

# **AN IT MODEL FOR PRODUCT (QUALITY)**

**PLANNING**

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award of the degree of

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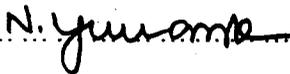
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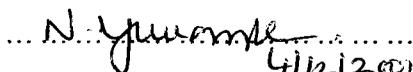
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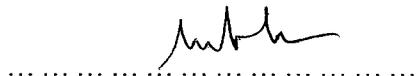
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## **Synopsis**

There is never shortage of challenges for people in industry. There are always issues that need attention. Issues are interwoven in a business that action to improve one issue will have ripple effect on others. This in turn, strengthens the company's financial position and provides capital for improving both the business and the economic health of its employee and community. Challenges are diverse. They may involve the need to decrease part variability in manufacturing to reduce costs of scrap and network or editing the help of the machine operators in planning new machine layouts and processes.

Many tools may have been developed to help companies work on these challenges more effectively. This project work is a preliminary step to computerize quality planning tool such as Quality function deployment. It is designed to address a specific issue i.e., it gives more importance to customers requirements / wants. QFD is a process that provides structure to development cycle.

To check the validity of the software developed, in this project, the product EZE clean mop is taken as a case study. The customer survey is conducted and its feature are analyzed using QFD ZAST PRIMER.

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A customer is the most important visitor on our premises. He is not dependent on us. We are dependent on him. He is not an interruption on our work. He is the purpose of it. He is not on our side on our business. He is a part of it. We are not doing him a favour by serving him. He is doing us a favour by giving us an opportunity to do so .

**- MAHATHMA GANDHI.**

# **INTRODUCTION**

---

## 1.Introduction

Faced with challenge of solving problems that abound in the real world, classical method often encounter great difficulty, even when equipped with a theoretical guarantee of finding an optimal solution, Vtally important applications in business, engineering economics and science can't be tackled with any reasonable hope of success, with in practical time horizons, by solution methods that have been the predominant focus of academic research throughout the past three decades.

The impact of technology and advent of computer age have presented us with the need and opportunity to solve a range of problems that could scarcely have been envisioned in the past. We confronted with applications that span the realms of resource planning, product development, market strategies and financial analysis and scores of others.

Quality function Deployment(or QFD, for short) is a basis TQM tool that systematically develops customer's need and expectations. The tool provides a graphical methodology for unearthing a customer stated and unstated needs expectations, for making decisions in cases where these needs and expectations conflict, and for driving these customer based requirements and expectations into the product development and manufacturing process QFD is driven by what the customer wants, and, for this reason, the technique is often described as "Deploying the Voice of customer".

The thing that makes QFD unique is that the primary focus is the customer requirements. The process is driven by what the customer wants, not by innovations in technology. Consequently, more effort is involved getting the information necessary for determining what the customer truly wants. This tends to increase the initial planning time in the project definition phase of the development cycle, but it reduces the overall cycle time in bringing a product to market. This is illustrated in figure 1.

## COMPARISION OF OLD AND NEW DESIGN SYSTEMS

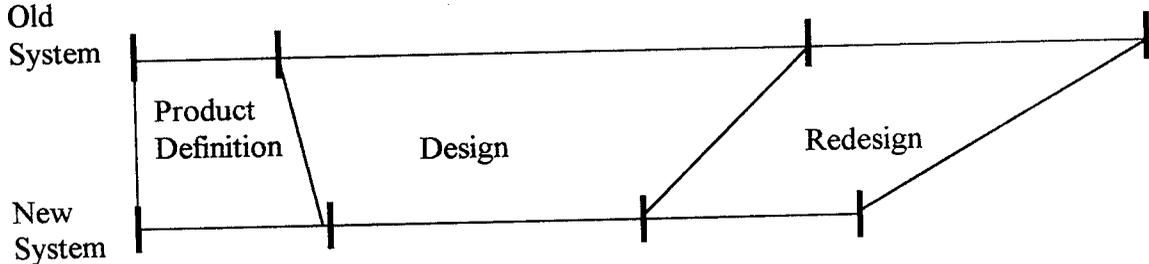


Figure 1

When a product is conceived, the primary focus is on who the customer is, since the customer sets the stage for all the work. What the customer wants will determine whether new technologies are possible, or whether a revolutionary concept is requirements is directly related to success in the market place. This is critical to the whole process.

Once a product is defined, QFD enables the design phase to focus on the key customer requirements, those elements that are defined as bring very important to the customer . By addressing these elements , the design phase is shortened to focus on items that the customer really wants. By concentrating efforts, less time will be spent on redesign and modifications. The savings have been currently estimated as this third to one half of the time taken using traditional means. If a new product took eighteen months from concept to market, using QFD could reduce the time to nine to twelve months, with little if any changes to the product once it is in the market place.

For many company this can mean many amounts saved not only in development but also in additional income brought in due to getting out a product that met the customers needs faster than before.

Another way to think of QFD is to compare the product development cycle to the human body. QFD would be the skeleton, which provides form and structure to the cycle and serves as the frame work that ties all activities into a complete package. Without the frame, there would be activity, but it would be vulnerable to outside influences like personal changes, product redesign, fickle management and so on. QFD documents all pertinent information to keep everyone on track. When critical decisions are made, they are documented so that all people on the team are not only aware of them but also buy into those decisions.

## **1.2 Roots –A Profile**

### **1.2.1 About The Organization**

**ROOTS INDUSTRIES LTD.**, head quartered at Coimbatore was promoted by **SRI.K.RAMASWAMY**, a Master degree holder in Automobile engineering from Lincoln technical institute, USA. Sri. Ramaswamy has established his reputation as a designer, inventor and innovator . He is one of the world authorities on electric horns.

ROOTS has been a dominant player for the last ten years in the Indian market in an uncontested manner. It has 60% of the replacement market.

Roots is a leading supplier to OE manufacturers such as Telco , Mercedes Benz, Bajaj Auto, Maruti Suzuki, Fiat, Uno, Toyoto Kirloskar, and TVS Suzuki, Hero Honda, Kinetic Honda, Etc.,

Roots has many credits for its innovation. Roots is the first horn company to get ISI approval for its Horns. Rots is the first Horn company to get ISO 9001 and QS 9000 certification. It is the first horn manufactures in Asia to bag the VDA 6.1 certification. Roots is the first company to get E-certification from Europe for its products. Roots is the largest exporter of

horns in India. Company exports to about 25 countries. Roots is the only company in India exporting horns to Japan.

In 1995 the company entered into technical collaboration with M/S Robert Bosch S.A., Spain to further enhance the technological competence. By this agreement Roots manufactures some of the ranges of BOSCH Horns in India. Manufacturing Capacity is now three million horns, which has made roots the 11<sup>th</sup> largest manufacturing company in the world.

The company has tremendous growth in the export sector. It's export started with the modest figure of Rs.4 million and within four years reached over Rs 3.5 million. It is the only Indian company to satisfy the exacting standards of the Japanese customers and enter the Japanese market and 25% of its exports goes to Japan. M/S OSAWA & co., Japan, one of the oldest respected trading houses in Japan has chosen Roots for the tie up arrangement to manufacture J horns for Japanese market.

Roots is proud to have developed horns successfully for Mercedes Benz in a record time of three months. It has been approved by Mercedes Benz. Roots has already bagged the order for Mercedes Benz. Indian operations. Mercedes Benz Germany have evinced interest in importing these horn .

Roots has full fledged design , development and test center with CAD/CAM facilities.

Roots has established Metrology Lab and is required with the latest state of art, world class instruments / equipments.

Roots Auto products Pvt Ltd., manufactures Air horn for heavy vehicles with 80% market share in the country.

Aruna Auto castings started in 1983 in an Aluminium and Zinc Pressure die casting unit with a capacity of 450 tons per annum meeting the to Italy, Germany, etc.,

Polycraft manufactures precision moulded plastic components.

Root wizard - a 100% indigenously designed and developed compact, convenient mini scrubber-drier machine for application in hospitals

restaurants, Sports facilities and office complexes is has been very well received in the international market. They are currently exporting to Europe, Australia, Middle-east ,etc.,

Roots Multiclean Ltd., is where the company with its ever probing eye on the needs of the market, diversified in the early 90's into the manufacturer and marketing of industrial and domestic cleaning systems. This RMCL is a joint venture on techno-financial collaboration with M/S HAKO WERKE GMBH & co., Germany , to manufacture world class industrial floor care and floor cleaning equipment. RMCL has a modern and well laid out manufacturing facility at Kovilpalayam about 30 Kms from Coimbatore, an Important Industries town in Southern India.

### **1.2.2 Product Ranges**

RMCL went in to production in June'93 and at present it is manufacturing the smaller ranges of sweepers and scrubber driers which have a ready demand in the country.

- ❖ Flipper – Manually operated walk behind sweeper
- ❖ Hakomatic e43 – a combined wet and dry scrubber drier
- ❖ Hamster 600 – petrol / Battery operated scrubber

RMCL also imports and market a wide range of all other HAKO machines like the larger power sweepers automatically scrubber dryers etc.,

RMCL is the sole representative in India and SAARC countries for their principles range of products .

M/S HAKO WERKE GMBH & co., Mechanized floor cleaning equipments power sweeper drier large road sweepers etc.,

RMCL also represent other leading manufactures for their range of products like Wap, Germany – High pressure hot and cold jet cleanliness ,and industrial vacuum cleaner. Clean fix, Switzerland – specialists in steam vacuum cleaning machines

Truvox , England – specialist in single disc scrubbing polishing and burnishing machines etc.,

CFM,Italy – specialist in heavy duty disc industrial vacuum cleaners

Unger, Germany – Specialist in window & glass cleaning systems

Soleco, Italy – For a wide range of vacuum cleaners\.

RMCL's products are considered to be of high quality and its sweeping machines are exported to United states, Europe ,Australia ,Japan, France and Middle office East ,south America,.RMCL has its own branch offices in Metro cities of Delhi, Mumbai, Calcutta, and Chennai with a well established dealer network for ales and services in all other principal cities . The wide range of products helps to provide a total solution to the customers cleaning problems.

RMCL has a good support systems of after sales & service to its clients and therefore facing trained technicians are located in all branches and dealer offices. In addition to service specialized equipment from Germany, RMCL has HAKO trained and Certified engineers at coimbatore and Mumbai

### **1.2.3 About The Product**

Roots EZE clean wet & dry mop is a uniquely designed product with a host of convenient features that make more alluring and better placed in the market. The main feature of this product from RMCL can be detailed as follows

- 1) This is the only mop available in the market while could be used both for dry sweeping and wet mopping
- 2) The replaceable wet-n-dry insert(mop bag) is made up of special blend of material, synthetic & cotton yarn which produces an electrostatic effect while being operated on the floor. Hence the dust clings to the mop and totally eliminate air bounding of dust. Brooms need not be used.

- 3) This is the only mop that carries six month warranty from the date of supply
- 4) The mop is manually operated and due to its less weight the fatigue is reduced considerably
- 5) The handle assembly and the base assembly are made in Aluminum and are powder coated and so tend to have a long life. The handle to have telescopic arrangement.
- 6) The swivel angle in the base will facilitate easy operations of the mop to clean static case and wall skirting
- 7) While doing wet mopping, the insert shall detail the water and give effective covering for an area of 500 sq.ft. for a single dip. Under working condition, the insert will have a life span of more than one year.
- 8) The mop is rust free by virtue of its anti- corrective nature of the materials used in the manufacture of mops
- 9) The designing of the mop is done ergonomically and hence is very user-friendly in its operation
- 10)The mop is maintenance free and hence the necessity of any periodic servicing is obviated
- 11)This mop is ideal for cleaning resistance, office floors, shopping arcades, airports, hospitals, hotels restaurants or such other similar smooth surfaces
- 12) this mop is easily maneuverable and hence can be handled by anybody

## **1.2.4 Future Plans Of The Organizations**

- 1) To develop new range of products and continuous up gradation of technology to keep the company's product on par with international standard
- 2) Indigenously sourced raw materials and components that will greatly reduce the import associated with such parts
- 3) Adoption / absorption / adaptation and innovation of new technological features that can greatly enhance the quality level in the manufacturing of the products
- 4) Importing of quality training to the company's engineers and technicians for the purpose of up gradation of technology
- 5) Resorting to a sort of advertisement drive that inter alia includes advertisement in T.V media industrial magazines, opening out new avenues like outlets for selling, appointment of dealers / distributors and relations in all main cities etc.,
- 6) Improvement in research and development infrastructure and allocation of more funds for such activities aimed at new product development and improvements in existing products to the specification of changing customer needs strengthening of indigenisation and value engineering
- 7) Better thrust in overall improvement at the quality front
- 8) Laying emphasis on value added exports
- 9) Launching a drive to secure new market share on the overseas front in the prospective future.



# LITERATURE SURVEY

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## 2. Literature Survey

Computers-communications technology is an all pervasive organizational phenomenon in the contemporary business environment. Seeds of technology, which were sown in the Indian economic soil about 10 years back have nurtured into full trees. The Question of "What we can do with IT" is likely to assume greater significance as compared to "What IT can do for us". Innovation in use of this technology will be the most pertinent issue in management of IT. The author takes stock of the impediments in the exploitation of IT and suggests some measure to combat these limitations. He also evaluates How IT can be leveraged for supply chain management towards gaining competitive advantage and highlights the role of emerging technologies such as geographical information system.[3]

"Emerging It based solution will be marked by the "new" fusion of information technology and telecommunications"[3]

"IT can become an effective driver, facilitator and co-ordinator of business processes. In public administration. It can play a pivotal role facilitating better levels of service"[3]

"When customers are more Quality conscious – the concept of cost of Quality emerged and thus statistical Quality control came in to existence. Six sigma is a concept which starts and ends with the customers. IN Six sigma approach, the fundamental reasons for problems are fathomed so that pinpoints corrective actions can be initiated.[4]

" Application of total Quality Management(TQM) in manufacturing organizations is a way of life these days however the implementation level of end- customers as in the case of educational(technical) establishments. To this end, an attempt has been made in this paper to define the customer in an Educational setting and to apply Quality Function Deployment (QFD), an important tool of TQM, for collecting the voice of customers. QFD process enables to translate the voice of customers in to system design

requirements and provides valuable information that helps policy-makers to assess the existing system and adopt new policies to have competitive edge in the market place. A case study in an Educational (technical) establishment is undertaken to demonstrate the applicability of QFD method.[5]

By using QFD method, a complex process becomes manageable, and vital information is obtained from problem development through issue resolution. QFD is a Quality assurance system that helps to ensure that the voice of customer is clearly heard and followed in the development of a product or service.[5]

One should not be content with one time study, as there is always scope for improvement in any setup. Therefore, continuous improvement aspect of TQM must be incorporated on an organizations to succeed in today's competitive environment. QFD serves as a powerful process which is highly successful in eliciting the strength and highlighting areas that requires attention. It can be adopted to any service sector if the customer needs and system design requirements are identified properly [5]

Quality function deployment (QFD), or the process of building 'The House Of Quality' is a powerful way to integrate the voice of the customer into the product being developed. This tool relies on a matrix to incorporate the requirements of the customers, and translate them into functional characteristics that the product must possess. The requirements of the customers are thereby 'deployed' to the desired function, which in turn is used to yield the engineering characteristics of the products. Since the matrix puts down comprehensive information on customer requirements, in tandem with other 'engineering data' derived from the basic information provided by the customers. To demonstrate how Quality requirements are deployed in the engineering characteristics of a product, the example of deriving a writing instrument.[7].

In [2], the QFD is defined with an example of PAVE VIPER, laser chief engineer at Omega lasers. The reader should also recognize that

although[2] is focused on new product development in an engineering environment the QFD technique is equally at home on product improvement efforts, and even developing a manufacturing approach. Organizations that use QFD successfully prepare numerous. Matrices for the product's concept development phase, detailed design work, and various phases of the product's manufacture. The approach is the same: Focus on the customer's needs and expectations, and develop everything that in a manner that optimally satisfies these needs and expectations.

'successful firms, well known for their competitive standing have the ability to introduce successfully products that do not have to undergo recall or engineering changes after mass production has begun. Such firms are especially adept at completing all the needed changes are initiated as a result of comprehensive design reviews after each stage of the process of new product development. [8]

The Japanese have been the first to realize that what may have been a product feature that caused customer delight the first time it was introduced, doesn't have the same impact on them at a latter point in time, because by then the attribute has come to be taken for granted. Thus "atarimae hinshitu", or "Quality taken for granted", has to constantly be improvised to "miriyokuteki hinshitsu", or "Quality that fascinates or excites". This obviously requires that the teams of people involved in new product development rely not only upon their creative abilities, but upon data gleaned from the market, from customers and made available in a systematized fashion where it is easily unable in adding value to the process of design. It is precisely to make data and facts, especially the qualitative kind that are forthcoming from customers available to design teams, that one has to use certain special tools.[7]

"How do we find What is important to the customer". on the surface that seems to be the job of sales force and a well-trained team of representatives can help keep a company clued in and focused on customer objectives. But even the most perceptive representative can also

see things through rose-colored glasses or to be the victim of his own defensiveness or biases. [9]

“It is for this reason that formalized surveys before and during a quality implementation are integral part of such programs. In reaching out in his way, the customer become partners” [9]

“ The thing that makes QFD unique in that the primary focus is customer requirements, the process is driven by What the customer wants, not by innovation in the information necessary for determining What the customer truly wants”. [9]

This process aids the difficult transition of bringing a product from development to manufacturing so that the line operator is capable of running. The process as necessary to produce the highest Quality product . “Customer information comes from a verity of sources; some are solicited and some are Qualitative, some are obtained in a random manner” [9]

In [7], the QFD is discussed as a investigating tool for Customer requirement and in this book it can also discussed that it can be used for the continuous improvement for the product service/ characteristics.

In [6], the QFD is a important tool for the company by which they get link with its customers. And also the author discussed about the way's to get the customer requirements and hoe these customer requirements are changed into technical requirements or the characteristic of a product / process with an example of Coffee Cup and lid.

In [1],[2] these are the important websites for Quality area. In this they are discussed important events of the developments of Quality Function Deployment with an live / recent example.

Markets are now becoming fiercely competitive. The scramble for customers is getting indensified. Securing edge over rivals is a major challenge facing marketers. Taking customers as a number causes doemotionalisation and dehumanization of the marketing process. The focus tends to be limited to the rational aspects. A strategy that focuses on the

human side can be an effective way to competing in the concentrate on the human aspects of services delivery to create bonds with customers.[7 ]

“provision of Quality goods and services is fast becoming a norm rather than exception”.[7 ]

“Marketers have conventionally focused on delivering customer satisfaction on a fundamental premises that a satisfied customer would be kept on a long term basis”.[7 ]

“High customers satisfaction may not get translated into long term customer patronage “[7]

“The technical Quality is transferred to customer during consumption and functional Quality is produced and felt by the customer in the Whole process” [7 ]

“ The market is becoming at tough battle ground. Now Quality has become a common denominator. The danger it has created is that now even a satisfied customer is likely to quit for he / she has nothing to lose. It is in this context that the marketers have to work out strategies. The human interface offers opportunity for creating customer delight. The marketer can develop an edge over rival by concentrating on the soft dimension of service Quality which is totally interface driven. Competing on human touch requires careful focus on issues like selection of people with service orientation , provision of emotion support and role clarity.”[ 21]

## **PROBLEM DESCRIPTION**

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### **3. Problem Description**

#### **3.1 Introduction**

There is never shortage of challenges for people in industry. There are always issues that need attention. Issues are interwoven in a business that action to improve one issue will have ripple effect on others. This , in turn, strengthens the company's financial position and provides capital for improving both the business and the economic health of its employees and community. Challenges are diverse. They may involve the need to decrease part variability in manufacturing to reduce costs of scrap and network or editing the help of the machine operators in planning new machine layouts and processes. The quality revolution that is underway today is addressing these issues. The Deming Philosophy and the concept Total Quality Control(TQC) (or Company Wide Quality Control [ CWQC]) focus heavily on break down these organizational barriers to improvement. Based on these approaches Taylorism in many U.S. companies is an endangered species.

#### **3.2 Existing System Of Product (Quality) Planning**

Many new tools used for Quality and productivity improvement. It provide every manager with the tools needed to make planning an effective and satisfying process. They also break down Taylor-type barriers by giving more individuals the ability to contribute to the planning step. Such tools are follows

- TQM (Total Quality Management)
- DOE (Design Of Experiments)
- VE (Value Engineering)
- QFD ( Quality function Deployment)
- SPC (Statistical Process Control)

- FMEA (Failure Mode Effective Analysis)
- FTA (Fault Tree Analysis)
- INVENTORY CONTROL Etc.,

These tools are neither complex nor easy. Most of these tools are not new at all. These tools have proven useful to virtually any level in a company. However, they seem particularly helpful for middle to upper managers.

### **3.3 Problem Definition**

There has been a lack of available tools that make the job of planning simple and timely. So it requires more gap between customer requirements and design aspects of product / process. Some tools need more processing time during the product / process development. And also it is impossible to get all requirements of customers to satisfy their needs.

### **3.4 Goal Of The Project**

- ❖ To simplify the process of product planning based on IT model.
- ❖ To improve the quality of the product / process.
- ❖ Reduce Cycle time & cost incurred for design & development of new product development.
- ❖ To meet the customer requirements through continuous improvements.

### **3.5 Objectives Of Product (Quality) Planning In Company**

- ✓ To study the general trend in cleaning equipment used
- ✓ To trace out the factors behind the purchase motivation
- ✓ To study the feedback of respondents
- ✓ To study the level of awareness and the opinion about the price of the product EZE clean
- ✓ To analyze the correlation between customer requirements and technical requirements
- ✓ To study the expectations and opinion of customer about EZE clean product, that suits with present scenarios to promote the sales of EZE clean
- ✓ To draw quality function Deployment chart with respect to EZE clean Mop and pinpoint weak areas compares with competitors product.

## **METHODOLOGY**

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## **4. Methodology**

### **4.1 What Is QFD?**

QFD is a practice for designing your process in response to customer needs. QFD translates what the customer wants into what the organization produces. It enables an organization to prioritize customer needs, find innovative responses to those needs and improve process to maximum effectiveness. QFD is a practice that leads to process improvements that enable an organization to exceed the expectations of the customer.

### **4.2 Historical Development Of QFD**

QFD was originally developed in Japan and used at the KOBE SHIPYARD in the 1960s. Its use spread throughout Japan, and it is still widely used there in both manufacturing and service settings. QFD was originally brought to the United States in the MID-1980s by Xerox. It has not yet achieved wide scale adoption in the United States, but it is being used by both manufacturing organizations (such as HEWLETT-PACKARD) and service organizations (such as St. Clair Hospital in Pittsburgh, Pennsylvania).

QFD is an approach to design of equipment and was introduced in Japan in 1966 by YOJI AKAO. In October, 1983 he introduced QFD to the U.S., through the monthly journal of the American Society of Quality. The monthly journal of the American Society of Quality Control. Today QFD is a major force in the effort of quality management in U.S.,

In 1978 Akao edited a text book which led to a major increase in the use of QFD. In the early 1980's Akao integrates QFD with value Engg.,

through his research/he also integrated QFD with new technologies like reliability Engg., and neck engineering.

Toyoto used the technique in developing automobiles and from Toyota it spread to the American automobiles industry(most notably Ford Motor Company). QFD is now making headway in other high-technology areas. QFD began as an engineering tool to ensure that the development process resulted in a product meeting consumer needs and expectations but because it does so, it also provides strong marketing advantages to those organizations choose to use it.

### 4.3 Structure Of QFD

The most widely used analogy for explaining how QFD is structured is the house. Figure 2 shows how a basis QFD matrix is put together.

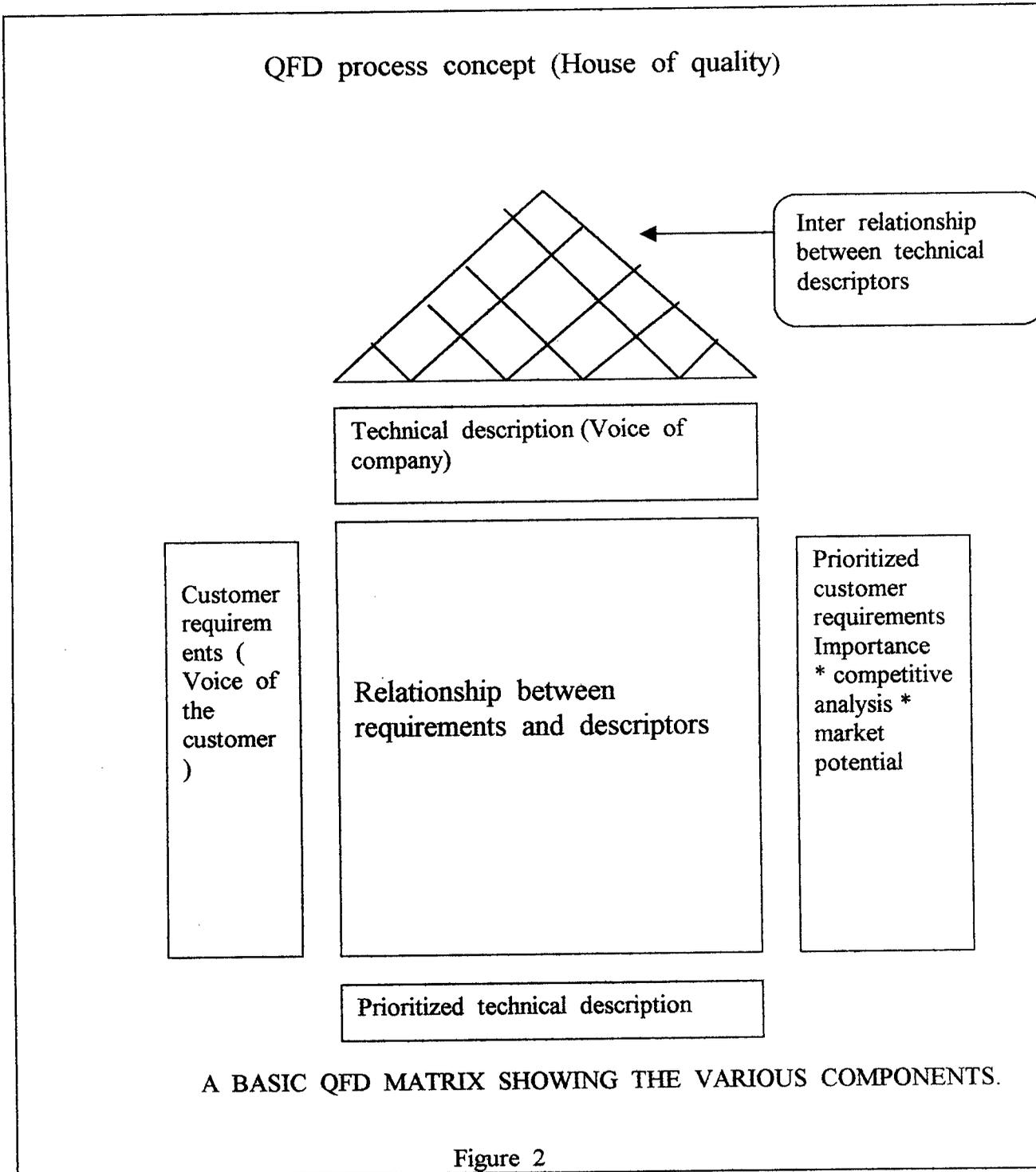


Figure 2

help the team focus on the item that will yield the greatest potential for success in the marketplace.

Organizations are not willing to devote this level of time and commitment to a project unless there is obvious value received. The principal purpose of developing a QFD matrix is to put the organization in touch with its customer's wants and needs and to help determine the priority items and needs to help determine the priority items for improved customer satisfaction, same organization and information to the customer portion in setting priorities,

### **4.3.1 Goal**

It is used to record the results of the teams judgment concerning the customer satisfaction goals for the new product. For example the goal of 4.5 means that the team believes its company should strive to improve this requirements so that the customers evaluation of the new product would average 4.5 on the 1 to 5 scale in using a column for goals. Some managers still a mindset that to establish a target less than maximum represents some form of weakness for the organization. If the organization's personality is such that establishing any goal less than 5 would be judged as improper, then there is no value in using this column.

### **4.3.2 Sales Point**

This should be used to highlight those rows in which action to improve the product can provide a competitive edge. In these cases , the company can advertise this competitive edge. The advertising should have a significant effect because these items had high levels of importance coupled with current low to moderate customer competitive evaluations. An arbitrary weight can be assigned to the presence of a sales point and used in calculation of the "Row Weight"

### 4.3.3 Improvement Ratio(I.R)

It is a calculated measure representing the scope of the improvement required to achieve the goal shown in the goal column

Goal

$$I.R = \frac{\text{Goal}}{\text{Current customer evaluation ratings}}$$

### 4.3.4 Row Weight (R.W)

It is the product of three columns such as the customer level of importance, sales points and the improvement ratio

$$R.W = \text{Importance} * \text{Sales point} * \text{Improvement ratio}$$

These row weights can help an organization evaluate the relative significance of rows. These can assist a team by lending some quantitative value to use in conjunction with judgments about competitive evaluations complaints and other data such as marketing and sales trends and changing special issue and demographics.

### 4.3.5 Action

A decision column has been added ranks the items to shows the suggested order of action, these decisions must represent a term balance of issues such as the estimated time, cost, and human resourced involved in working on the priority item.

### 4.3.6 Column Weight

The customer importance rating value is specified by  $W_i$  the performance rating value is specified by  $R_i$  usually  $W_i$  values are 1 to 5,

where 1 industries least importance and 5,3,1 where 5 is the strong relationship, 3 for medium relationship and 1 for weak relationship. From the above values

$$\begin{aligned} \text{Technical Importance rating} &= \sum_{i=1}^n \text{column weight} \cdot R_i \\ \text{(or)} & \end{aligned}$$

The technical importance rating are the guiding factor for the next phase of the QFD. Higher the value of technical importance ratings more the concentration required to get better results.

If the technical importance rating value is very less, and if the supplier feels there is nothing to improve further the quality characteristics, those quality characteristics can be dropped at this stage. This is not of major significance of the team continues to recognize that these calculations of goals, ratios, and row weight are simply to help in the decision process. They are not a substitute for common sense. They are not algorithms that replace judgments. They are simply aids in the decision process.

In figure 2, the peak of the matrix is the manufacture's requirements. This is where trade –offs are identified. By identifying those early on product development people can narrow their development efforts, thus speeding up the development cycle. The body of the matrix is where the relationships are categorized. This is where customers requirements are “translated” into manufacture's terms. It is also where interactions between relationships are identified so that the synergistic effect is seen.

The Bottom is the prioritized manufacturer's requirements. This identifies the requirements that are the most critical for success as well as the degree of technical difficulty to achieve. All other matrix will be comprised of these fundamental features. Once the format is understood, all the matrices are easily understood.

## **4.4 QFD Process**

Each matrix developed as part of the QFD process should be structured according to the house illustrated in Figure 2. There will be six such matrices developed in a complete cycle of the QFD process. Figure 3 shows the flow and focus of one complete cycle of the QFD process. The purpose of each matrix is explained in the following paragraph.

### **4.4.1 Matrix 1**

It is used to compare customer requirements with the related technical features of the product. All other matrices grow out of this first matrix.

### **4.4.2 Matrix 2**

It is used to compare the technical feature matrix, with their related applied technologies. These two matrices produce the information needed to answer the following questions.

- (i) What does the customer want ?
- (ii) What are the technical requirements relating to features the customer wants?
- (iii) What technologies are needed to meet or exceed customer requirements ? and
- (iv) What are the trade-offs relations to technical requirements?

### **4.4.3 Matrix-3**

It is used to compare the applied technologies from matrix 2 with their related manufacturing process. This matrix helps identify critical variables in manufacturing process

#### **4.4.4 Matrix - 4**

It is used to compare the manufacturing process from matrix with their related quality control process from matrix – 3 with their related quality control process. This matrix produces the information needed to optimize problems through experimentation, the reliability and responsibility of process are determined.

#### **4.4.5 MATRIX – 5**

It is used to compare the quality control processes with their product statistical process control process. This matrix helps ensure helps ensure that the proper parameters and process variables are being used.

#### **4.4.6 Matrix – 6**

It is used to compare the statistical process control parameters with the specifications that have been developed for the finished product. At this point, adjustments are made to ensure that the product produced is the product that customer wants. The QFD process ensures that all resources are being optimally utilized

## QFD PROCESS : ONE COMPLETE CYCLE

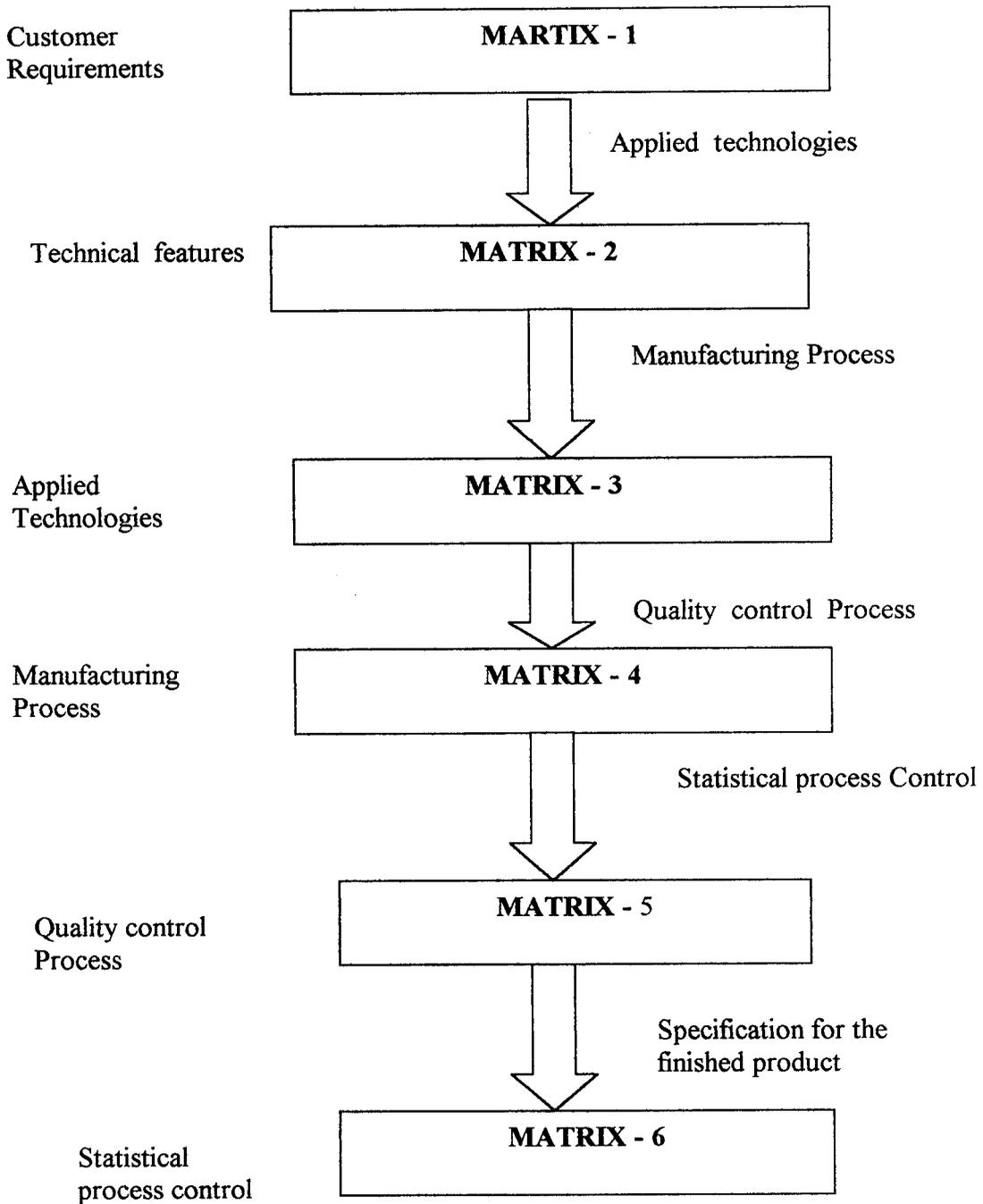
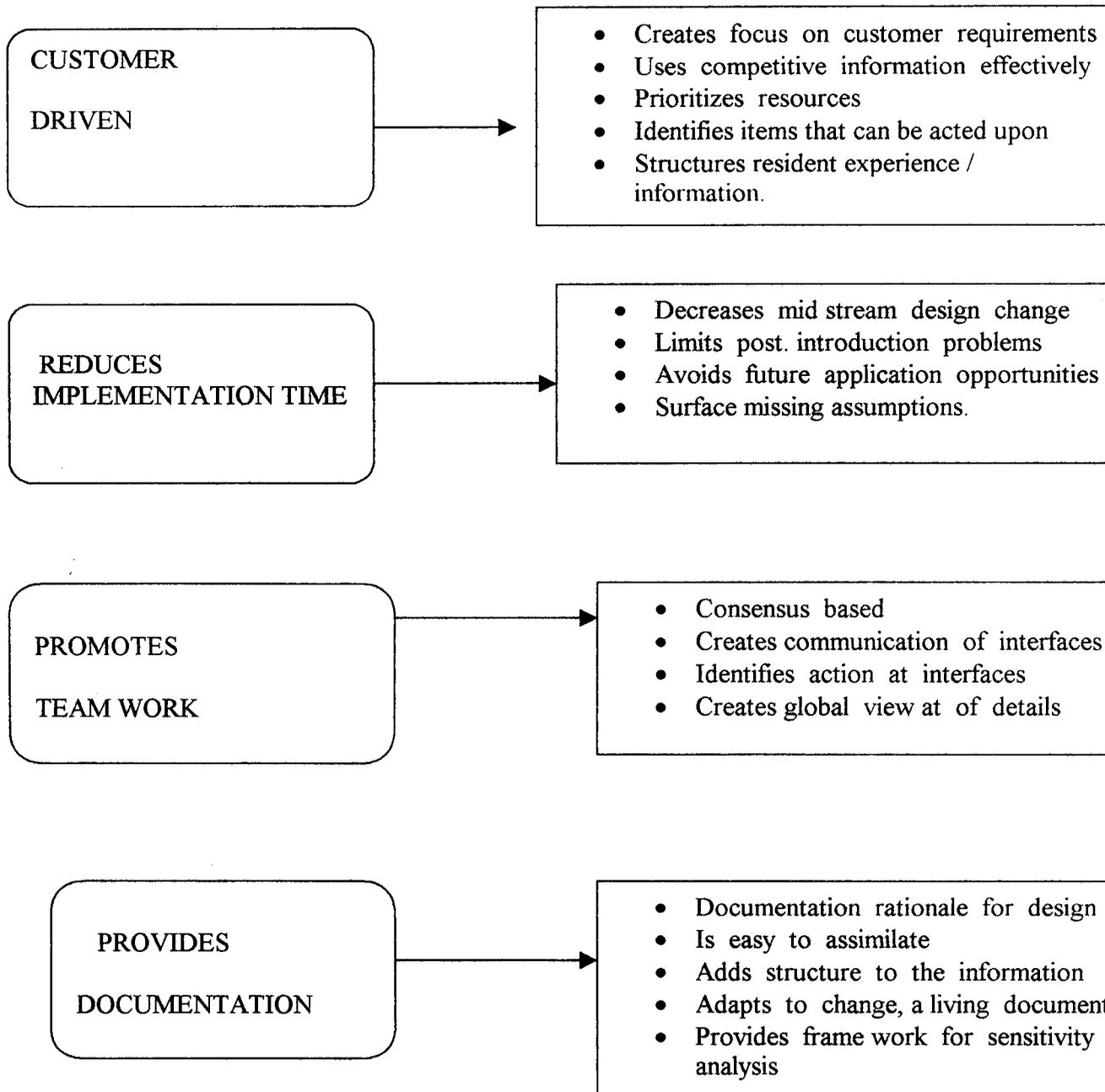


Figure 3

## 4.5 Benefits Of QFD



## **4.6 Conclusion**

Success will not be achieved simply as a result of introducing the organization to new concepts and stating that they are endorsed by management. The effort needs to be accompanied by an investigation of the process by which the company currently plans, design and manufactures a product. Once agreement is achieved that these represent the most efficient flow of the overall process from concept to deliver and service, they should become the established process. People should become the established processes. People should be trained for reviews at critical points. Continued improvement of the organization. If QFD is made a formalized part of the product development cycle , it will help an organization accomplish the objective of understanding its customers and designing products and services that meet the customers requirements in a superior, exciting way.

## **4.7 Survey Methodology**

Under this sample survey method employed here, we have selected group of 150 respondents ,out of which 117 from other brand users and 33 from EZE clean users. 23 respondents out of 33 pertain to domestic end users like hospitals, complexes and hotels etc., so that a feedback as close as possible to the ground situation is obtained which in turn can make the findings more meaningful.

Having decided this sample survey method, questionnaire we devised in such a way as to elicit the required information and this is achieved through informal one to one meeting with the respondents and through personal interviews. The purpose of the questionnaire technique is to be facilitate understanding or to enable prediction of the behavior of the respondents. The information so elicited was initially done for a small

group of individuals. So as to fine tune the questionnaire technique that thus paved way towards accomplishing the objectives of the research in a better and effective way. The study is an overall effort to know all the requirements of the respondents about EZE clean mop.

We have neatly tabulated and analyzed the responses so obtained from all these comparing the end users. The various tools like percentage method, weighted average method(WAM), quality function deployment(QFD) are used here for the purpose of analysis so that the findings make more sense.

The questionnaire is inserted in the appendix – A

#### **4.7.1 Limitations.**

The research methodology enumerated above through effective and also an easy to adopt technique, is however not without its limitations that cast its influences on the accuracy of the study. The main limitations that confront us in such a venture can be listed as follows

- ❖ This sample survey technique was adopted as the target population is quite vast and the availability of time restricted. However, this surveyed group constitutes only a very small percentage of the overall populace and hence can not in real sense be constructed as a reflection of the entire group. In fact, theoretically, there is every possibility that the verdict of the overall populace is different from that of the sample group. In such an eventuality, the findings themselves can go away
- ❖ There is a chance that the information so obtained may be biased in nature. The details furnished need not necessarily be objective but a degree of subjective ness cannot be ruled out.
- ❖ Under this study, the present market conditions and the individuals behavior at a given period of time alone have been considered.

❖ Lack of seriousness, and involvement n the part of certain individuals in furnishing the requirements information may alter a actual findings derived at.

❖ The inherent difficulty to quality the percentage of error in the findings leaves one with no clue either as to the level of the degree of accuracy of the entire research.

# **SURVERY RESULTS**

**Table 1: Buying capacity**

	No. of respondents	%
Less than 3000	3	2
3001 –5000	12	8
5001 – 10000	31	20.66
10001 - 15000	82	54.66
15001 – 20000	10	6.66
> 20000	12	8
TV	150	100
AUDIO/VIDEO	150	100
TELEPHONE	140	93.33
WASHING MACHINE	80	53.33
REFRIGIRATOR	80	53.33
A/C	2	1.33
WET GRIDER	139	92.66
COMPUTER	82	54.66
MOTOR CYCLE	130	86.66
VACCUM CLEANER	35	23.33
FOUR WHEELER	12	8

### 4.7.2 Buying Capacity ( Income Group)

The table 1 and graph 1 shows the buying capacity of people based on their salary and consumer product goods they have

TOTAL NUMBER OF RESPONDENTS 150

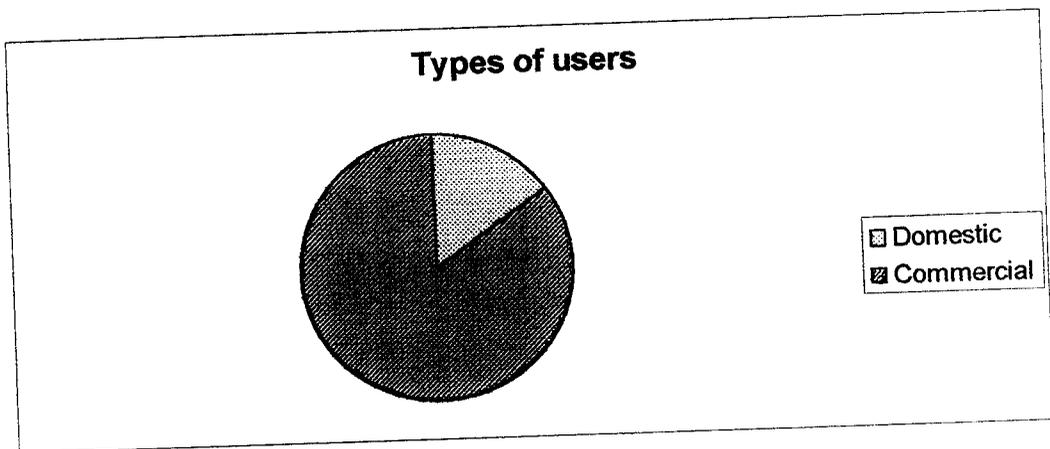
### 4.7.3 Types Of Users

TABLE 2 Shows the % of domestic users and commercial users of EZE clean mop and other local mop

Table 2 : % of domestic users and commercial users

		DOMESTIC USERS		Commercial users	
		Total respondents 139		Total respondents 11	
EZE users	Clean	23	16.54	10	90.9
	Non user	116	83.45	1	9.09

The following fig 5 shows the graphical format of table 2



#### 4.7.4 Mode To Know About Mop

The following table (Table 3) shows that the mode to know about the products

Table 3 mode to know about the Mop

	OTHER BRAND		EZE CLEAN MOP	
	Total respondents 117		Total respondents 33	
Friends & relatives	3	2.56	2	6
TV advertisement	*	*	1	3
Magazine / news paper	*	*	9	27.27
Exhibition	*	*	12	36.36
Door deliveries (Representatives)	*	*	8	24.24
Departmental stores	114	97.43	1	3

### MODE TO KNOW ABOUT MOP

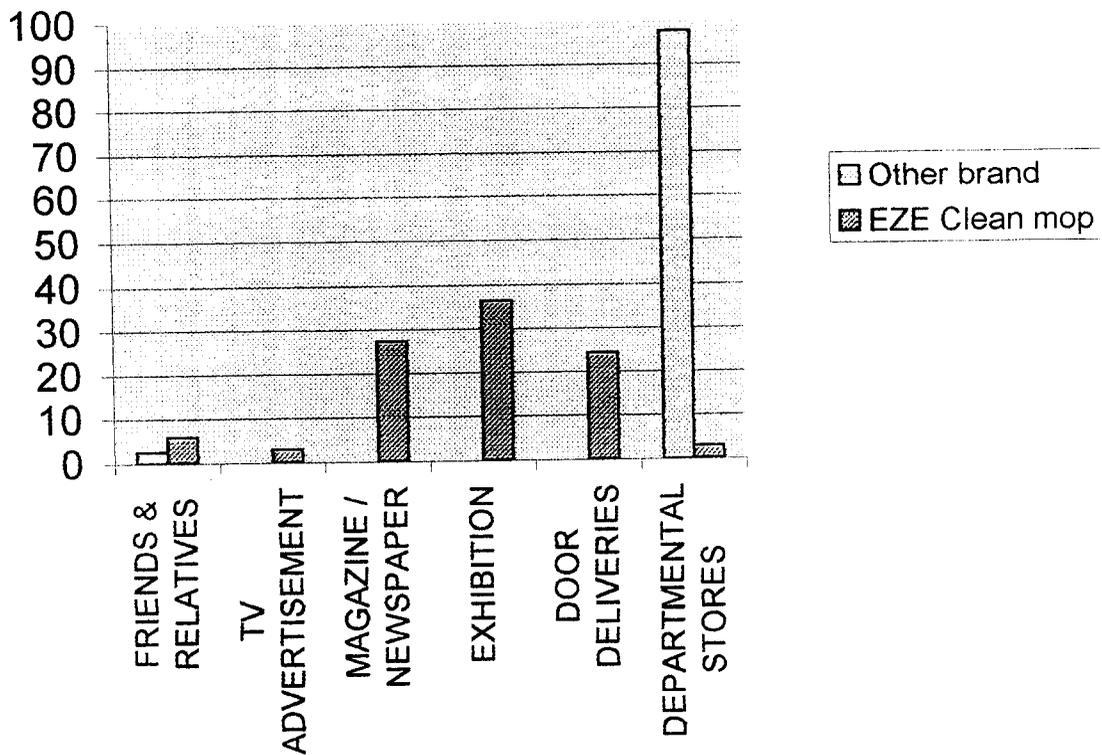


Figure 6 : Mode to know about Mop

### 4.7.5 Frequency Of Usage

TOTAL NO OF RESPONDENTS 150

Table 4: Frequency of usage

TWICE A DAY	15	10
ONCE IN A DAY	32	21.33
WEEKLY ONCE	22	14.66
TWO DAYS ONCE	81	54

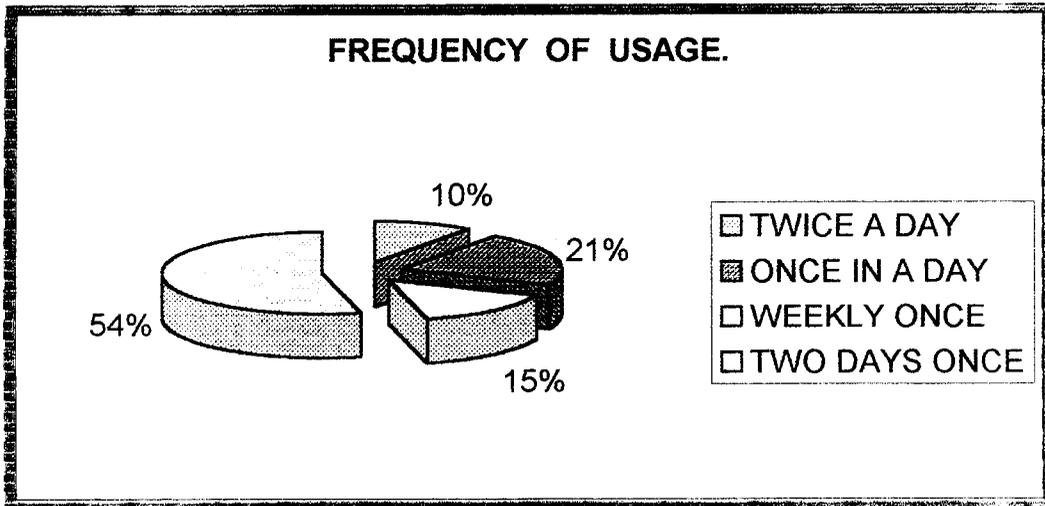


Figure 7: Frequency of usage

#### 4.7.6. Overall Results

THIS TABLE SHOWS OVER ALL SURVEY RESULTS

Table 5 : Overall results.

	Total no. of respondents 117						Total no. of respondents : 33					
	LOCAL MOP						EZE CLEAN MOP					
	V.S	%	J.S	%	N.S	%	V.S	%	J.S	%	N.S	%
APPEARANCE	12	10.25	102	87.17	3	2.5	28	84.84	4	12.12	1	3.03
AVAILABILITY OF REFILL	114	97.43	3	2.56	*	*	26	78.78	5	15.15	2	6.06
AVAILABILITY OF THE UNIT	115	98.29	2	1.7	*	*	14	42.42	7	21.21	12	36.3
BODY MATERIAL -AI	*	*	11	94.87	6	5.1	25	75.75	7	21.21	1	3.03
COMFERT	6	5.1	82	70	29	24.8	7	21.21	22	66.66	4	12.1
DURABILITY	11	9.4	100	85.47	9	5.1	27	81.81	5	15.15	1	3.03
ERGONOMIC DESIGN	*	*	11	9.54	106	90.5	31	93.93	2	6.06	*	*
FINISHING	*	*	18	15.3	99	84.6	32	96.96	1	3.03	*	*
GURANTEE	*	*	1	0.8	116	99.1	4	12.12	26	78.78	3	9.09
MOP.REFILL LIFE	1	0.8	2	1.7	115	98.2	15	45.45	18	54.54	*	*
MOP Removable &Washable	*	*	*	*	117	100	32	96.96	1	3.03	*	*
MOP DESIGN	1	*	2	1.7	115	98.7	32	96.96	1	3.03	*	*
POWDER COATING	*	0.8	*	*	117	100	32	96.96	1	3.03	*	*
PRICE	114		3	2.56	*	*	2	6.06	2	6.06	29	87.9
QUALITY	3	*	88	75.2	26	22.3	32	96.96	1	3.03	*	*
RELIABILITY	*	97.43	29	24.78	88	75.2	32	96.96	1	3.03	*	*
SAFETY CONSIDERATION	*	2.56	29	24.78	88	75.2	30	90.04	3	9.09	*	*
SUITABLE FOR BOTH Wet-n-Dry	*	*	*	*	117	100	*	*	25	75.75	8	24.2
SWIVEL BASE	*	*	*	*	117	100	31	93.93	2	6.06	*	*
TELESCOPIC DESIGN	*	*	*	*	117	100	32	96.96	1	3.03	*	*

## FOR LOCAL MOP CUSTOMER REQUIREMENTS

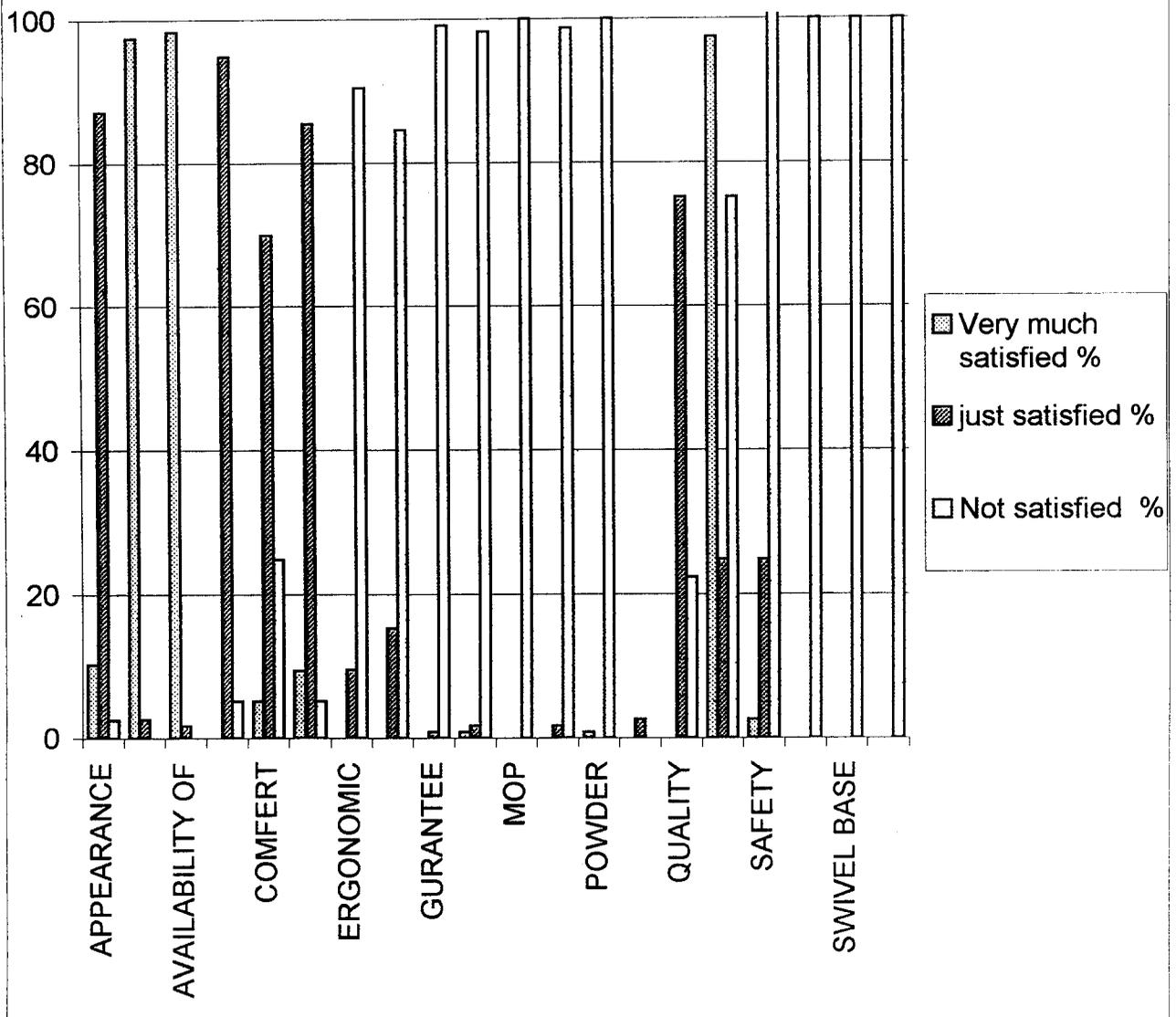


Figure 8: Customer requirements for Local MOP

### Customer Requirements for EZE clean Mop

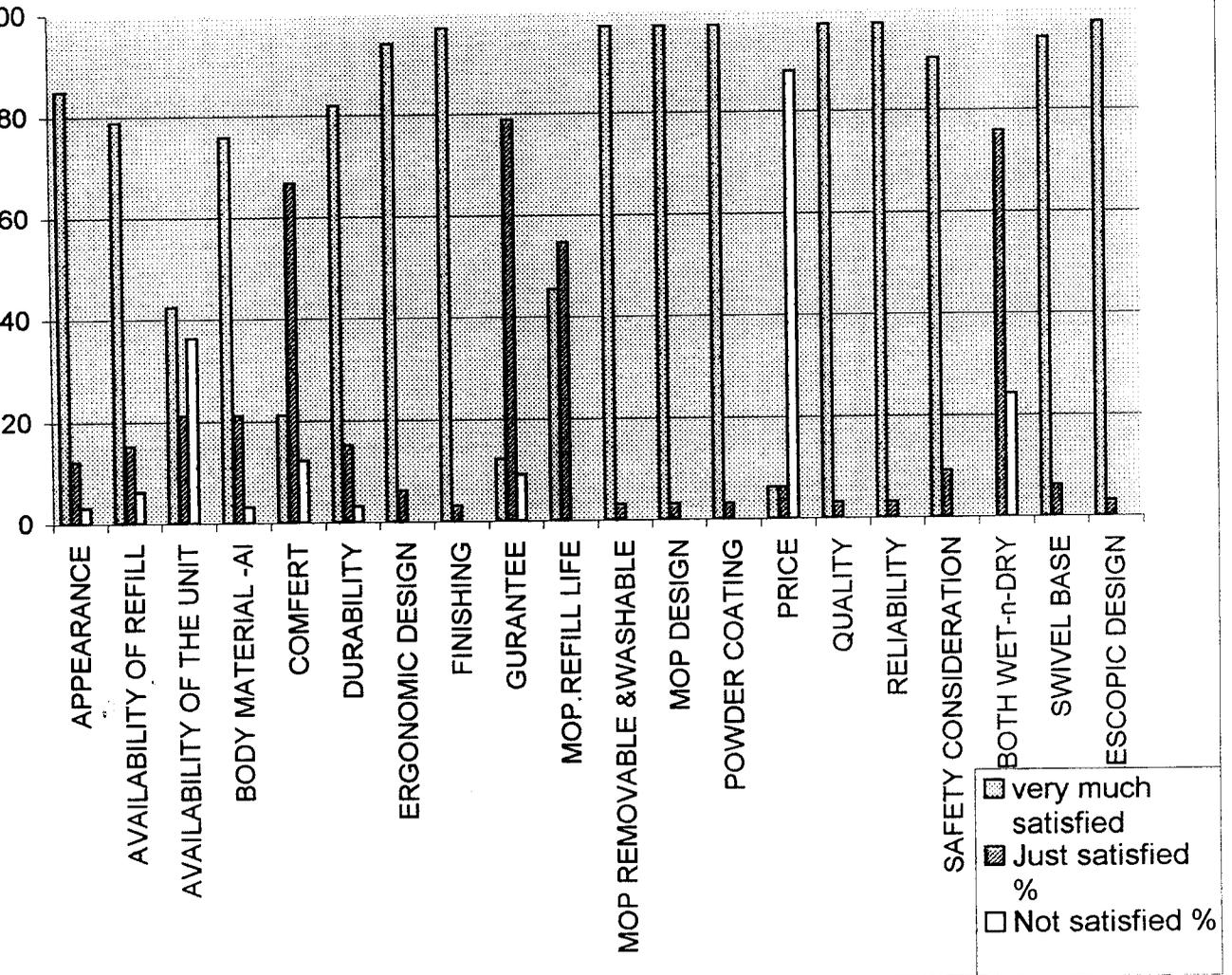


Figure 9. customer requirements for EZE clean mop

### 4.7.7 Reasons Have Not Purchased

TOTAL NUMBER OF RESPONDENTS 117

**Table 6 : Reasons have not purchased**

LACK OF AWARENESS	39	33.33 %
COSTLY	78	66.66 %

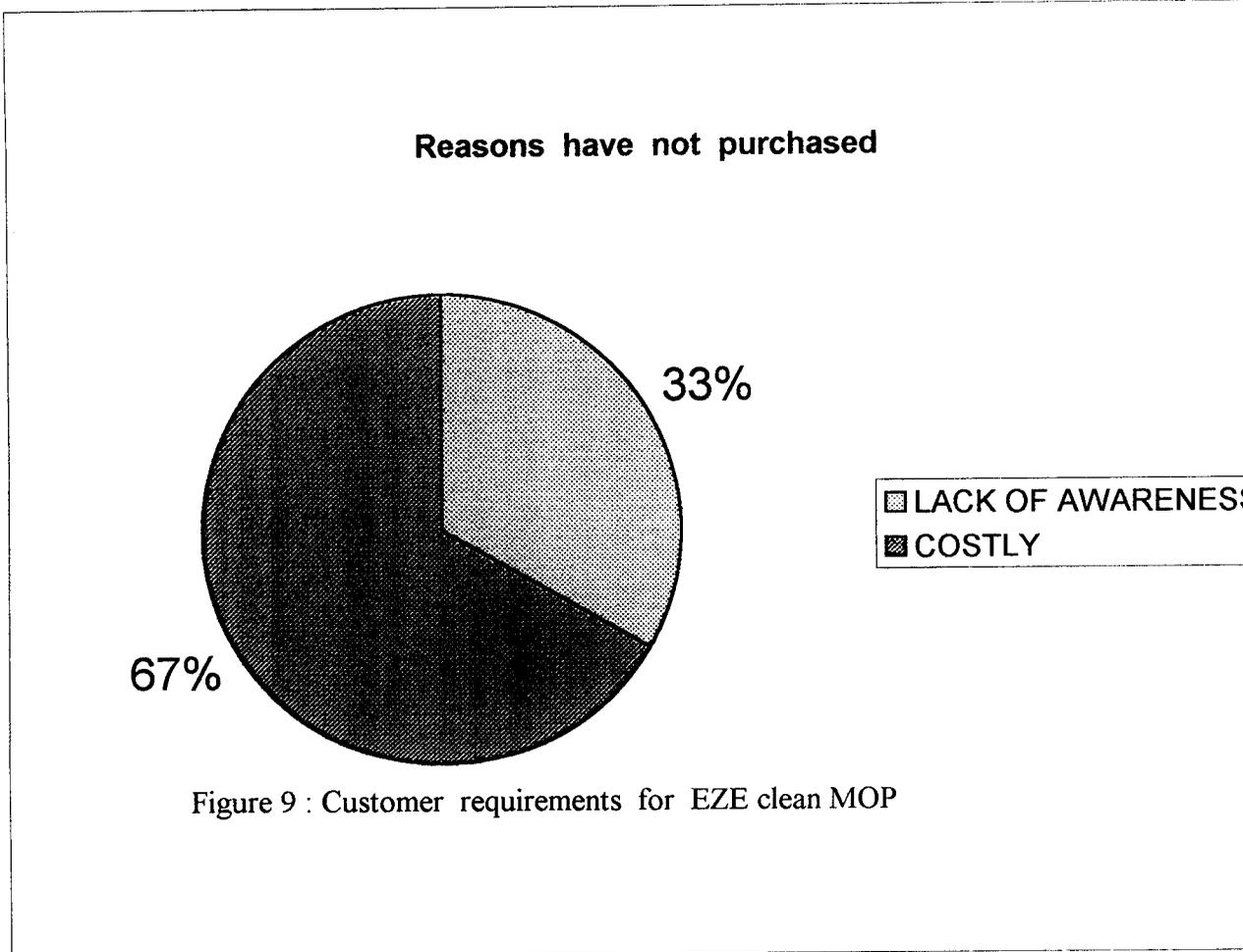


Figure 10: Reasons have not purchased

**SOFTWARE DESIGN**

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# QFD ZAST PRIMER

## 5.1 QFD - ZAST PRIMER

The QFD - ZAST PRIMER is a computer program for Quality function deployment Chart preparation. By using this program, we can find out these areas in which this program, we can find out those areas in which more care is needed. We can also use the QFD - ZAST PRIMER

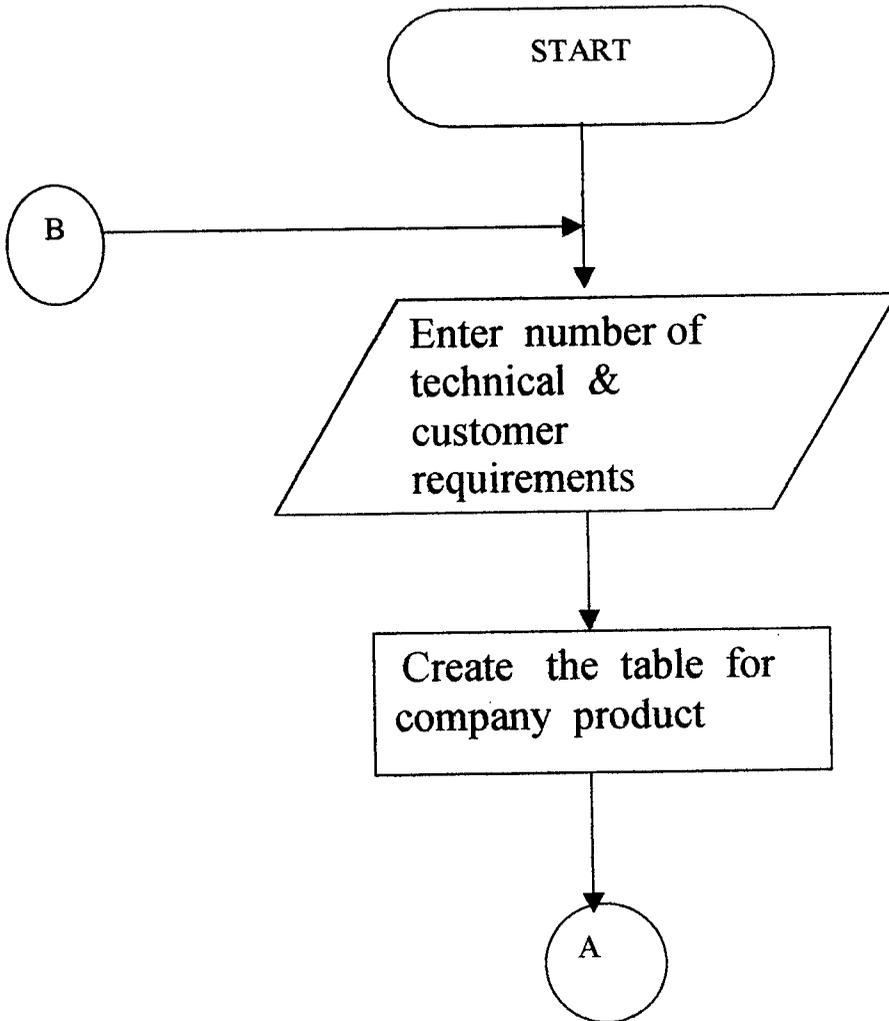
To calculate customer assessment and technical assessment which is most helpful in decision making. QFD - ZAST PRIMER is a self contained general purpose software package developed particularly the process of quality planning in small industries also.

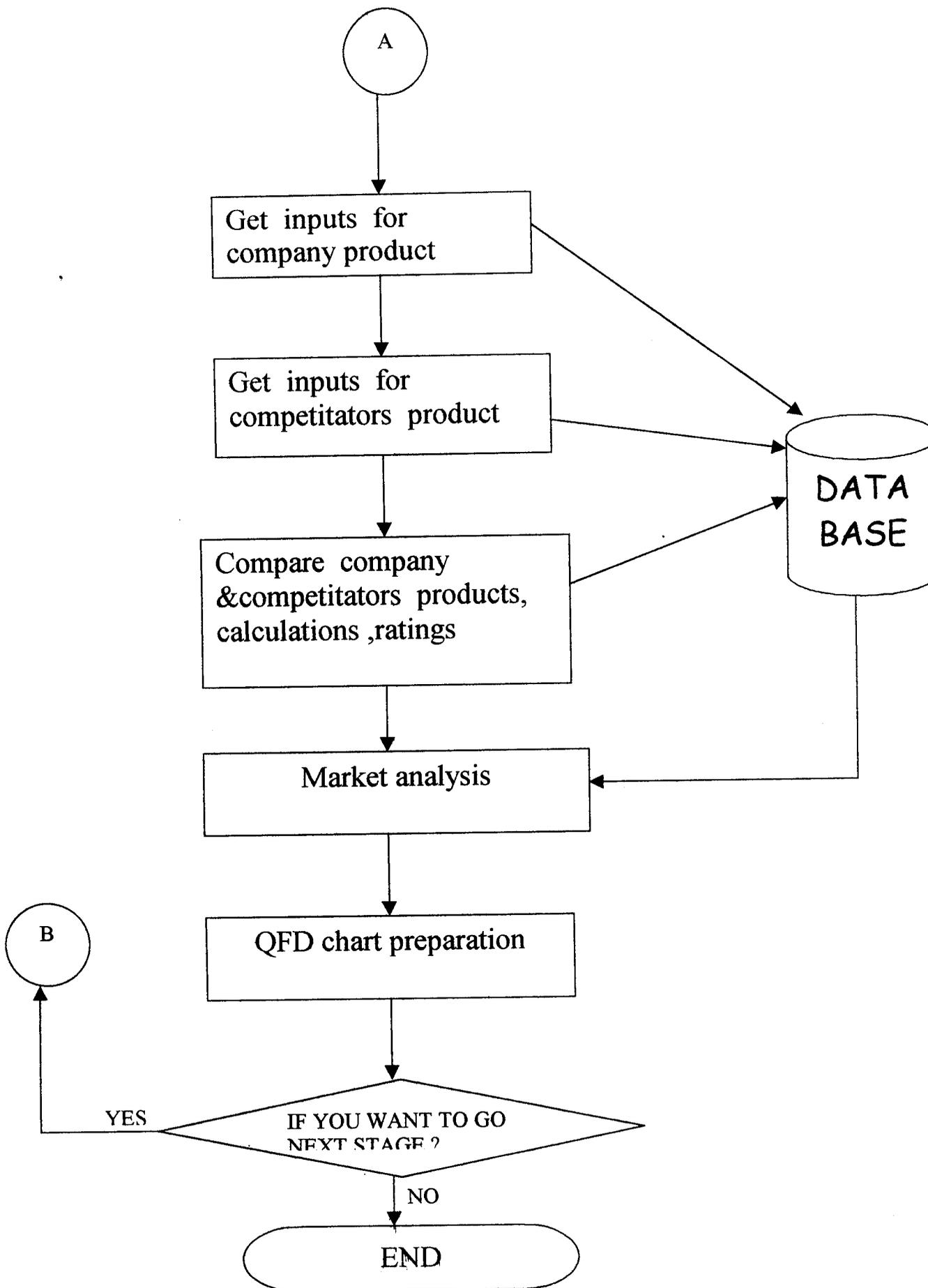
The first step (or) Inputs requirements customer requirements. They are obtained only thoroughly the field survey. So it make more interactive with the customers. It gives the original (or) real wants of customers and their opinion about the product and the same from the competitors.

The QFD - ZAST PRIMER may be used by the industries in the new product development itself. So that it reduces the product development cycle time and increase the efficiency of the product/services.

The Appendix-D has the coding of the QFD ZAST PRIMER. The Appendix – B contains the structures of the QFA ZAST PRIMER and the Appendix – C contains the QFD ZAST PRIMER'S output for the product EZE CLEAN MOP.

## 5.2 HOW DOES QFD - ZAST PRIMER WORKS?





### 5.3 REVIEW OF RESULTS

Solution results are stored in the database and also written to a result files

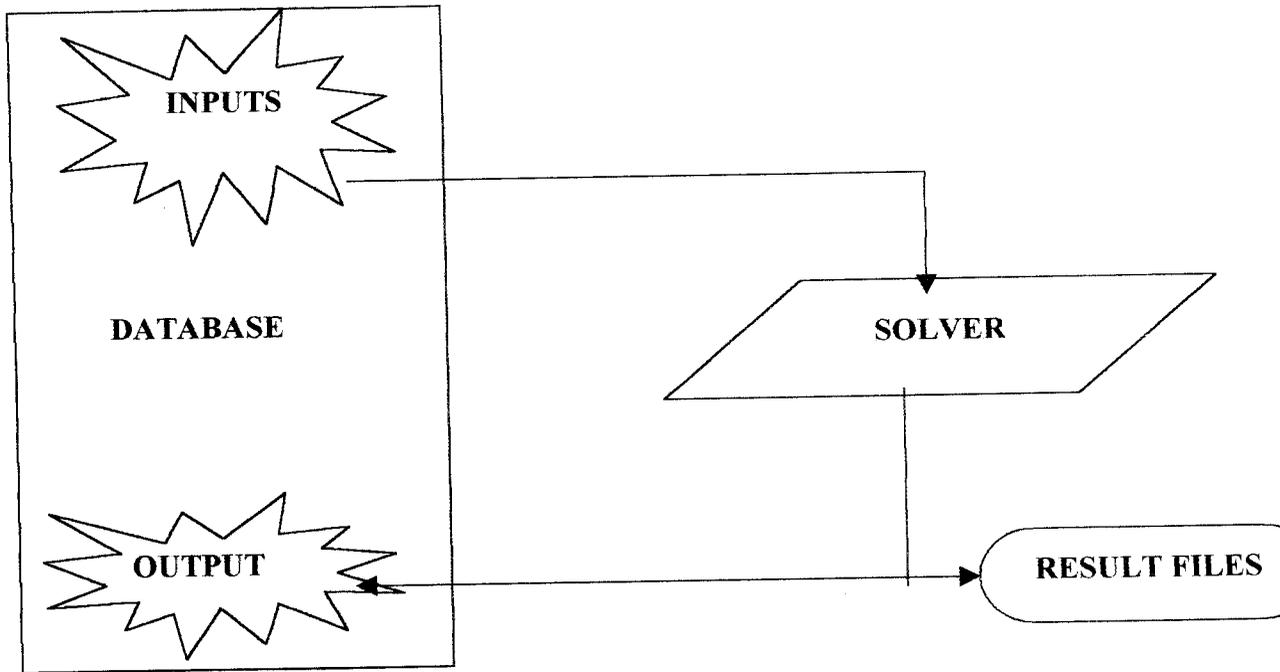


Figure 12

The . QFD - ZAST PRIMER is a user friendly package, in which the **Front end - VISUAL BASIC 6.0** is used and **MS-ACCESS** is used as a **Back end**.

The program is instructed to solve the problems and to compute results form in graphical manner. This is a computationally intensive part of an Quality planning and most user friendly approach. It requires less time to design the QFD chart for a particular product / process. The program automatically records the fields which produce the most efficient solution

## **RESULTS AND DISCUSSION**

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Once the chart is drawn, the . QFD - ZAST PRIMER asks, whether to go on next stage or not. If the user wants to go next stage, it automatically takes the first technical inputs as second stage customer requirements and asks the entry for second stage. Technical requirements and their corresponding ratings.

## **6 . Results And Discussion**

### **6.1 Findings From Data Interpretation – End Users**

1. 33 % Of the respondents are domestic users and commercial users.
2. Among the domestic market 8% of the respondents are in the income level of Rs. 20000 and above
3. Mop is the commonly used cleaning equipment i.e., 83.45 hence market is wide spread.
4. Mop priced by other brands ,the majority(64%) is less than Rs. 100 , Rs 100- 200 is 27% , Rs 200 & above is 9%
5. 96.96% of the respondents of EZE clean users are very much satisfied about its telescopic design , swivel base , reliability , powder coating , mop removable & washable , ergonomic design.
6. Well aware about EZE clean in domestic market is 66% whereas market is 85%
7. EZE clean used in domestic market is 16,54% while in commercial market is 90.9%
8. Reasons for not using EZE clean mop by domestic market are un awareness ands highly priced is 33.33% and 66.66% respectively
9. Both domestic and commercial users prefer reduction in price of EZE clean.

## 6.2 Suggestions

1. Large quantity using organizations such as hospitals, institutions and complexes etc., should be followed up and given demonstration to avoid the lack of experience in handling this product by servants.

2. Low awareness level can be visited by intensive advertising strategy such as

- Giving advertisements in local channel, Tamil news papers, Radio etc., in peak time
- Signage in buses and other public transports.
- Hoarding in prime location.
- Displays near schools, provision stores and super market and road shows made to attract house wife
- The availability of the EZE clean mop compared with local mop is very poor. So holding displays in super market otherwise make free show at peak purchase time in the departmental stores
- Giving any provision to clean small electronic products
- The size is so length eve it has telescopic arrangements so the compectability is so reduced

Mop is a common product which is used by all income group. Generally, awareness about this mop is low among the people of coimbatore city. The people using EZE clean are satisfied. The price is only one decremental factor. More advertisement is needed . the researcher has found that the sales of EZE clean will be good in the near future according to its promotion campaign

**CONCLUSION**

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## 7 Conclusion

A right product delivered at right time will have a good marketability. Every manufacturer is interested to minimize the lead time of a product. On the other hand the gap between product design (or) its continuous development and customer expectations is growing more and more. The author has made an attempt in there's to bridge the gap and tried to minimize it.

A software , known as QFD ZAST PRIMER is developed keeping in mind the gap between customer and product design. Normally , the QFD is employed to design the new product. Here, it is employed for continuous improvement of a product. The time involved and repeated nature of activities here resulted with this software for a case study product on EZE Clean Mop at Roots industries Ltd., The software has been designed Using Visual Basic Software Language. A software has been discussed in detail in this thesis work.

The software has been validated using the data collected from the survey on EZE clean Mop . It has been compared with the simulated data of competitors to this provided. The company can use the software to identify the weaker areas if any.

### Scope:

The software could be further structured so that it can be used for any product. The graphical representation of evaluation of the product with competitor could be further aligned vertically in future. More case studies can be run to test the validity of the software. They need to include use good engineering analysis tools such as FMEA,FTA ,Value engineering analysis and design of experiments in the software. The most effective way to ensure the organization uses these processes and tools effectively is to embed them in the process for new product development and to audit the process sufficiently to ensure its efficacy.

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**APPENDIX A:  
QUESTIONNAIRE**

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## CUSTOMERS REQUIREMENTS / EXPECTATIONS TOWARDS MOPS

NOTE: Tick the appropriate

1. Name of the respondent :
2. Address :
  
3. Age : a). 15-25 b) 26-35 c). 36-45  
d). 46-55 e). Above 55.
4. Type of family : a). Nuclear b). Joint
5. No. Of Family members : a). 2 b). 3-5 c). 6-9 d). 10 & above
6. Occupation : a). Pvt. sector employee b). Govt. employee  
c). professional d). Business e). Shopkeeper  
f). Self-employed g). Others specify \_\_\_\_\_
7. Monthly Income of the family : a). Less than 3000 b). 3001-5001  
c). 5001-10000 d). 10001-15000  
e). 15001-20000 f). 20000 & above
8. Nature of consumer Durable owned : a) T.V b). Audio/ Video System c) Tele phone  
d). Washing machine e). Refrigerator  
f). Air cooler h). Wet grinder l). Computer  
j) Motor cycle/scooter k). Four Wheeler  
l). Vacuum cleaner m) others specify \_\_\_\_\_
9. How did you purchase majority durable : a). Personal fund b). Private loan c). office  
loan d). loans from banks  
e). Others specify \_\_\_\_\_
10. Who makes decision in purchasing a durable product ?  
a). Spouse b). Self c). Parents d) Collectively e) Person Who uses the product  
f). Sons / Daughter G). Others Specify \_\_\_\_\_
11. Do you own a mop? YES NO  
If YES, continue..... If no go to Question no. 19

12. What type of product do you have ?

a). Locally Manufactured b). Branded product c). Others Specify \_\_\_\_\_

13. Nature of the Mop Owned

a). Ordinary Mop (Threaded Mop) b). Specialized Mop c). Others Specify \_\_\_\_\_

14. What brand do you have?

a). EZE clean mop b). GALA mop c). BRW Mop d). SUPER Mop e). RASI Mop  
f). Mrs. CLEAN g). SMART Mop

15. How did you come to know about the brand?

a). Friends / relatives b). T.V. Advertisement c). Magazines / News papers  
d). dealers, Shop keepers/ Departmental stores e). Door deliveries  
f). others specify \_\_\_\_\_

16. Who handles the mop?

a). House maid b). House -wife c). Office boy d). Others specify \_\_\_\_\_

(i) For how many times you use the mop?

a). Twice a day b). Once in a day c). Weekly once d). Others specify \_\_\_\_\_

17. How frequently you purchase the product?

a). Once in a month b). once in two month c). once in a six month  
d). once in a year f). others specify \_\_\_\_\_

18. Kindly specify the level of satisfaction you receive on the above mentioned

REASONS	Very Much Satisfied	Just Satisfied	Not Satisfied
Appearance			
Availability			
Availability of the refill			
Availability of the unit			
Body material			
Comfort			
Durability			
Ergonomic design			

Finishing			
Guarantee			
MOP refill life			
Mop Design			
Mop removable & washable			
Powder coating			
Price			
Quality			
Reliability			
Safety consideration			
Suitable for both wet-n-dry			
Swivel base			
Telescopic design			

19. If no, why have you not purchased a mop? Give reasons.

20. Are you aware of the EZE clean mop? YES/NO

if yes what source

a). friends/relatives b). T.V. advertisement c). Magazines / News papers.

d). Dealers / shop keepers/Departmental stores e) Door deliveries f). others specify \_\_\_\_\_

21. Do you own an EZE mop? YES / NO

if no, why you have not purchased it?

a). Lack of awareness b). Costly c). Not easy to handle d). Non-availability  
e). Others specify \_\_\_\_\_

22. Will you prefer to purchase an EZE clean mop? Yes / No

if yes, for what reasons? ( in order)

a.

b.

if no, for what reasons (in order )

23. What improvements as you feel, if made in the product would make you to purchase EZE clean mop

a.

b.

24. What suggestions you can give to improve the sales performance of your present brand?

a.

b.

25. Do you use to purchase the same brand regularly YES/ No

if yes, due to what major reason you purchase

a

b

if no, why?

a.

b.

26. if you are a owner of a threaded d mop, if you have the proposal to purchase a durable Mop? YES/ No

if yes what brand you will purchase

a.

b

Why will you prefer this brand (in order)

a).

b).

c).

THANKING YOU FOR SPENDING YOUR VALUABLE TIME IN FILLING UP THE QUESTIONNAIRE.

**APPENDIX B:  
QFD-ZAST PRIMER**

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**QFD--ZAST  
PRIMER**



*Developed By*

**P.Thamil Arasi**

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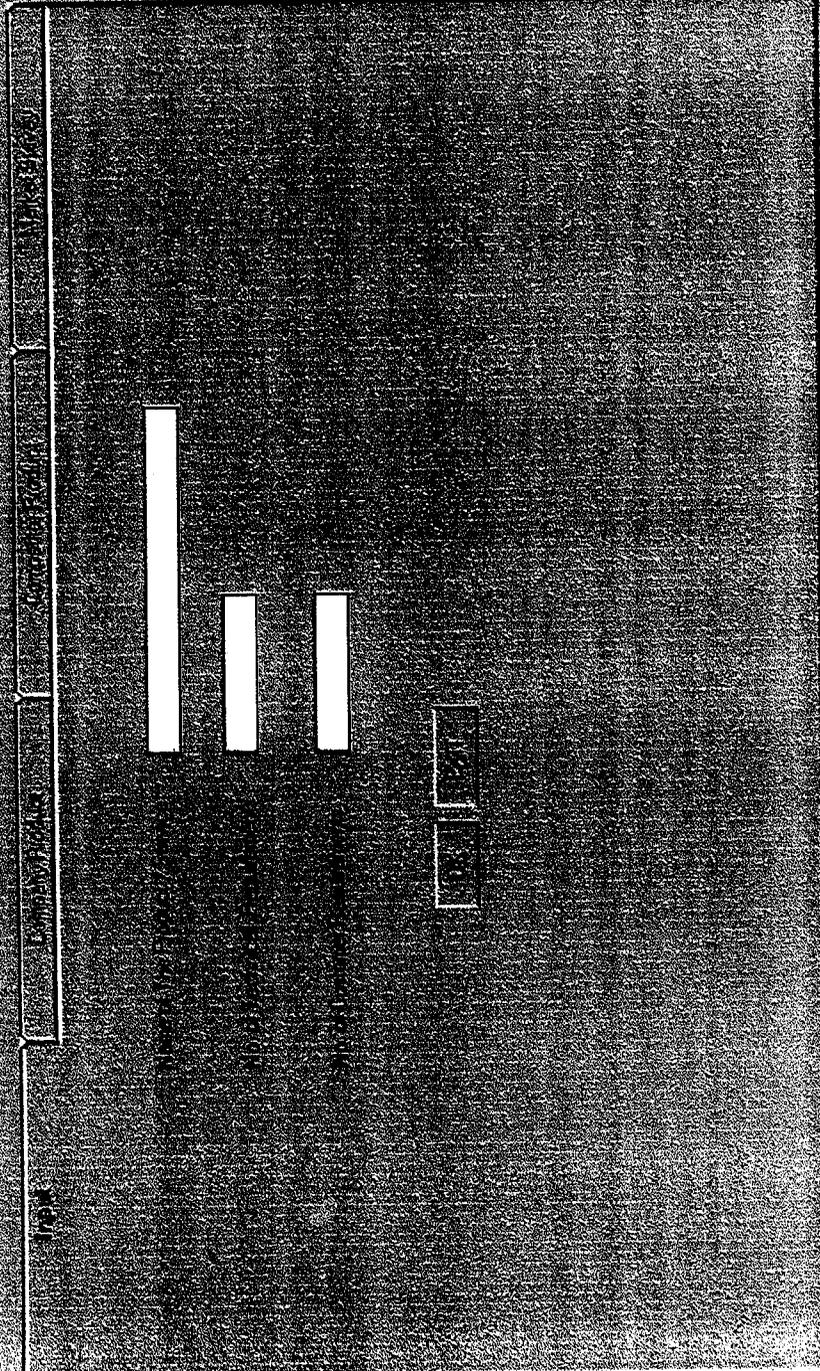
1963

MAIRME NUFEM

1963

1963

### Quality Function Deployment





Quality Function Deployment

Model Number

Department/Project

Emp. No./Date

COMPETITIVE PRODUCT

Importance	TOTAL	Complaints	Goal	Improve Pt.	Actions
TOTAL					

Print



**APPENDIX C:  
QFD-ZAST PRIMER FOR EZE CLEAN MOP**

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### Quality Function Deployment

Project: [ ]

EZE Clean Mop

5

5

[ ] [ ]

### Quality Function Deployment

### COMPANY/PRODUCT

	Importance	inserter	telescopic d	Swivel base	shaft handle	base roller	TOTAL	Complaints
wet-dry	4	5	5	5	5	5	25	0
inserter desi	5	4	4	4	5	5	22	0
Quality	5	5	5	5	5	5	25	0
price	3	3	2	2	2	2	11	0
ergonomic d	4.5	4	4	4	5	5	22	80
<b>TOTAL</b>		21	20	20	22	22		



Quality Function Deployment

COMPETITOR PRODUCT

telescopic d	Swivel base	shaft handle	base roller	TOTAL	Complaints	Goal	Improve Rt.	Actions
1	1	1	1	6	105	5	4.17	
2	2	2	2	10	98	5	2.50	
1	1	1	1	5	95	5	4.17	Improve Que
4	4	4	4	20	0	5	1.25	
5	5	5	5	25	28	5	1.00	

PRINT

# Quality Function Deployment

Master Tables

Formulas/Calculations

Formulas/Calculations

## ANALYSIS



TECHNICAL REQUIREMENTS	DESIGN REQUIREMENTS									
5	1.00	further impro	5.00							
5	2.27	reduce price *	8.17							
5	1.14		5.13							



Address

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

