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contact@qfdi.org

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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 defining 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 Andresen 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 TechnoGroup 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.