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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 shows 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 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 Motors' 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, COE, 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 State-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 Eichstätt*. 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.