Design a Patient Transfer System Using QFD Approach

Thesis submitted in accordance with the requirements of the National Technical University College of Malaysia for the Degree of Bachelor of Engineering (Honours) Manufacturing (Process)

By

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Main supervisor
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DECLARATION

"I hereby declare that the content in this project is the result from my own writing except summarized content and figure from certain references which I declare the original source."

Signature : 
Name : MUAZAM SHAH BIN MOHAMAD
Date : 27/12/05
ABSTRACT

Quality function deployment (QFD) is a well-known design method. It’s management tool that provides a visual connective process to help teams focus on the needs of the customers throughout the total development cycle of a product or process. It provides the means for translating customer needs into appropriate technical requirements for each stage of a product/process-development life-cycle. It helps to develop a product or services more customer-oriented, higher-quality products. This project is all about to improve the transferring system especially bed to stretcher. In this project, the Quality Function Deployment (QFD) methodology has been used in order to evaluate customer wants and needs from the user feedback. These application of QFD are widely use in government and non-government hospital and clinic. The complaint from the user of stretcher contributes this case study to be implemented. For this case study project, Hospital Besar Malacca area was identified in order to seek the problem and difficulties in using present stretcher design for the patient user. The final improvement after using QFD methodology will be able to meet user requirement and satisfaction.
ABSTRAK

QFD adalah merupakan salah satu kaedah merekabentuk yang telah lama dikenali. Ia merupakan salah satu kaedah peralatan pengguna yang menyediakan proses hubungan secara visual untuk membantu kumpulan rekabentuk memberi fokus kepada keperluan pengguna sepanjang kitaran proses pembangunan product. QFD menyediakan serta membolehkan keperluan pengguna diterjemahkan kepada keperluan teknikal yang bersesuaian untuk setiap peringkat pembangunan produk mahupun kitaran. Ia mampu membantu didalam pembangunan produk ataupun perkhimatan yang lebih berorientasikan pelanggan iaitu produk yang lebih berkualiti. Projek ini adalah berkenaan untuk memperbaharui kaedah pemindahan khususnya pemindahan dari katil pesakit ke katil usungan yang sedia ada dengan menggunakan maklumbalas daripada pengguna dengan menggunakan kaedah QFD. Didalam projek ini, kaedah pemindahan ini telah dipilih untuk diaplikasikan didalam kaedah dan teknik QFD untuk menilai keperluan dan kehendak pengguna daripada maklumbalas yang dicatap. Ia banyak digunakan di hospital dan klinik kerajaan dan swasta. Aduan daripada pengguna tentang katil usungan ini menyumbang kepada pelaksanaan kajian ini dijalankan. Untuk projek kajian kes ini, Hospital Besar Melaka telah dikenalpasti untuk mengenalpasti permasalahan dan kesulitan didalam mengendali kaedah pemindahan khususnya dari katil pesakit ke katil usungan yang sedia ada untuk memenuhi keperluan pesakit. Pembaharuan setelah menggunakan kaedah QFD akan dapat memenuhi keperluan dan kepuasan pengguna.
DEDICATION

Firstly thank to Allah S.W.T for the opportunity to finish this project. I owe this project and my true happiness to my beloved parent. Since the day I started going to this university until today, they are very caring and supporting for me.
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May Allah bless all of you and repay your good deeds with something better, and last longer

From,
Muazam Shah B Mohamad
KUTKM
December 2005
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CHAPTER 1
INTRODUCTION

1.1 Introduction

In this chapter, the problem of this project is clearly defined. The objectives of this project are also explained in detailed. Lastly, the methodologies used to achieve the objective and to solve the problem are listed out.

1.2 Problem statement

When transferring a patient from bed to stretcher or vice versa, the patient might suffer body injuries caused by improper handling. This study will find out the problem associated to handling the patient and recommendation for a proper system.

1.3 Objective of study

The objectives of study are as follow:

i. To understand the basic concept and application of Quality Function Deployment

ii. Use the QFD methodology to come out with an improve design patient handling system.
1.4 Scope of study

The scopes of this project covers the following areas:

i. Propose a new design, it is just the design not the prototype
ii. To make a survey of customer regarding the existing patient transfer system and do the analysis
iii. To propose an improved design to replaced current product based on customer feedback

1.5 Methodology of this study are:

i. Literature Review
   a) Study the existing patient transfer system
   b) Study the QFD methodology
ii. Conduct survey on the use of existing patient transfer system
iii. Analyses the data collection from the survey
iv. Convert the voice of customer into QFD matrix
v. Propose an improved design of patient transfer system

1.6 Background of the study

i. Nursing personnel are consistently listed as one of the top ten occupations for work-related musculoskeletal disorders, with incidence rates of 8.8 per 100 in hospital settings and 13.5 per 100 in nursing home settings (Bureau of Labor Statistics, 2002). These are considered to be low estimates, since underreporting of injuries in nursing is common (U.S. Department of Health & Human Services, 1999). 38% of all nurses report having a back injury during their career. Its a seriously and they need estimated costs associated with occupational back disorders is $5 billion per year.
ii. Aggregated data on prevalence of back injury, compiled from over 80 studies, revealed an international worldwide point prevalence of approximately 17%, an annual prevalence of 40-50% and a lifetime prevalence of 35-80% (Hignett, 1996). While there has been a steady decline in the rates of most occupational injuries starting in 1992, work-related musculoskeletal disorders in nursing continue to rise (Fragala & Bailey, 2003).

1.6.1 Lifting Limits - Posture

![Figure 1.0 Physiological limitations of the human body.](image)

i. Limiting loads to recommended levels (NIOSH)

ii. NIOSH Action Limit is approximately 19.8 pounds. Maximum permissible limit: 51 pounds.

iii. Unless the patient can assist the caregiver, no more than 19.8 pounds should be lifted.

iv. Studies have shown that during patient lifting, the average force on the L5/S1 disc exceeded the upper limit for disc compression specified by NIOSH (770 lbs.).
1.6.2 Back Injuries – Nursing

i. Back Injuries to nurses continues to be one of the most expensive injuries in health care and average direct cost was $37,000 per incident

ii. Indirect costs ranged from $145,000 - $370,000 per incident (1996 - NSC)

iii. In a 10 hospital study using the “lift teams”, showed a 90% reduction in lost days, 65% reduction in injuries, with a substantial reduction in compensation dollars and medical expenses. (American Journal of Occupational Health Nurses, 1996)

1.6.3 Nurses change jobs due to back pain

Since the 1980s, many nurses have changed positions or actually left the nursing profession because of overexertion injuries. In one study, a questionnaire revealed that 38% of 503 nurse respondents had suffered occupation-related back pain severe enough to require leave from work. Twenty percent of those with back pain said they had made at least one employment transfer (e.g., from an intensive care to an obstetric unit; from the hospital inpatient setting to a school setting; from a staff nurse to a pharmaceutical representative) to decrease the amount of physical stress involved with lifting or moving patients. Twelve percent of respondents indicated they were considering making an employment transfer, and another 12% stated they were thinking about leaving the nursing profession because of occupation-related back pain. Another study in England found that 12% of all nurses intending to leave nursing permanently cited back pain as either a main or contributing factor. (American Journal of Occupational Health Nurses, 1996)
CHAPTER 2

LITERATURE REVIEW

2.1 What Is QFD

Quality function deployment is a method for structural product planning and
development that enables a development team to specify clearly the customer’s
wants and needs and then to evaluate each proposed product or service capability
systematically in terms of its impact on meeting those needs. (Lou Cohen, 1995)

Quality Function Deployment (QFD) is a set of powerful product
development tools that were developed in Japan to transfer the concepts of quality
control from the manufacturing process into the new product development process.
The main features of QFD are a focus on meeting market needs by using actual
customer statements (referred to as the "Voice of the Customer"), its effective
application of multidisciplinary teamwork and the use of a comprehensive matrix
(called the "House of Quality") for documenting information, perceptions and
decisions. Some of the benefits of adopting QFD have been documented as:

i. Reduced time to market
ii. Reduction in design changes
iii. Decreased design and manufacturing costs
iv. Improved quality
v. Increased customer satisfaction
And it’s developed to bring this personal interface to modern manufacturing and business alike. In today’s industrial society, where the growing distance between producers and users is a concern, QFD links the needs of the customer (end user) with design, development, engineering, manufacturing, and service functions. It helps organizations seek out both spoken and unspoken needs, translate these into actions and designs, and focus various business functions toward achieving this common goal. QFD empowers organizations to exceed normal expectations and provide a level of unanticipated excitement that generates value.

QFD is:

i. Understanding Customer Requirements
ii. Quality Systems Thinking + Psychology + Knowledge/Epistemology
iii. Maximizing Positive Quality That Adds Value
iv. Comprehensive Quality System for Customer Satisfaction
v. Strategy to Stay Ahead of The Game

2.2 History of QFD

QFD was developed in Japan in the late 1960s by Professors Shigeru Mizuno and Yoji Akao. At the time, statistical quality control, which was introduced after World War II, had taken roots in the Japanese manufacturing industry, and the quality activities were being integrated with the teachings of such notable scholars as Dr. Juran, Dr. Kaoru Ishikawa, and Dr. Feigenbaum that emphasized the importance of making quality control a part of business management, which eventually became known as TQC and TQM.

The purpose of Professors Mizuno and Akao was to develop a quality assurance method that would design customer satisfaction into a product before it was manufactured. Prior quality control methods were primarily aimed at fixing a problem during or after manufacturing. The first application of QFD:
to identify each customer requirement (effect) and to identify the design substitute quality characteristics and process factors (causes) needed to control and measure it.

Quality Function Deployment was originated in Japan and was introduced at the Kobe Shipyard of Mitsubishi Heavy Industry Ltd around 1972. The Japanese Characters for QFD are, phonetically, (Lou Cohen, 1995)

1. Hinshitsu, meaning “quality”, “feature” or “attributes”
2. Kino, meaning “function” or “mechanization”
3. Tenkai, meaning “development”, “diffusion”, “development” or “evolution”

US first exposed to QFD was in 1983 through an article in Quality progress by Kogure and Akao and through Ford Motor Company and the Cambridge Corporation, an international management consulting firm. The effort of Don Clausing (1991) of Xeror and later MIT and Bob King of GOAL/QPC (1989) are also significant in popularizing the application of QFD among Americans. Currently, the interest in and application of QFD in the United State is growing at an incredible rate, despite its brief history. (Larry Shilito, 1994)

At the same time, Katsuyoshi Ishihara introduced the Value Engineering principles used to describe how a product and its components work. He expanded this to describe business functions necessary to assure quality of the design process itself. Merged with these new ideas, QFD eventually became the comprehensive quality design system for both product and business process.

The introduction of QFD to America and Europe began in 1983 when the American Society for Quality Control published Akao’s work in Quality Progress and Cambridge Research (today Kaizen Institute) invited Akao to give a QFD seminar in Chicago. This was followed by several QFD lectures to American audiences sponsored by Bob King and GOAL/QPC in Boston.
Chicago. This was followed by several QFD lectures to American audiences sponsored by Bob King and GOAL/QPC in Boston.

Together with the English publication of QFD: The Customer-Driven Approach to Quality Planning and Deployment (1994 Quality Resources: ISBN92-833-1122-1; written by Mizuno and Akao; translated by Glenn Mazur) and QUALITY FUNCTION DEPLOYMENT: Integrating Customer Requirements into Product Design (Productivity Press: ISBN 0-915299-41-0; written by Akao; translated by Glenn Mazur and the staff at Japan Business Consultants for GOAL/QPC for the first advanced QFD training outside Japan), QFD caught on across a wide variety of industries in the U.S. and Western Europe. In the U.S., in particular, because of its flexibility and comprehensiveness, the methodology was eagerly embraced by the businesses that were facing the Japanese competition. There, new and innovative applications of QFD were experimented by industries and businesses that were not reached before.

Japan has continued to push the envelope of QFD applications through an ongoing QFD Research Sub-Committee at the Union of Japanese Scientists and Engineers (JUSE) and their annual QFD Symposium established in 1993. They hosted the first International Symposium on QFD and are a charter member of the International Council for QFD.

Today, QFD continues to inspire strong interest around the world, generating ever new applications, practitioners and researchers each year. Countries that have held national and international QFD Symposium to this day include the U.S., Japan, Sweden, Germany, Australia, Brazil, and Turkey.