crucial for the first development team's effort and the incorporation of QFD for any further projects. The first need was to satisfy the product development core team; the second was to establish the realistic expectations of the organization as a whole. Responses were formulated to these needs through the QFD methodology and many benefits were derived in the process.

What Do I Put in a QFD Chart? *J. Cavanagh, American Supplier Institute.* A four-page paper describing what data should be put in the QFD charts.

Management Aids for Summarizing House of Quality Information, *G. S. Wasserman, Wayne State University.* Management must be able to extract the vital information which is contained within the QFD product planning matrices, even though a single matrix may be composed of tens of thousands of cells. This paper proposes a useful graphical design that aids easy identification of the voice of customer priorities and conflicts. Hypothetical products case studies are used.

New Directions for QFD - Goal/QPC Research Committee 1989 Research Report, *B. King and J. Moran, GOAL/QPC.* Each year various conferences bring together speakers to describe a wide variety of continuous improvement tools that will enable companies to achieve "world class" status. These tools are important and certainly have their place in the quality improvement process. The tools alone, however, cannot provide a solution to needed quality improvement. Fundamental changes to planning and listening to customers must occur if a company is to become a strong competitor. This paper presents one of the TQM planning tools - QFD. QFD provides activities that bring together all required disciplines to work and plan the product or service development efforts in a highly disciplined, communicative, and effective manner. QFD's focus on the voice of the customer contributes to a company's ability to attain quality levels that provide a cost competitive position in the world marketplace.

Deployment Normalization, *D. Lyman, International TechneGroup, Inc.* This paper is an investigation of the mathematical processes contained in the QFD matrix. As you consider the logic of the techniques applied to your information, you can see that certain formulas introduce errors or distortions into the results. These distortions can account for the occasional

feeling that the results of the importance calculations are close to correct, but not quite right. This paper suggests modifications to the formulas that correct the distortions and are consistent with the matrix logic. It also proposes extensions that help you gain further insight while keeping the information consistent.

Marketing Research 1990

New Technologies for Listening to the Voice of the Customer, *R. L. Klein, Applied Marketing Systems, Inc.* This paper focuses on the most recent advances in the technology and methodology to identify and structure the Voice of the Customer for use in QFD and other quality improvement programs. These advances represent a fusion of U.S. marketing science technology with the Japanese methodology resulting in a procedure particularly appropriate for use by American industry.

A Pilgrimage from the House of Quality to the Customer Cathedral, *M. Lyons and J. Alexander, Impact Group.* Presentation on the what and how of a "Customer Success System™" process, i.e. how a company should use QFD to organize sales, technical service and marketing and then link that with the internal functions of design, manufacturing and delivery in order to install a customer success-oriented interface.

Manufacturing 1990

Manufacturing Strategic Plan - QFD & The Winchester Gear Transfer, *D. Calloway and B. Chadwell, Rockwell International.* This paper demonstrates how QFD was used to help implement a World Class Manufacturing Program at a large manufacturing plant. The goal was established to achieve world class manufacturing, with the objective to streamline plant processes and reduce wasted effort. The paper provides insight about applying QFD to optimize the movement and relocation of a complete gear manufacturing process from one Rockwell facility to another, demonstrating the usefulness of QFD as a planning and prevention tool for improving an old design and manufacturing system.

QFD Planning Approach to a Supplier Quality Program, *R. J. Pratt, ARCAD Corporation; G. J. Marcel, Rockwell International.* The purpose of this project was to develop a process which could be used to establish and maintain an improved Supplier Quality Assurance (SQA) system. To date no SQA program has been developed based on the QFD planning method, and the author proposes just that in this paper.

Medical Device 1990

Incorporating Market Research into the Product Development Process, *T. Domke, GE Medical Systems.* QFD provided the structure and customer focus in this product development project at GE Medical systems. The product development team gained its strength through a cross-functional development team, structured design process, and marketing research. Customer involvement from the onset of the program contributed to the success of the project. The paper also describes Simultaneous Multi-Attribute Level Trade Off (SIMALTO) that the GE team selected. Presentation slides.

Service 1990

Quality Function Deployment at FPL, *J. L. Webb, Florida Power and Light, Inc.; W. C. Hayes, Qualtec, Inc.* This paper discusses both the macro and micro application of QFD at FPL. In service industries, it has always been difficult to identify customer requirements and then to evaluate the organization's

performance in meeting them. FPL has successfully used QFD at a higher level to identify customer requirements and basic quality elements. These were then deployed through all levels of the organization into each job function. Through customer segmentation, FPL has also begun to identify more specific applications of QFD in service, software, and product development. The first example provided here describes the "Customer Needs Table of Tables" and its use in deploying their Corporate Quality Elements. The second example shows how QFD was used to redesign the way in which the company responds to customer requests at their regional phone centers.

Software 1990

Software Quality Deployment - Adapting QFD to Software, *Richard Zultner, Zultner & Company.* A framework is presented for applying QFD to software based on the experiences of several projects at different firms. Adapting the approach originally developed in Japan as a way of improving the product design process in manufacturing, software quality deployment is a powerful method for improving the entire software engineering process. In addition to enhancing the ability of software engineering to hear the "voice of the user" more clearly, it provides a basis for integrating a variety of disparate software engineering models, and offers a means toward continuous improvement in software engineering. Experience to date indicates it results in better systems built faster, than traditional approaches.

QFD Integrated with Software Engineering, *M. A. Betts, Hewlett-Packard.* This paper is written to encourage people to apply QFD to software projects. The case presented here is Hewlett Packard's experience applying QFD to a Corporate Quality Information System project, PRIMA. The major point discussed are: the QFD domain, software engineering situation, life cycle, and the PRIMA project experiences.

Taguchi Method 1990

QFD and Taguchi Methods, *J. Quinlan, ASI.* Presentation slides on QFD vs. Taguchi Methods.

1989: 1st Symposium on QFD

(ISBN1-889477-01-X)

Automotive 1989

Vehicle Wiring QFD, *D. Carter, K. Hasenstab and S. Schafer, Electro-Wire; R. Uroda, Ford B&AGO.* The QFD core team consisting of design engineering, advanced systems engineering, product engineering, and QA from Electro-Wire and Ford reports their pilot QFD efforts. The project involved application of QFD in the design, manufacturing, and assembly of the wiring harness for an entire vehicle. The objectives were to learn QFD methodology, establish foundation for future vehicles and impact current vehicle. The paper reports the steps taken and the resulting benefits.

Pre-Planning a Total Product: The Key to Success in Complex Product Development Situations, *C. W. Kurowski, Chrysler Motors.* Utilization of QFD sometimes resulted in a very long customer requirements list. This adds complexity to product planning and development of large and complex products. Using QFD as a tool to help systemize the total process plan, a macro "Pre-Planning QFD" has been developed to organize data to determine the two or three important product characteristics that will enhance the product for increased customer satisfaction. This paper explains this new concept and matrix.

QFD: A Systems Approach to Brake Design, *T. J. Bodell and R. A. Russell, Kelsey-Hayes Company.* Kelsey-Hayes began using the concepts of the QFD process in 1986 and had done a couple of studies on developed components. A new vehicle program at one of the Big Threes directed them into the next study, which turned out to be a complete systems QFD study encompassing new products as well as all of the KH products. The paper reports their progress to date in the on-going initiatives.

Front End Accessory Drive Design - A QFD Approach, *R. Ahoor, Ford/Engine Product and Manufacturing Engineering.* The front end accessory drive belt drive system was chosen for a QFD study, because of the extremely challenging performance and warranty objectives. This paper reports the benefits of the QFD experience specifically as it applied to the modular engine program, including the relationship of QFD to the use of engineering tools such as simulation program, design of experiments and cross-functional team approach for system design.

SMC Truck Hood, *M. Gavor and G. Marcel, Rockwell International; Greg MacIver, Ashland Chemical.* This paper provides an insight to Rockwell International Automotive Operation's philosophy and approach to QFD highlighting the SMC Truck Hood project. This project illustrates the organizational commitment necessary to successfully implement QFD. How QFD and existing product development procedures were integrated is explained.

QFD: A Road Map for Survival in the 1990's, *D. Makie, Masland Industries.* Why can the Japanese introduce a new vehicle in half the time and with superior quality than the U.S. auto companies? A large part of the answer seemed to be QFD. For this reason, Masland employed QFD as a strategy for survival in the 1990's. This case study, the company's second QFD efforts, involved the development of a full floor carpet system. This reports explains how QFD principles were put to work in a step-by-step fashion and what they have learned through the process.

General Industry 1989

Developing Tree Structures that Include Qualitative Characteristics, *J. Naughton, Expert Knowledge Systems.* QFD and the Seven Management Tools offer means to acquire, organize, and use the essential information needed to satisfy customer quality requirements. As these approaches are used beyond manufacturing application, there is an increased need to deal with a greater volume of qualitative information. The quantitative information techniques must be supported with additional techniques in order to effectively build trees and other forms of information organization. This paper describes an overall approach to techniques for the inclusion of qualitative information in QFD projects.

Lessons Learned in Applying QFD, *J. Moran, Polaroid Corporation.* This paper reviews four QFD projects: A new product in development, a new product in the final design stages, a program to specify system design requirements to a vendor, and internal review of a human resource development program to deliver training. It then reports the lessons learned in applying QFD to these diverse programs.

Useful Enhancements to the QFD Techniques, *H. Vannoy, AC Rochester.* This paper reports a QFD case study involving a catalytic converter. The steps of the QFD process taken are illustrated.

QFD: A Flexible Management Tool, *R. C. Blaine, D. W. Burden and N.E. Morrell, The Budd Company.* This paper provides examples of the flexibility of QFD as a management tool beyond the new product design concept. Facts based on experience and opinion resulting from observations focus on

why a technique with the powerful potential of QFD is often difficult to initiate, and frequently impossible to sustain through a satisfactory conclusion. It deals with recognizing a valuable concept and making it work within your environment.

Medical Device 1989

QFD in the Development of a New Medical Device, *J. R. Rodriguez-Soria, Ernst & Whinney*. This QFD case study covers the development of a new medical device, the first QFD application at this healthcare manufacturer. The case presents the unique aspects of connecting the Voice of the Customers, a customer model and building of the House of Quality.

Telecommunication 1989

QFD: A Systematic Approach to Product Definition, *D. Thompson, AT&T Bell Laboratories*. AT&T began exploring the potential of QFD in 1986. Since then, they have studied the concept and applied the first phases of the QFD approach to several projects with very positive results. This paper provides a brief background of QFD in Japan and the U.S., and focuses on the company's experience with QFD through three case studies involving a network reconfiguration software system, network monitoring software for internal AT&T use, and a large system composed of software and hardware used in telephone central offices.

Computer & Software 1989

Implementing QFD at TI: What Worked and What Didn't, *R. Porter, Texas Instruments*. Successful implementation of QFD requires a cultural change. This report traces the steps Texas Instruments took to implement QFD across the Materials & Controls Group worldwide. It highlights the "management process" with emphasis on the role of the Management Quality Improvement Team, training, revision to the Design Control Procedure, and synergism across the organization. Case studies from operations in Europe, Asia, and the United States are referenced to highlight the major specific outcome of the QFD project.

Thrill Your Customer, *K. Shaikh, Hewlett-Packard*. Although Hewlett Packard has found QFD to be valuable in developing a highly complicated software product. This case study shares how the QFD process was modified to meet the need of the software development team. It describes the benefits and advantages of using QFD for software products at Hewlett Packard. Difficulties and ways to alleviate barriers as well as some intangible fringe benefits to the organization resulting from use of this process is also discussed.

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Hoshin Planning (1996)

Hoshin Planning (Hoshin Kanri, or Policy Management) is a written plan that breaks down the organizational long term destination (vision, mission, strategic business plans) into yearly cumulative targets. Hoshin then associates with each target the means to achieve it and the way to measure this achievement. Taught by Prof. Yoji Akao, Prof. Kozo Koura, and Prof. Tadashi Yoshizawa, this volume contains several articles on the fundamentals of hoshin planning and strategic hoshin planning for building long term organizational goal. ISBN1-889477-80-X

Gemba Kaizen (1995)

Gemba is a Japanese word that means the place where the real action takes place. Taught by Masaaki Imai, author of "Kaizen" and "Gemba Kaizen," this post conference 3-hour tutorial introduced the concepts of continuous improvement at the gemba, the site where the product it put into use. ISBN1-889477-79-6

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