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### ABBREVIATIONS

ACIT	: Advisory Committee for Industrial Technology
ACDHP	: Advisory Committee for Development of Human Resources
ALP	: Actual Level of Performance
ASQC	: American Society for Quality Control
BS	: British Standard
BSI	: British Standards Institution
CCCI	: Cyprus Chamber of Commerce and Industry
CASCO	: Community Assessment Council Committee
CEO	: Chief Executive Officers
CDB	: Cyprus Developing Bank
CDP	: Cross Domestic Product
G&E	: Cause and Effect (diagram)
CMI	: Cyprus Manufacturing Industry
COLA	: Cost of Living Allowance
CPC	: Cyprus Productivity Centre
CY	: Cyprus
CYS	: Cyprus Organisation for Standards
DPA	: Departmental Purpose Analysis
EC	: European Committee
EFQM	: European Foundation for Quality Management
EN	: European Normal
FMEA	: Failure Mode and Effects Analysis
HTI	: Higher Technical Institute
ILP	: Ideal Levels of Performance
ISO	: International Standards Organisation
IOT	: Institute of Technology
ITA	: Industrial Training Authority
ITDC	: Industrial Technological Development Committee
JIT	: Just in Time
SMs & E	: Material, Men, Machines, Method, Money & Environment
MBWA	: Management By Wondering About
EIF	: Employers and Industrialists Federation
Q	: Question
QA	: Quality Assurance
QAI	: Quality Assurance Institution
QC	: Quality Control
QCs	: Quality Circles
QFD	: Quality Function Deployment
QM	: Quality Management
Qno.	: Question Number
SQC	: Statistical Quality Control
SPC	: Statistical Process Control
TQC	: Total Quality Control
TQM	: Total Quality Management
UNDP	: United Nations Development Program
ZD	: Zero Defects



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*EVALUATION OF THE STATUS OF  
TOTAL QUALITY MANAGEMENT IN  
CYPRUS MANUFACTURING INDUSTRY*

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*A thesis submitted in partial  
fulfillment of the requirements for  
the degree of Master of Philosophy*

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# ABSTRACT

This thesis analyses the present status of the Cyprus Manufacturing Industry (CMI) through identification, analysis and evaluation of all quality parameters related to the concept of Total Quality Management (TQM).

This analysis is accomplished through an extensive National Quality Survey, reported through a specially designed questionnaire, which targeted 60 manufacturing industries. Data and information on quality growth in the US, Japan and Europe are presented for comparison with Cyprus.

The survey reveals that the Quality Standards of CMI fall short of those of other competitor countries with respect to the following:

- \* Quality policies, manuals, systems and certification;
- \* Suppliers assessment, communication;
- \* Behaviour, culture, Cypriot attitudes;
- \* Usage of Quality techniques/tools;
- \* Who are the customers and what are their requirements;
- \* Insufficient training;
- \* Almost negligible performance measurement;

It is shown that in Cyprus TQM can only be implemented by a few large enterprises, which currently possess the right structure, systems, culture and training. It is suggested that the majority of these enterprises, having first understood the concept of TQM, should proceed step by step along the route of restructuring, in accordance with the suggestions elaborated in the conclusions and recommendations chapter of this thesis.



D e d i c a t i o n

To my wife Zoe, sons Stelios and Argiris and  
to my daughter Maria, born in the middle  
of writing this thesis, who stood by my side  
when I was long on work and short on time,

I love you all

# CONTENTS

	page
ABSTRACT	i
DEDICATION	ii
CONTENTS	iii
LIST OF FIGURES	viii
LIST OF TABLES	x
LIST OF ATTACHED MATERIAL	xi
ACKNOWLEDGEMENTS	xii
ABBREVIATIONS	xiv
 <u>CHAPTER 1 - INTRODUCTION</u>	 1
1.1 AIMS AND OBJECTIVES	1
1.2 THESIS HYPOTHESIS	1
1.3 THESIS STRUCTURE AND CONTENT	1
 <u>CHAPTER 2 - INTERNATIONAL QUALITY GROWTH AND TQM: ITS MEANING, EVOLUTION AND WORLDWIDE APPLICABILITY</u>	  4
2.1 INTRODUCTION	4
2.2 BRIEF HISTORY AND DEVELOPMENT OF QUALITY	5
2.3 THE TQM CONCEPT	9
2.4 PEOPLE/CULTURE - QUALITY GURUS	12
2.4.1 Crosby	14
2.4.2 Deming	14
2.4.3 Feigenbaum	15
2.4.4 Ishikawa	16
2.4.5 Juran	16
2.4.6 Tom Peters	17
2.5 SYSTEMS	19
2.5.1 ISO 9000 Quality Systems Series	19

	page
2.6	A COMPARISON OF THE SYSTEM, THE PHILOSOPHIES OF THE GURUS AND THE TOOL 21
2.7	TOOLS/TECHNIQUES FOR QUALITY IMPROVEMENT 22
2.7.1	Introduction 22
2.7.2	The tools/techniques 24
2.7.3	Quality Tools Summary in a Matrix Form 31
<b><u>CHAPTER 3 - RESEARCH DESIGN AND METHODOLOGY</u></b>	<b>33</b>
3.1	MANUFACTURING INDUSTRIES SURVEY - QUESTIONNAIRE 33
3.1.1	Introduction 33
3.1.2	Questionnaire Formulation 33
3.1.3	Questionnaire Key Areas 34
3.1.4	Selection of Companies - The Sample 37
3.2	METHOD OF CONDUCTING THE SURVEY 39
3.2.1	Questionnaire Administration Method 39
3.2.2	Before the Interview 40
3.2.3	During the Interview 40
3.2.4	After the Interview 41
3.2.5	Accuracy and Statistical Error of the Survey 41
3.3	COMPUTER PACKAGE CUSTOMIZATION 43
3.3.1	Introduction 43
3.3.2	Package Selection 43
3.3.3	Computer Programming 44
3.3.4	The Start File 45
3.3.5	Data Entry 45
<b><u>CHAPTER 4 - PRESENTATION AND EXPLANATION OF QUESTIONNAIRE ANSWERS</u></b>	<b>47</b>
4.1	RESULTS PRESENTATION 47
4.2	PRESENTATION OF QUESTIONNAIRE ANSWERS 47

	page
4.3	CODES, EXPLANATION, EXAMPLES 49
4.3.1	Explanation of Table 4.1 codes 49
4.3.2	Examples illustrating the meaning of each symbol and number of table 4.1 50
 <b><u>CHAPTER 5 - DISCUSSION OF QUESTIONNAIRE RESULTS</u></b>	
	<b><u>AND RECOMMENDATIONS</u></b> 52
5.1	INTRODUCTION 52
5.2	GENERAL CHARACTERISTICS 52
5.3	SYSTEMS 55
5.4	CULTURE-PEOPLE 58
5.5	SUPPLIERS 60
5.6	QUALITY ASSOCIATED ACTIVITIES 62
5.6.1	Quality Activities 62
5.6.2	Inspection 63
5.7	ON LINE QUALITY 66
5.7.1	Design Stage 67
5.7.2	Capability 67
5.7.3	Optimization 67
5.7.4	Manufacturing Stage 68
5.8	CUSTOMERS 69
5.9	TRAINING 71
5.10	QUALITY COSTS 75
5.11	GENERAL QUESTIONS 76
 <b><u>CHAPTER 6 - LISTING OF QUALITATIVE RESULTS</u></b>	
6.1	INTRODUCTION 81
6.2	SYSTEMS 81
6.3	CULTURE-PEOPLE 82
6.4	SUPPLIERS 85
6.5	QUALITY ASSOCIATED ACTIVITIES 86

	page
6.6	ON LINE QUALITY 87
6.7	CUSTOMERS 88
6.8	TRAINING 88
6.9	QUALITY COSTS 89
6.10	CYPRUS QUALITY PROBLEMS IN A C & E DIAGRAM 90

## **CHAPTER 7 - OVERALL CONCLUSIONS AND RECOMMENDATIONS** 92

7.1	CONCLUSIONS RELATED TO EVALUATION 92
7.2	RECOMMENDATIONS 94
7.2.1	National Level 94
7.2.2	Company Level 97
7.3	RECOMMENDATIONS FOR FURTHER RESEARCH WORK 99

## **APPENDICES**

1.	ISO 9000 AND THE PHILOSOPHIES OF THE QUALITY GURUS. A QUALITY FUNCTION DEPLOYMENT	101
2.	INDUSTRIAL STUDIES: THE STATUS OF CYPRUS MANUFACTURING INDUSTRY	108
A2.1	INTRODUCTION	108
A2.2	BRIEF REVIEW OF CYPRUS MANUFACTURING INDUSTRY	108
A2.2.1	Definitions	108
A2.2.2	General Information	109
A2.2.3	Contribution and distribution of Manufacturing Industries	109
A2.2.4	Cost-structure of Manufacturing	111
A2.2.5	Size of Enterprises	112
A2.2.6	Supplementary Information	114
3.	PEOPLE AND ORGANIZATIONS INVOLVED IN THE PREPARATION OF THE QUESTIONNAIRE	117

	page
4. QUESTIONNAIRE USED FOR THE EVALUATION OF TQM ACTIVITIES TO 60 MANUFACTURING INDUSTRIES IN CYPRUS	118
5. FILES INCLUDED IN THE 3 1/2" DISKETTE ATTACHED (DI)	137
6. STEPS FOLLOWED IN PROGRAMMING THE COMPUTER	138
7. SAMPLE PAGE OF THE COMPUTER 400 PAGES PRINTOUTS	140
8. SUMMARISED SURVEY RESULTS	141
9. PROPOSAL FOR A "QUALITY MANAGEMENT" TRAINING AND IMPLEMENTATION PROJECT	146
<u>REFERENCES</u>	149
<u>BIBLIOGRAPHY</u>	154

# LIST OF FIGURES

	page
2.1 Total Quality time line illustrating year of adoption	7
2.2 The European TQM model	9
2.3 The TQM model adopted	11
2.4 The QFD House, ISO 9000 + Quality Gurus	23
2.5 Seven helpful charts	26
2.6 Range of application of Quality techniques in a typical manufacturing organisation	32
3.1 Questionnaire Key Areas	36
5.1 Cyprus Quality and European Community	54
5.2 Quality Systems	56
5.3 Questions related to People-Culture	59
5.4 Questions related to Suppliers	61
5.5 Quality-Associated Activities	63
5.6 Failures and defectives figures	64
5.7 Answers related to on-line quality	66
5.8 Answers related to Customers	70
5.9 Willingness for Training and Improvements	72
5.10 Training content and methodology	74
5.11 Status of Quality Assurance Institution	78
5.12 Suggested structure of Quality Assurance Institution	80
6.1 Findings of an Evaluation of the status of TQM in Cyprus Manufacturing Industry in a C & E diagram	91

	page
7.1 Suggested Structure and Action Plan for Cyprus Quality Improvement	96
A2.1 Composition of Cyprus Manufacturing Industry 1990	110
A2.2 Size of Enterprises 1989 (persons employed)	113



## LIST OF TABLES

	page
2.1 A Comparison of the Gurus	18
4.1 Questionnaire Answers	48

## LIST OF ATTACHED MATERIAL

D1 3 1/2" Diskette containing all computer files  
related to this thesis (last page)

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5Ms & E	: Material, Men, Machines, Method, Money & Environment

MBWA : Management By Wondering About  
Q : Question  
QA : Quality Assurance  
QAI : Quality Assurance Institution  
QC : Quality Control  
QCs : Quality Circles  
QFD : Quality Function Deployment  
QM : Quality Management  
Qno. : Question Number  
SQC : Statistical Quality Control  
SPC : Statistical Process Control  
TQC : Total Quality Control  
TQM : Total Quality Management  
UNDP : United Nations Development Program  
ZD : Zero Defects

# CHAPTER ONE

## INTRODUCTION

### 1.1 AIMS AND OBJECTIVES

The main objectives are to evaluate the status of Total Quality Management (TQM) and to make recommendations for improving the performance of the Manufacturing Industry in Cyprus.

The evaluation and recommendations are based on findings identified through a survey designed to evaluate Cyprus Quality status and levels.

### 1.2 THESIS HYPOTHESIS

This Thesis is based on the premise that Quality Standards of the Cyprus Manufacturing Industry (CMI) fall short of those of other competitor countries (mostly European).

To address this deficiency, if the above hypothesis is valid, it is proposed that CMI should invest in Quality Systems at all levels, according to the requirements identified through the survey, spanning from simple quality techniques to TQM.

### 1.3 THESIS STRUCTURE AND CONTENT

This investigation addresses only the CMI and excludes the service sector. The manufacturing industry must greatly improved before Cyprus joins the European Community (EC). The TQM concept, as discussed in this evaluation research, will supply information on the current status of Cyprus Quality Standards to all levels of management in an organisation and to other institutions (e.g., Industrial Training Authority (ITA), Cyprus Productivity Centre (CPC)).

Improvements can be successful at the implementation phase only after the needs and problems have been identified and correctly evaluated at the diagnostic phase. The thesis is dedicated to an identification and evaluation of those needs. The purpose is to recommend actions to be taken and to assist later any plans for implementation of TQM, not only by the CMI but by any nation or organisation that might share the same needs and problems.

To identify the above, a Questionnaire covering the most important aspects of TQM was designed and a survey was conducted. (The methodology used to identify the needs, evaluate the status and prove that the hypothesis could easily be adopted by any other country or organisation throughout the world.). The survey offers a variety of experiences, techniques, approaches and solutions to any reader who wants to follow the same path for research.

In Chapter 2 the TQM concept (its meaning, evaluation and applicability) is introduced through a literature search and discussion of related topics such as history, quality Gurus, quality systems, tools, techniques, etc.

Chapter 3 details the research design and methodology adopted and includes the formulation, steps, and techniques which have been followed in the preparation of the questionnaire. The design and formulation of the questionnaire were very much assisted by the information and findings of the industrial studies of CMI, which are outlined in detail in Appendix 2. The questionnaire was given out to 60 manufacturing enterprises (10% of the total manufacturing population and 16% of total gross financial output) over a period of nine months.

This is followed by illustrating the methodology which was adopted to conduct the above-mentioned survey. A research study of this kind has never before been conducted in Cyprus and its survey results are unique to



the subject area. These results were mainly used for the purpose of this thesis but were also presented to industrialists to discuss an action plan for improvements and to investigate a methodology which could be adopted for the implementation of TQM by the CMI.

The last topic in Chapter 3 discusses computer programming and customization for data analysis. The program (SPSS) was customised in such a way to accept and analyze the results and findings of the survey.

All answer codes, explanations and results are presented in a numerical summarised form in Chapter 4, to assist at a later stage the evaluation, findings and recommendations.

Chapter 5 includes all the quantitative results, findings and recommendations. This chapter addresses the eight important aspects of TQM which have been included in the survey. The chapter discussion is based on the quantitative answers to the questionnaire. All the discussions and answers by industrialists to qualitative questions are summarised briefly in Chapter 6.

Chapter 7 summarises and outlines the findings and the recommendations of the survey, together with conclusions. It also offers recommendations for further work and outlines the parameters that should be considered if implementation is decided upon.

TQM is important for small countries like Cyprus with limited resources, technology, shortage of workers, etc. There is a need to upgrade manufacturing sectors through productivity and quality in order to become and remain competitive. This can be achieved with better utilization of the existing resources and by adopting a new philosophy after the needs and problems have been identified and evaluated.

## CHAPTER TWO

# INTERNATIONAL QUALITY GROWTH AND TQM: ITS MEANING, EVALUATION AND WORLDWIDE APPLICABILITY

### 2.1 INTRODUCTION

Interest in quality is growing worldwide. Customers and users are becoming more and more demanding. They are no longer willing to accept inferior quality. Citizens are also insisting that the public sector improve the quality of its services.

A recent survey of the American Society for Quality Control (ASQC) conducted in the United States of America, Japan and Germany (among others), identified quality as consumer's top or second priority after price [Ryan J. 1991]. Therefore this chapter is dedicated to an investigation of its meaning, evaluation, and worldwide applicability.

"Total Quality Management" (TQM) is a generic term for the modern approach to quality. Several attempts to define TQM have led to many interesting discussions. Some definitions of TQM are given below:

"TQM is a cooperative form of doing business that relies on the talents and capabilities of both labour and management to continually improve quality and productivity using teams" [Jablonski J. & Hartman P. 1990]. "TQM is continually satisfying customers' requirements at lower cost, achieving total quality by harnessing everyone's commitment (customers, suppliers) in the organisation" [Smith S. 1990].

Total quality is one of many "cultures" (attitudes, management style, leadership, way of thinking) which may be exhibited by a business enterprise. A culture

determines the way in which staff successfully carry out their work. Many company cultures have arisen over years speaking about change. Changes for the worse can be achieved overnight; changes for the better can take years [Millan R.M. 1990].

Total quality is the company culture that allows quality goods and services to be provided at the lowest cost. TQM's objective is to achieve Total Quality by harnessing everyone's commitment.

## 2.2 BRIEF HISTORY AND DEVELOPMENT OF QUALITY

Before mass production, the craftsman was responsible for the manufacture of a product and at the same time controlled the quality of his work. That period was known as "Operator Quality Control" [Feigenbaum A. V. 1983]. That was followed by the "Foreman Quality Control" period where a supervisor was assigned to oversee the quality of the operators. The first full-time inspectors were employed during World War I. The 1920-30s saw the creation the "Inspection Quality Control".

"Statistical Quality Control" (SQC), the fourth stage was widely used during World War II.

Statistical Process Control (SPC) was first introduced by Deming in Japan in the early 1950s as an integral part of management control.

During the 1950s the concept of Total Quality Control (TQC) was introduced in western countries by Feigenbaum. He saw TQC as a management tool that would improve product design and quality and also reduce operating costs and losses.

Kauru Ishikawa was one of the first to introduce TQC in Japan during the period 1950-60. He defines TQC as "A

company-wide management tool that makes high quality goods and services, for the most important competitive edge now and in the future" [Ishikawa K. 1985]. Feigenbaum adds another element to this definition ".... which allow for full customer satisfaction" [Feigenbaum A.V. 1983].

L.R. Chase in an article in the booklet "Winning with Quality" [1989], illustrates very thoroughly the differences between western and Japanese organisations: "Japanese businesses have spent over 30 years pursuing quality. Japanese companies in the 1950s and 1960s created total quality organisations. After 'perfecting' customer-driven management methods in the domestic market, they entered global trade with devastating effects. Within a decade Japanese manufacturers dominated US markets in motorcycles, cars, washers, cameras, pianos, robots and photocopiers. Now Japan has more than a 50% share of world trade in over 30 separate product fields.

US industry spent most of the 1970s in turmoil. Originally, companies did not understand the problem. They started 'crash' product development programmes. Massive cost reduction followed. Work forces were slashed by up to 50%, plants closed, and capital-intensive, factory automation projects were initiated. They attempted to graft Japanese manufacturing 'secrets'. At the same time Japanese competitors continued to expand by producing inexpensive, reliable products which the American public wanted".

Developing countries, especially in the Far East, attempted to duplicate Japanese economic success by stressing quality. Companies in Taiwan, Singapore, Hong Kong and South Korea were particularly quick to adopt quality manufacturing practices. This is clearly shown by the total quality time line illustrated in Figure 2.1

[Smith S. 1990].

European companies have been slow to learn the quality message. Automotive manufacturers began implementing quality programmes in the late 1970s. Since then, the quality revolution has spread to their suppliers. More recently this has been adopted by other sectors of the manufacturing and service industries. "The recent formation of the European Foundation for Quality Management is now sending a clear signal to the US and Japan. Europe is determined to gain global markets by manufacturing and selling only quality products" [Chase L.R 1989].

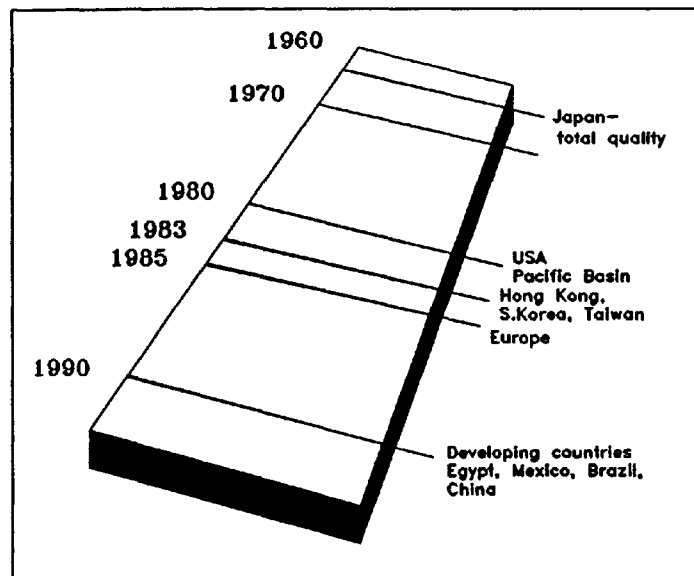


Figure 2.1 Total Quality time line  
illustrating year of adoption

There are many differences between Quality Control (QC) activities in Japan and those in the US and Western Europe. They were developed within a framework of different societies and cultures. Ishikawa elaborates these differences in his book, "What Is TQC" [Ishikawa K. 1985].

Quality control regulated the quality of the product. But what about the product's durability and integrity? The discipline covering these aspects is product assurance. Product quality assurance is concerned with quality, performance, aesthetics, reliability, safety,

economy, integrity, etc. [Carrubba R.E. & Gordon D.R. 1988].

TQM represents a fundamental shift from previous systems (QC, TQC). The systematic analysis, preplanning and blue-printing of operations remain essential, but the focus switches from a process driven by external controls through procedure-compliance and advancement, to a process of habitual improvement, where control is embedded within and is driven by the culture of the organisation.

"In TQM a customer orientation is achieved through continuous quality improvement" [Foster M. 1990]. D.M. Lascelles and B.D. Dale [1991] in the article "Levelling out the future" they identify six different levels of Total Quality Improvement (TQI) adoption. They invite managers to consider the six levels and place their organisation at one of these levels.

Continuous improvement and change are not enough. They do not guarantee the complete transformation of a non-quality company to a systematic and consistent quality company. There should be a metamorphosis. Gibbs, who has devoted his "Quality Newsletter" to TQM training, argues in his cover letter that the new word which should be used is "morphing". "Tom Peters could speak about a passion for morphing also. TQM could be Total Quality Morphing" [Gibbs K. 1992].

As mentioned earlier TQM is a concept with different approaches, views and implementation procedures. This is also stressed by an International Quality Study, conducted in the four leading countries, the US, Japan, Germany and Canada where each country has adopted its own approaches to quality management [Bemowski K. 1991]. They have their own views on what customers are looking for, with respect to product and service quality [Ryan J. 1991].

In his article "Australian TQM model", Turwell Ch. [1991] proposes a broad TQM framework to help overcome Australia's unique implementation barriers. The Australian culture is very different from that of America and Japan.

The European Foundation for Quality Management developed and adopted its own model, which has been used by several European countries.

Figure 2.2 expresses graphically the principles of the European Model developed for the European Quality Award. Processes are the means by which the organisation harnesses and releases the talents of its people to produce results. In other words, the process and the people are the ENABLERS which provide the RESULTS [EFQM Guidelines 1992].

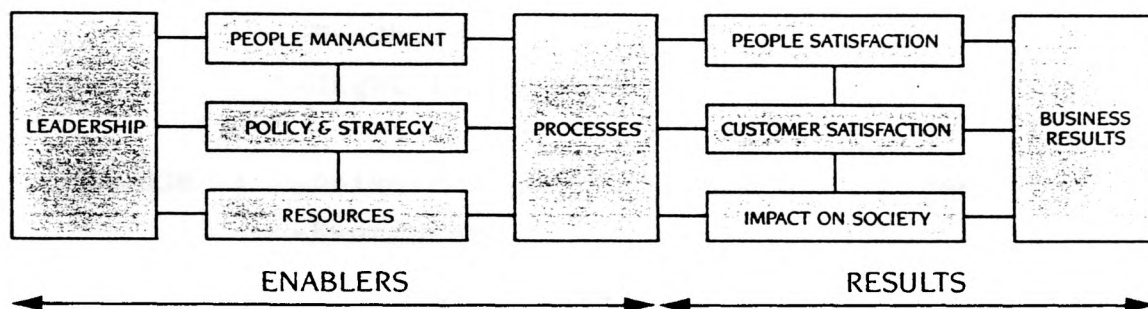


Figure 2.2 The European TQM Model

This model has been used to address the basic principles and concepts of TQM in Europe.

### 2.3 THE TQM CONCEPT

TQM is both a philosophy and a practical working process for companies committed to growth and survival. To support this process, TQM is guided by seven basic principles, as follows [Smith S. 1991]:

- \* The approach : Management-led
- \* The scope : Company-wide

- \* The scale : Everyone is responsible for quality
- \* The philosophy : Prevention not detection
- \* The standard : Right first time
- \* The control : Cost of quality
- \* The theme : Continuous improvement

A total Quality Management organisation is one that is totally committed to quality, which:

**FOCUSES ON:**

- Continuous process improvement
- Everything as a process as well as the results
- The use of scientific methods/techniques
- Perfection as the goal
- Customers
- Prevention versus inspection
- Mobilize expertise of work force
- Fact-based decision making
- Feedback
- Right first time

**THROUGH :**

- Universal participation - everyone
- Everywhere
- Individual and teams

**RESULTING IN-**

- Customer satisfaction
- Exceeding expectations
- Image
- Productivity
- Cost reduction
- Certainty of operation
- Morale
- Teamwork, unity
- Improved management
- Satisfied customers

**FOR:** Internal and external customers  
 [Jablonski R.J. & Hartman P. 1990, Lucas Eng. 1988, Price F. 1984]



Any company in any sector can follow this path and share their success, provided its management considers quality and meeting customer requirements as major issues. TQM is a never-ending route leading to the creation of a Quality company. The first steps are the hardest. Deciding where and how to begin are so difficult that many have failed to apply TQM. This stagnation is so common that it has been given the name "Total Quality Paralysis". The process for applying TQM in practice consists of four phases, summarised below [Smith S. 1990]:

- I Diagnosis and preparation
- II Management focus and commitment
- III Planned improvement
- IV Review, reinforce and re-start

There are three factors that dictate how a TQM organisation functions and how that organisation is perceived. These have been described variously as Culture, Structure, Systems [Lucas Eng. 1988], or People, Policy & Strategy, Resources [EFQM 1992] or People, Systems, Tools. The EFQM European model is similar to the one followed in the UK. The model which will be adopted in this thesis is shown below in Figure 2.3, conforming to the UK model.

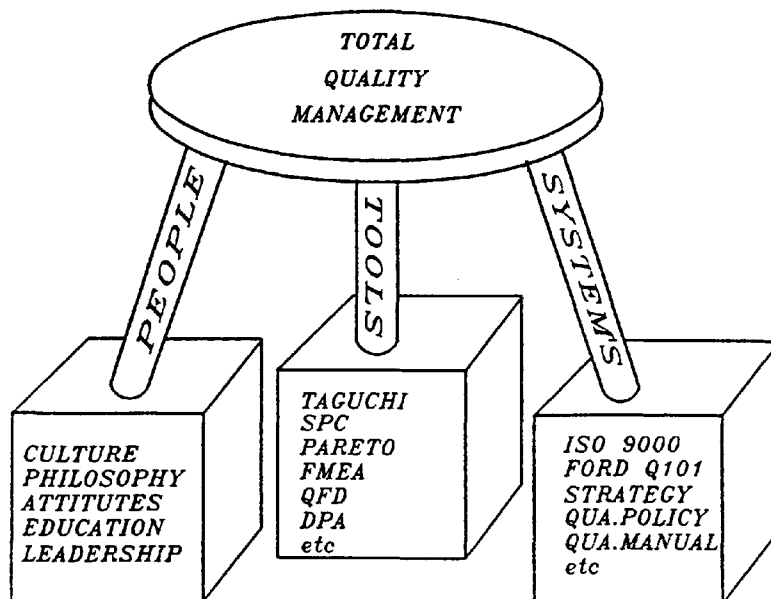


Figure 2.3 The TQM model adopted

Success comes from the right balance between these factors, which should be supported as outlined below.

**PEOPLE/CULTURE:** The combination of company values and management style, and employee attitudes and reactions to these values supported by training and education, motivation and leadership - not management.

**SYSTEMS:** Format procedures related to organisation, policy, strategy, communication, implementation, review and improvement. Above all, the essence of the system is to say what you do, do what you say, and be able to prove it.

**TOOLS/TECHNIQUES FOR QUALITY IMPROVEMENT:** All the scientific methods and tools that support the decision-making through facts and data. These quality assurance techniques (e.g., statistical process control (SPC), Taguchi methods, QCs, etc.) tend to be used mainly by technical experts but also by shop floor operators when they have been trained [Lucas 1988, Hundy B. 1991].

#### **2.4. PEOPLE/CULTURE - QUALITY GURUS**

More than anything else, what distinguishes a total quality company from an ordinary one is the way its staff think and act, i.e., the value that employees place on quality of performance in every activity and what they do to improve the quality of their work and product to satisfy the customer's requirements. A company only lives because it has customers. A quality company lives for its customers. Culture is the set of attitudes that people at work share with each other [Lucas Eng. 1988].

A recent survey by Develin & Partners found that the two greatest difficulties in introducing TQM were [Seddon J. & Jackson S. 1991].

- a) achieving cultural change and,
- b) changing management behaviour.

Every aspect of the organisation influences culture:  
[Seddon J. & Jackson S. 1991, Lucas Eng. 1988]

- The company's mission
- The company's technology
- Organisation structure
- Organisation systems
- Management values or philosophy and management style
- Training programmes
- Strategic goals
- Leadership

Changes in culture will only result from making a coherent set of changes in all aspects of the organisation. Therefore, structures and systems must be designed to reflect the company's mission and values.

Most quality management theories can be traced back to the ideas and philosophies of a group of distinguished men, often referred to as "Gurus", because they form a cornerstone of quality management theory and culture. The overall major messages and philosophies of the Gurus are consistent, varying in details.

Dr W.A. Shewhart, F.W. Taylor, Dr W.F. Deming, Dr T.M. Juran, K.Ishikawa, P. Crosby, A.V.Feigenbaum, T.Peters, Dr G. Taguchi, M. Imai, T.Ohno, S. Shingo, C. Moller, T. Peters are considered the most important persons in the field of quality, in the last 100 years [DTI 1991].

A brief review of the philosophies of five of the leading quality "Gurus" together with the views of T. Peters are presented below and summarised in a comparison table (Table 2.1) page 18 [DTI 1991, Timmers G.J. & Wiele T. 1991, Angeli I. & Smith J.A 1992].

#### 2.4.1 Crosby

Philip B. Crosby is one of the quality gurus, who has developed his own distinctive approach to Total Quality. A former corporate vice-president and director of quality at the ITT corporation, he established a Quality College in Florida, USA in 1979, to spread his philosophy.

Crosby uses a disciplined and highly structured approach which is not solely product-oriented, but is based entirely on "prevention" and readily applicable to any enterprise.

With his four "absolutes" of quality management, Crosby provides a well-defined road map for attaining a new management quality commitment and culture programme. A well structured approach, which demonstrates how the culture can be changed and a process improved, is provided through the 14-step Quality Improvement Process [Crosby P. on Quality video 1979].

Because of his focus on changing the management culture, Crosby's approach is clearly a top-down process.

The approach and main doctrines of Crosby as well as the other five gurus in the field of quality management are summarised in a comparison table (Table 2.1).

#### 2.4.2 Deming

Dr William Edwards Deming is an American statistician and business consultant. He worked at Western Electrics and in March 1950 went to Japan. Deming spent 30 years contributing to and leading the Japanese economy out of the devastation of war to become the dominant industrial power of the 1980s. He was, and still is, a national hero in Japan. The most prestigious National Quality Award, "The Deming Prize", carries his name. Now, in

spite of his age, he is still delivering seminars all over the world.

Deming's philosophy is as much about management style and leadership as about the practice of quality itself. Through his 14 points of management obligations and management commitment he removed the major roadblocks to quality improvement, started the renaissance in quality attitude and promoted a participative management style [Walton M. 1989].

In her book, "Deming Management method", M. Walton [1989] reviews Deming's seven deadly diseases and obstacles, many of which are so serious as to be fatal to an organisation unless corrected. Deming is as much a part of Total Quality Management today as he was 30 years ago. His teaching is as vital as ever [Deming W.E. 1982, Deming Video].

#### 2.4.3 Feigenbaum

Feigenbaum is a strong advocate of the "Total Quality System" approach. He argues that because any single activity can create a quality problem, there is a need for integrated and continuous control of all activities. The Total Quality system should offer customers the quality they seek [Truscott T.B. & Turner T.B. 1986].

He also states two organising principles for quality: "Quality is everybody's job" and "Everybody's job tends to become nobody's job".

Feigenbaum argues that, from the organisation's point of view, for quality programmes to be maintained they must comprise a systematic group of quality disciplines which are continuously coupled with buyer/ customer needs. The need for integrated high level control is of primary, rather than secondary importance [Feigenbaum A.V. 1986].

#### 2.4.4 Ishikawa

Kaoru Ishikawa is a Japanese chemist who graduated from Tokyo University in 1939. He studied statistical methods in 1948. His work contributed to the recovery of Japan's economy.

Ishikawa has long been considered one of the world's foremost authorities on quality control. His practical methods have helped literally thousands of companies - including IBM and Ford - to turn out higher quality products at much lower costs.

The main issues of his methodology include involvement of all employees in all stages of decision making, use of quality circles for problem solving and extensive use of statistics and Quality Control at all stages [Ishikawa K. 1976].

In his book, "What Is TQC, The Japanese Way" [Ishikawa K. 1985,] he states 14 points of difference between Japanese experience and western experience. Although the Japanese adopted ISO 9000 in 1992, they used their own QC method to achieve their present status. These points, as stressed and explained by Ishikawa, show how the Japanese management style has proven more effective and successful compared to their western counterparts [Ishikawa K. 1985].

#### 2.4.5 Juran

Dr. Juran is one of the most well-known gurus in the quality scene, worldwide. He first visited Japan in 1954 and delivered seminars to top managers explaining the role they had to play in promoting QC activities.

He emphasised that QC should be conducted as an integral part of management control [DTI 1991]. He reiterated

that QC is a tool for management, which ensures the establishment of Total Quality Control.

He breaks quality tasks into two distinct categories: breakthrough, and control. He also divides the problem-solving effort into two journeys: a journey from symptom to cause and a journey from cause to remedy. The first is the more difficult [Quality Magazine 1986, Truscott T.B. & Turner T.B 1986].

One of the latest theories for management of quality is "The Juran Trilogy". These three managerial processes or schemes are Quality Planning, Quality Control and Quality Improvement [Juran J.M. 1988].

Similar to the other gurus, Juran emphasises the importance of QC in setting goals for improvement, providing training, and monitoring and recording the progress in achieving those goals [Juran video 1989].

Dr Juran suggested nine steps/stages as a road map for Quality Planning [Juran J.M. 1988].

#### 2.4.6 Tom Peters

Tom Peters is best known for his emphasis on customer orientation. He is the writer of the international best-seller, "In Search of Excellence", published in 1982, followed by, "A Passion for Excellence", published in 1986. He explores the art and science of management through discussion of leading companies with records of long-term profitability and continuing innovation.

Superior customer or client service, constant innovation, and full use of the abilities of every company employee, combined with leadership, are the three secrets of long-term excellence [Peters T. & Haterman H.R. 1982, Peters T. & Austin N. 1986].

Peters argues that the heart and soul of the whole

<b>CROSBY</b>  Def: conformance to requirements	<ul style="list-style-type: none"> <li>* Zero defects</li> <li>* Cost of quality</li> <li>* Hidden factors</li> <li>* Slogans</li> <li>* Management culture</li> <li>* Process model</li> </ul>
<b>DEMING</b>  Def: has no meaning except the definition that you give it	<ul style="list-style-type: none"> <li>* Process orientation</li> <li>* Use of statistics</li> <li>* Drive out fear</li> <li>* Reduction of variation</li> <li>* All one team</li> </ul>
<b>FEIGENBAUM</b>  Def: is everybody's job	<ul style="list-style-type: none"> <li>* Total quality system</li> <li>* Design quality in</li> <li>* Customer orientation</li> <li>* Quality programs</li> </ul>
<b>ISHIKAWA</b>  Def: conformance to customers requirements	<ul style="list-style-type: none"> <li>* Use of statistics</li> <li>* Quality circles</li> <li>* Involvement of employees</li> <li>* Quality control</li> </ul>
<b>JURAN</b>  Def: fitness for purpose	<ul style="list-style-type: none"> <li>* Management involvement</li> <li>* Quality planning</li> <li>* Quality control</li> <li>* Quality improvement</li> </ul>
<b>PETERS</b>  Def: is about care, people, passion, pride, consistency, eyeball customer  Def: Definition of Quality	<ul style="list-style-type: none"> <li>* Quality has always paid</li> <li>* Learn to love change</li> <li>* Managing by wandering about</li> <li>* Leadership</li> <li>* Training and retraining</li> </ul>

Table 2.1 : A comparison of the gurus



concept of leadership is "Managing by Wandering About" (MBWA). He also stresses that "Quality Has Always Paid" and "We Must Learn To Love Change" [Peters T. video 1990]. Like the other gurus Peters has his own 10 points of quality, similar to the others but with more emphasis on management and training [DTI 1991].

## 2.5 SYSTEMS

A supplying organisation wants to install and maintain a quality system that will strengthen its own competitiveness and achieve the required product quality in a cost-effective way.

In addition, in the contractual situation, the purchaser is interested in those elements of the supplier's quality system which affect the supplier's ability to produce consistently the product or service to its requirements, and the associated skills [BS 5750 Part 0 1987]

### 2.5.1 ISO 9000 Quality Systems Series

"The International Standards Organisation (ISO) Quality Assurance series is a harmonizing standard with a comprehensive systematic framework for consistent application. It is not a product specification standard but a management system standard, which demonstrates how quality is applied and shows that it can be done consistently every time" [BSI video 1992]. According to that standard, quality equals fitness for purpose and meeting the agreed specifications. Its purpose is to ensure that the product or service is under the control of a system that will ensure customer satisfaction.

ISO 9000/EN 29000/BS5750 dictates how an organization can establish, document and maintain an effective system that will demonstrate to potential customers that there is a commitment to quality and an ability to supply

their quality needs. The guiding principle is "Right-First-Time", and everyone has a role to play in this system.

The quality management system originated during World War Two, when ammunition suppliers realized that it was very difficult to test all products. As a result, they found a system to supply quality products.

BS 5750 was the first Quality Assurance System for Quality Management developed from NATO-AQAP (1968), Def. St. 05-2 (1972), BS4891 (1972), and BS5179 (1979).

It was first published in 1979 and in 1989 was integrated with ISO 9000. ISO 9000 was first published in 1987.

ISO 9000 and 9004 are advisory in nature, whereas ISO 9001-9003 constitute a three-level series of Quality assurance standards: Quality Systems for Design, Development, Production, Installation and Servicing (9001), Production and Installation (9002), Final Inspection and Test (9003). The series are accompanied by ISO 8402 "Quality Vocabulary" and BSI 6443 (1981), "Quality Costs" [Angeli I. 1992 (A)].

The importance of these quality standards is stressed everywhere by leading organisations and institutions: "It is a necessity you cannot live without, especially those seeking to trade with Europe" [Mulder J.R. 1991, Sawin D.S. & Hutchens S. 1991, BSI Q.A]. Among the 91 countries belonging to ISO, 42 countries reply in a survey that either they use ISO 9000 or have an identical and fully equivalent national standard [ISO/CASCO Report May 1991]. Sixteen thousand British companies received an accreditation certificate in 1990, 180 companies in Switzerland in 1991, as well as some other EC countries.

According to George Lofgren [1991], the Japanese were

expected to adopt the ISO 9000 series as Japanese national standards by Autumn 1991. (According to a recent ISO/CASCO report Japan has adopted ISO 9000 as from January 1993.). In the US the majority of certification bodies have already adopted and used quality systems standards compatible with EC processes [Subhash C.P. 1991].

The certification process required by the EC involves on-site assessment and subsequent registration. The average time for certification can vary from 12-24 months.

Every six months there is a Quality Audit to verify that the standard is implemented correctly.

In general the role of the audit function is to act as an extension of management by monitoring performance, identifying anomalous performance, reporting their findings and verifying the effectiveness of corrective actions [Arter R.D. 1989].

## **2.6 A COMPARISON OF THE SYSTEM, THE PHILOSOPHIES OF THE GURUS AND THE TOOLS**

By combining the three major components of TQM (elaborated previously) in a matrix form and using a powerful tool (Quality Function Deployment (QFD)), we can share some important and useful conclusions [Angeli I. & Smith J.A. 1992].

To accomplish the above-mentioned task an exercise was conducted that compared the requirements of the International Quality Assurance Management System Standard ISO 9001 (SYSTEMS; see Figure 2.3) with the philosophies of five of the leading quality gurus, namely: Crosby, Deming, Feigenbaum, Ishikawa and Juran (PEOPLE). This was achieved by constructing a QFD matrix (TOOL) see Figure 2.4. The correlation between

the respective philosophies of the gurus is presented and analysed in the matrix representing the "roof" of the "house of quality". The entire procedure and exercise is detailed in Appendix 1.A. A short summary of the conclusions is given below:

A) ISO 9001 requirements in comparison with gurus's points

From Figure 2.4, it can be seen that:-

- \* Not one of the five gurus covers all ISO requirements.
- \* All the guru's points are not covered by the standard.
- \* Crosby's and Deming's points are more related to ISO than those of the other gurus.
- \* The most important ISO requirement stressed by the gurus leading to success of a quality business are as follows, in rank order:
  - a) Management responsibility 259
  - b) Training 88
  - c) Process control 65
  - d) Statistical techniques 52
  - e) Quality system 37
  - f) Internal quality auditing 33

B) Comparison of the Gurus Points

- \* The Guru's points consist of 119 similarities
- \* Crosby and Deming have the greatest number of similarities with the rest of the gurus.
- \* They all stress management responsibility and commitment.

2.7 TOOLS/TECHNIQUES FOR QUALITY IMPROVEMENT

2.7.1 Introduction

In a TQM environment most staff and employees should be

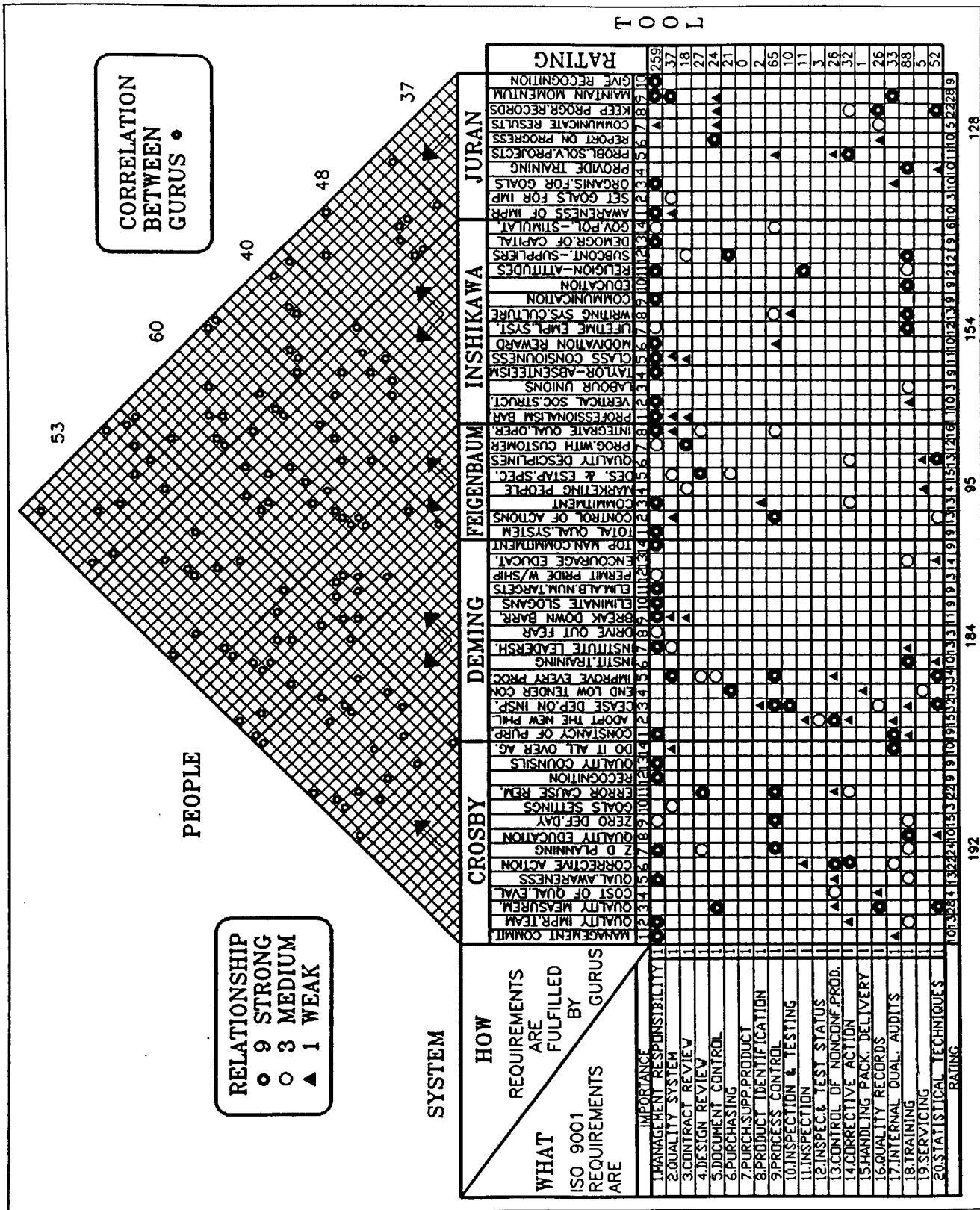


Figure 2.4 The QFD House, ISO 9001 + Quality gurus

ready to become actively involved in a task force for quality improvement, working in teams and using communication skills. It is at this stage that the appropriate training tools and techniques offered by professionals may be called for. This is where the philosophies of the so-called "Gurus" find their place: "Institute modern methods of training on the job" (Deming's 6th point) or "Employee Education" (Crosby's 8th point).

Quality improvement tools, when accompanied by proper training, and implemented using self-directed work teams, enable companies to attain dramatic increases in productivity and product quality. They help people in a particular section or even from diverse areas in the company to work together more efficiently. This enables the company to compete more effectively with foreign and domestic rivals.

### 2.7.2 The Tools/Techniques

Some of the most important tools/techniques and skills for quality improvements are now explained briefly.

#### 1. 7 Basic Tools

The seven basic tools are summarised below [Walton M. 1989, Ishikawa K. 1976], and are outlined in Figure 2.5, page 26.

##### A. Cause and Effect Diagrams

Also known as the "fishbone" diagram because of its shape, or the Ishikawa diagram, named after its originator. It represents the relationship between an "effect" and the possible "causes" influencing it.

##### B. Flow Charts

These are pictorial representations of a team working

towards improving a process, which show all the steps of that process.

#### C. Pareto Charts

These are among the most commonly used graphic techniques. These are sorted vertical bar graphs which help to determine priorities for action and to distinguish between the important few and unimportant many.

#### D. Run Charts

These are perhaps the simplest of the statistical tools. They display observation points over a specific time period.

#### E. Histograms

These are used to display the frequency of an event and to present the distribution of data values.

#### F. Scatter Diagrams

These are diagrams used to study the possible relationship between two variables.

#### G. Control Charts

These are charts that control and analyse a process. They are time-ordered charts with statistically determined upper and lower control limits on either side of the process average (e.g.,  $\bar{X}$ , R, moving charts and attribute charts p, np, u, c).

### 2. Quality Function Deployment (QFD)

QFD was developed in Japan by Toyota in the late 1970s. Since then its use has grown very rapidly;

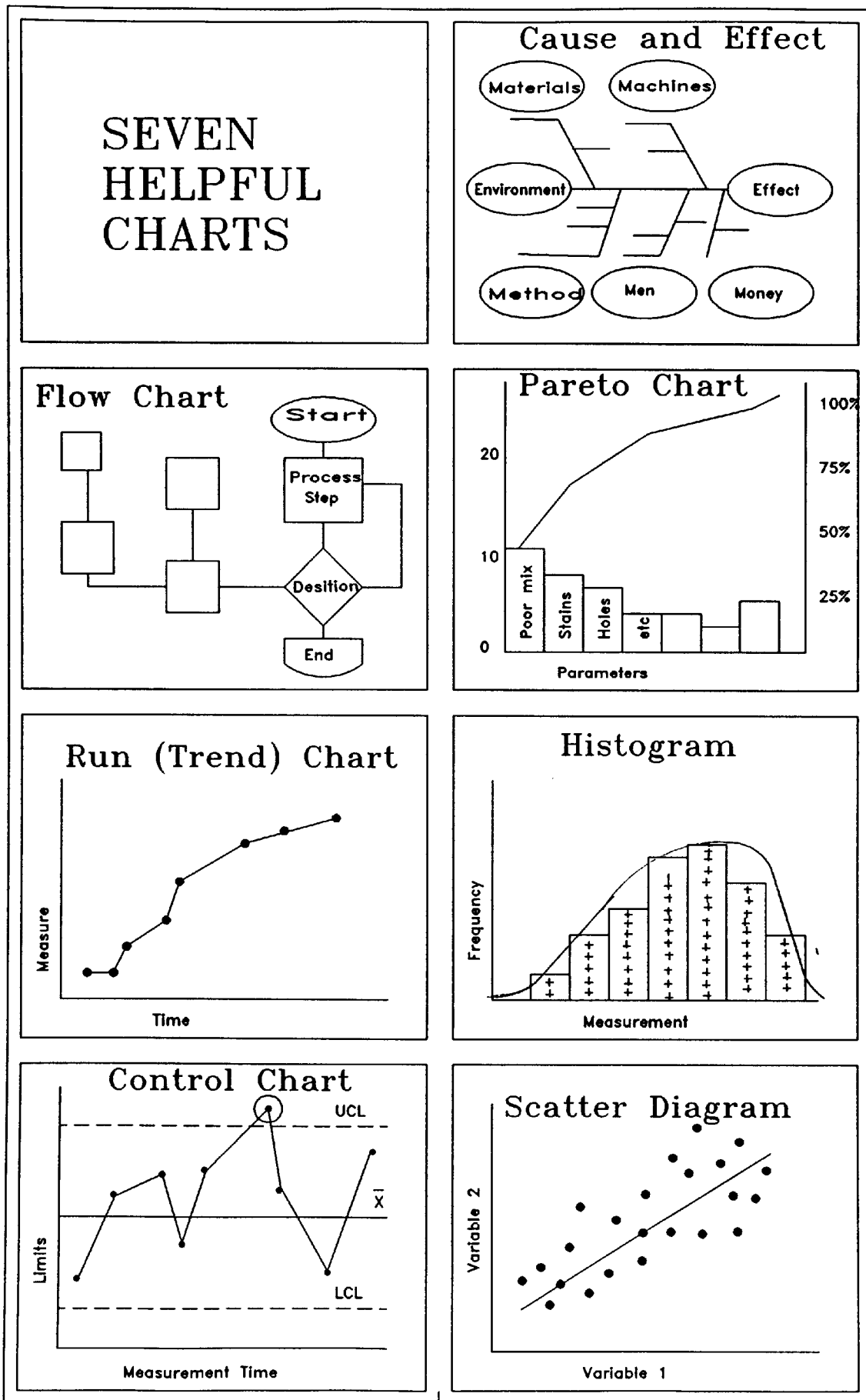


Figure 2.5 Seven helpful charts



simultaneously it has realised a competitive advantage in quality cost and timing [ASI 1989].

"QFD is the most powerful approach to product/process design and strategic running of a business which employs a collection of tools to highlight where engineering effort should be expended and, just as importantly, where not to invest time and money. In many respects it has parallels with FMEA (i.e identify elements-sources of problem, relative severity of problem, add up points, score and focus on priorities) in its ability to help determine where quality technology and engineering effort (e.g., Taguchi methods) should be applied" [Lucas Eng. 1988].

QFD is also known by the terms, Customer Driven Engineering and Matrix Product Planning [ASI 1989]. The whole concept is based on a sequence of operations to translate the voice of the customer into the final product (or service), with a basic tool, the house of the QFD.

### **3. Failure Mode and Effects Analysis (FMEA)**

The definition of FMEA is "the study of the potential failures that might occur in any part or a system, to determine the probable effect and results which are ranked in order of seriousness" [BS 4778 1987].

FMEA was first developed over 60 years ago and was adopted by the Aerospace industry during the 1960s. The technique can be applied to both the design and to the manufacture of components, processes and for systems improvements [Lucas Eng. 1988].

### **4. Statistical Process Control (SPC)**

Statistical Process Control has been available for many years, and has been adopted by most large manufacturing

companies. However, it also has a major role to play in service companies.

"SPC is a method which gives confidence that components produced are within tolerance, without having to measure every component. It is also associated with machine capability and with the theme of controlling the process, NOT the product, and is a form of feed-forward control" [Lucas Eng. 1988].

Some charts of SPC are average and range control charts, for variables, charts for attribute data, charts  $p, np, c, u$ . Charts detailing moving average, moving range and short-run SPC have been recently developed.

## 5. Taichi Methods

Taichi Methods are an off-line quality engineering approach, which complement on-line quality control systems such as SPC. It follows application of FMEA procedures and is used when a particular process element requires an in-depth attack using experimental methods [Millan R.M. 1990].

A Taichi experiment minimizes the number of experiments required for each variable when searching for the OPTIMUM combination [Lucas Eng. 1988].

The Taichi methods not only contribute to the design of experiments but also to the interpretation of Loss and tolerance design. "The quality of a product is the (minimum) Loss imparted by the product to the society from the time the product is shipped" [Taichi G. 1986].

## 6. Poka Yoke

This practice is widely used in Japan where the word "poka yoke" means fool-proofing. It involves designing parts with marks, signs, slots, sockets, key ways, so

that they can be correctly assembled with limited knowledge. It might prevent incorrect assembly of components and eliminate defective products [Lucas Eng. 1988].

#### 7. Just In Time (JIT)

Just in Time, which is not strictly a quality tool, is an operating philosophy/technique which has as its basic objective the elimination of waste. This is a continuing and perpetual focus.

"This methodology allows an organization to improve competitiveness in business via improved product quality, reliability of delivery, and reduced product costs. All of these can be achieved with positive cash flow due to the release of capital allowed by the reduction in stock levels" [Lucas Eng. 1988].

#### 8. The Kanban System

"Kanban" literally translated, means visible record and is generally taken to mean a card.

Toyota's Kanban system (one of many) uses a card to signal the need to deliver more parts and another card to signal the need to produce more parts. "The key feature, is that in Japan, the cards act as a system to pull work through, in contrast to western systems, including Materials Requirement Planning (MRP), which push work through" [Lucas Eng. 1988].

#### 9. Departmental Purpose Analysis (DPA)

Departmental Purpose Analysis (DPA) is a tool which assists departments to :

A) Align their objectives with the overall company mission

- B) Clarify customer and supplier relationships
- C) Establish measures of performance [Lucas Eng. 1988].

Departmental quality can be defined as how well a department as a whole meets its own and the outside world's bottom line and "beyond bottom line" demands and expectations [Moller C. et al. 1988].

#### 10. Quality Circles (QCs)

Quality circles are small teams which are formed voluntarily by people employed in similar jobs. They have regular 30-45 minute long meetings to identify and solve work-related problems (usually quality) [Ishikawa 1976].

#### 11. Zero Defects (ZD)

The doctrine of Zero Defect, which is not a quality tool but a well-structured approach, was first developed by Philip Crosby 20 years ago.

The idea is to achieve a Zero Defect rate. Any company which is prepared to accept a 5% or even 1% rate of defects in its products will not succeed in today's marketplace. The only acceptable level of defects is zero [Crosby P. 1979, Skapinker M. 1986].

#### 12. Skills Levelling

"Skills Levelling is an approach to servicing a Total Quality Organisation (TQO) with simpler employment arrangements. They are organised in relation to changing tasks and not fixed jobs, are resourced by people able to express the full range of their personal skills in relation to tasks, and have a fair reward structure in which the dominant factors are the level of personal skills and performance" [Lucas Eng. 1988].

### 13. Management By Wandering About (MBWA)

This is a technique used by managers for communication with internal customers, external customers and suppliers. Tom Peters suggests that 75% of managers' time should be spent on wandering-walking around to express their interest in people and to "naive" listening. Through this leadership and constant innovation managers should listen and protect the views and ideas of their employees, teach them through questions and take care of their people, ideas, views, etc. [Peters T. & Austin N. 1986].

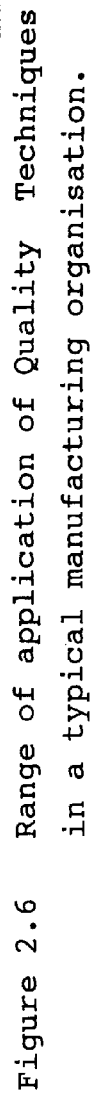
#### 2.7.3. Quality Tools Summary in a Matrix Form

Figure 2.6 summarizes the quality tools and concepts mentioned previously and their range or application in a typical manufacturing company. Many of these can be equally well applied to the service industry [Hundy B. 1991, Angeli I. 1992 (B)].

Each matrix, representing a particular tool/technique consists of two elements: The USER (vertical axis) and the AREA/SECTION (horizontal axis).

The user axis is divided into four levels of people: Director, Managers, Technical and Operatives. The area axis is split into three sections of a company: Sales & Marketing, Development & Design and Manufacture.

By drawing vertical and horizontal lines, starting from a particular point in the boxes of a matrix, the reader can identify in which area a particular tool is applicable and by whom. Strong or weak relationships between the user and the area are specified by the symbols used (donut = strong, circle = weak). With this methodology the answers to the following three questions are demonstrated at the same time: Which tool? In what area? and By whom?



**Figure 2.6** Range of application of Quality Techniques in a typical manufacturing organisation.

# CHAPTER THREE

## RESEARCH DESIGN AND METHODOLOGY

### 3.1 MANUFACTURING INDUSTRIES SURVEY - QUESTIONNAIRE

#### 3.1.1 Introduction

A survey was determined to be the best method to identify and evaluate the current problems and needs of CMI. In this chapter the steps and methodology which have been adopted to carry out the survey will be explained. Included also are the design and contents of the questionnaire which was used for the industrial survey.

#### 3.1.2 Questionnaire Formulation

According to various authors and references [Camp C.R 1989, Hague N.P. 1984, Levey C.D. 1991], the best method of conducting a survey of this nature is to produce a questionnaire which is completed during a personal interview between the interviewer and the company representatives. This was the approach adopted by the author.

A draft questionnaire was prepared and its contents were discussed with senior representatives from the Department of Statistics, the Industrial Training Authority (ITA), the Cyprus Chamber of Commerce and Industry (CCCI) and Cyprus Standards Organisation (CYS).

The draft questionnaire was reviewed by the above bodies in January 1991 and their ideas and comments were incorporated in the final document. One should bear in mind that the majority of the recommendations to come out of the study will be implemented through these bodies. A list of the persons who were interviewed or

asked to comment on the questionnaire is attached as Appendix 3. This questionnaire is unique in its nature, as it is the first of its kind in this country formulated specially to survey TQM and quality standards.

The final form of the questionnaire was largely influenced by the techniques devised and used by L.R. Chase [1989], B.G. Dale [1991], C.R. Camp [1981] and the Questionnaire Censuses [1984]. Appendix 2 contributed valuable information in preparation of the questionnaire.

The questionnaire was written both in English and Greek to ensure maximum participation in this exercise.

A pilot implementation of the questionnaire, surveying 15 enterprises, was conducted over a period of 45 days. This pilot study enabled the author to test the reliability, suitability and effectiveness of the questionnaire and proceed with the formulation of the final questionnaire.

Changes suggested by the manufacturers were incorporated into the final questionnaire [Stowell M. & Smith H.S. 1991].

Changes were suggested on 5% of the questions and certain new questions were added. Improvements were made regarding response methodology, options, and the suitability of certain questions.

The final questionnaire incorporating the above amendments is shown as Appendix 4. This was the vehicle for the whole study.

### 3.1.3 Questionnaire Key Areas

A survey of TQM literature [Yearout L.S. 1991, Lakewood



Research 1990, Benchmark Partners 1991, Bottomley C. & Darlymple J. 1991, Dale B.G. 1991] reveals that questionnaires are widely utilized. Surveys that intend to evaluate/measure quality levels, identify customers' needs or implement TQM, follow the same structure. This questionnaire was formulated so that it could be used within any manufacturing unit throughout the world.

It includes all aspects and concepts of TQM: Systems, Tools, People. All the parameters contained within those three concepts were explained in Chapter 2. The questionnaire covers those parameters through 105 different questions.

The questionnaire is divided into three sections:

- 1) **Inputs-general characteristics** (structure, culture, suppliers, etc.)
- 2) **In-house Quality activities**, (design, techniques, inspection, control, etc.)
- 3) **External Quality activities** (customers, training, QC, etc.)

The sections relate closely to Crosby's Three Plate Analogy, (suppliers-me-customers) [Crosby's video]. The sequence of the questions and activities parallel the sequence of a real production line. It's design recalls Deming's flow diagram (Incoming materials - Process - Outputs) [Deming W.E. 1982].

The framework of the questionnaire is shown in Figure 3.1.

Page 1: Title

Page 2: Director of Studies, Supervisors, Advisors, Sponsor

Page 3: Cover letter

Page 4: TQM Picture

Page 5: Confidential data (Name, Address of respondent), Characteristics of enterprise (for official use)

SECTION I GENERAL CHARACTERISTICS	SECTION II IN HOUSE QUALITY ACTIVITIES	SECTION III EXTERNAL QUALITY ACTIVITIES
A) Characteristics of Enterprise	G) Design Stage	L) Customers
B) Organisational Structure	H) Machines - Process Capability	M) Total Quality Management
C) Company Culture	I) Optimization	N) Training
D) Departmental Purpose	J) Manufacturing Stage	O) EC and Cyprus
E) Suppliers - Inputs	K) Inspection	P) Quality Costs
F) Quality Associated Activities		Q) General Questions, Comments, Suggestions

Figure 3.1 Questionnaire Key Areas

#### 3.1.4 Selection of Companies - The Sample

The size of the sample and selection of enterprises were of vital importance: These questions were addressed in Appendix 2 where the Cyprus manufacturing fraternity was examined.

According to the 1986 Census of Industrial Production, 6,656 enterprises were registered. It was decided to interview enterprises employing more than 10 workers, which reduced that number to 669 enterprises (for the five investigated sectors). As this number was still too large, an eventual sample of 60 enterprises was investigated (see next page). The enterprises were carefully selected from catalogues (see points 2,3,5 next paragraph) to ensure accurate and consistent results. By selecting a representative sample the findings and recommendations can be expanded and generalized to include the entire manufacturing population. The selection of the enterprises was assisted by the following:

1. The findings and recommendations of Appendix 2
2. Membership catalogues of Cyprus Chamber of Commerce and Industry (CCCI)
3. Membership catalogues of Employers and Industrialist Federation (EIF)
4. Recommendations of senior officers of CCCI and EIF
5. Census of Enterprises 1989

The purpose and objectives set at the beginning placed three major restrictions in the selection of any enterprise. Therefore, the 60 enterprises selected in accordance with above had to fulfill the following three criteria:

- a) Suitability and capability for implementation of TQM
- b) Belong to one of the five major sectors of manufacturing industry and

c) Similarity and compatibility with EC competitors.

These three restrictions reduced the number of eligible companies to a list of 150 prospective enterprises. Although the initial target was to survey 100 enterprises, the sample size was reduced to 60 for reasons explained in section 3.2.4, page 40. All other parameters (location, sector, size of enterprise, etc.) remained unchanged. The final sample of 60 was then selected from the above list at random and was as follows:

a) Sample size:	CLOTHING	13	Enterprises
	FOOTWEAR - LEATHER	13	"
	FOOD-DRINKS PROCESSING	14	"
	METAL INDUSTRY	14	"
	FURNITURE	6	"
	TOTAL	60	"

b) Enterprise size (no. of employees)

Enterprises with 10-50 Employees	- Interview 33%
Enterprises with 50-100 Employees	- Interview 33%
Enterprises with 100-above Employees	- Interview 33%

c) Exports: [Industrial Statistics 1989-1990].

Enterprises exporting to the UK, Greece and Belgium were preferred (EC countries absorb the largest volume of Cyprus exports).

d) Distribution: [Industrial Statistics, 1989-1990]

The number of enterprises interviewed in each district were in accordance with the actual total number of enterprises located in those districts.

Nicosia district	65%
Limassol district	20%
Larnaca district	15%

e) Persons interviewed in rank order of preference

- 1) Quality Engineers
- 2) Person responsible for Quality
- 3) Owner - Director
- 4) Production Manager

### 3.2 METHOD OF CONDUCTING THE SURVEY

#### 3.2.1 Questionnaire Administration Method

As mentioned previously, the best method of collecting data and information is through personal interviews, especially when conducted by the researcher. This approach (which has been adopted) is the best, with two major disadvantages: I) It is expensive and time-consuming, II) It is valid only insofar as the researcher does not lead or guide the interviewees in their answers.

The reaction among senior officers of Industrial Training Authority (ITA), statistical departments and some manufacturers, was that only a few enterprises would answer a large and specialised questionnaire especially if were received through the mail.

The majority of enterprises (37) were personally interviewed and the return mail method was used only in cases where the company representative could not allocate time for a personal interview with the researcher on the day of the appointment and visit. On those occasions there was a small introduction-discussion between the two parties followed by a request to forward the completed questionnaire (return mail method).

### 3.2.2 Before the Interview

The companies were selected randomly in accordance with the restrictions specified earlier (3.1.4). Prior to each interview there was a telephone conversation requesting an appointment and explaining the nature of the research.

### 3.2.3 During the Interview

All the interviews were carried out by the author at the premises of the enterprises and consisted of two approaches: a personal interview (62%) lasting on average 84 minutes or a 30-minute discussion when the interviewee could not allocate the minimum of one hour on that particular date to answer the questionnaire. This was followed by return mail method (38%) specified on the SPSS spread sheet with statement "By hand".

The interviewees were mainly Owner/Directors (27%), Directors (26%), Production Managers (39%) and Quality personnel (10%).

The average time required to respond to the questionnaire was approximately 84 minutes. but in many cases, the interview lasted more than 3 hours due to extensive discussions. Discussions either were recorded, or notes taken at the back of the questionnaire, and were used in the preparation of Chapters 5 and 6.

As a general comment, the experience, knowledge, information and benefit received from the survey was enormous. Some of this information and these experiences will be shared in Chapter 6.

#### 3.2.4 After the Interview

Immediately upon completion of each interview the answers were entered into the computer. Further analysis was also made on notes and recordings, to be used in Chapters 5 & 6 (Findings and Results).

After the completion of the first 25 questionnaires a printout with all the answers was prepared. This printout appears under files FREQ1A and FREQ2B on the 3 1/2" diskette enclosed (D1). A second printout was prepared after all 60 enterprises had been interviewed. This is listed under files FREQ2A and FREQ2B (Appendix 5).

Comparing these two printouts, it appeared that they were almost identical, with only small fluctuations. That comparison led to the decision to stop the interviews of more companies since the only difference would be in the sample size and the statistical error.

#### 3.2.5 Accuracy and Statistical Error of the Survey

The accuracy and the consistency of the data collected are shown below.

According to the statistics book [Damianou Ch. & Coutras M. 1987], it is very difficult to measure the error of a qualitative survey, such as the one executed. The statistical error and the confidence interval were calculated in an attempt to ascertain how accurate the survey was.

According to N.P. Houge [1984], "in most industrial samples selected from a large universe, 50 companies would be considered a minimum and 200 is an acceptable sample size."

The accuracy and the consistency of the answers given by

the interviewees were tested with an additional method. In three enterprises two questionnaires were given to two different persons (related to quality activities) at different times. The answers of the two persons were compared. The results reveal that either the answers were identical (in the majority of the answers) or the choice selected by the second person was only one choice before or after the selection of the first respondent.

But statistical error with respect to sample size can be measured more accurately using the following simplified formula [Johnson R. & Battacharyya G. 1986]:

$$E = \frac{(Z \ a/2)}{2 \sqrt{n}} \quad (1)$$

where  $E$  = sampling error

$n$  = sample size

$Z \ a/2$  = denotes the upper  $a/2$  point of the standard normal distribution

= 1.645 for 90% confidence interval, i.e.

For  $a = 10\%$ . (from standard normal distribution tables)

So  $n = 60$  from previous chapter

$Z \ a/2 = 1.645$

substituting to formula (1)

$$E = \frac{1.645}{2 \sqrt{60}} = 0.106$$

So there is an error  $E = \pm 10\%$  with confidence probability 90%.



OR the results are 90% accurate with an error of  $\pm 10\%$ .

### Comments

In spite of the fact that the questionnaire was very lengthy all the questions were answered by the majority of the interviewees (95%). There were only a few cases where they did not understand the question or could not answer it, due to lack of knowledge or information.

## 3.3 COMPUTER PACKAGE CUSTOMIZATION

### 3.3.1 Introduction

In this section the selection, programming and data entry method will be analysed.

### 3.3.2 Package Selection

Difficulty was experienced in selecting the computer package to analyse the data from the survey. This was due to the large size of the questionnaire which included 105 questions (232 entries into the computer).

The following packages were available in Cyprus, which were related with the requirements of the thesis:

Lotus 123, D-base, SAS, SPSSPC +, SMART.

The Cyprus Government Statistical Department uses SAS & SPSS/PC+, ITA uses SPSS/PC+. After consultations with senior officers of the above bodies, SPSSPC+ was selected as the most suitable for the questionnaire. This was available at the Higher Technical Institute (HTI) computer department.

SPSS/PC+ is a very powerful statistical package and information analysis system compatible with a wide

selection of mainframe and personal computers. It brings increased power and flexibility to the field of statistical and reporting software. This package is 7.8 Mb called SPSS/PC+ version 3.0 [SPSS/PC+ 1991].

This package is commonly used for large questionnaires of this nature. It includes the data entry menu which includes logic commands, certain protections against mistakes, accurate definitions, etc. It also has the capability for cross-tabulation, graphs, statistical information, etc.

### 3.3.3 Computer Programming

Upon formulation of the questionnaire, the computer was programmed to accept and analyse the results of the survey (answers/choices of the questionnaire).

All the variables were first defined and specified, followed by the definitions of ranges, rules, logic commands, etc.

The programming and data entry were accomplished through the DATA ENTRY II sub-menu. The entire programming, which includes 232 inputs for every case (questionnaire), contains all commands necessary to protect the user against typing mistakes, choices, etc. The steps followed are summarized in Appendix 6.

The computer programming and data entry customization processes lasted 3 1/2 months and were completed in April 1991. The computer was then ready to accept the data (answers of the questionnaire).

The computer was programmed to be used by and accept data from anyone with basic computer knowledge. The questionnaire, as mentioned earlier, is applicable for any country if accompanied by the customized computer program. Any modifications can be carried out easily to

meet the specifications and requirements of the user.

#### 3.3.4 The Start File

The START file was specially developed so that the survey results collected by any researcher can easily be entered into the computer users or operators with no background on the package. The batch file was created to enable any user to get into SPSS in order to input or modify data. The customization was designed to warn or give information to the operator when something was mistakenly entered or inconsistent. The operator can work either on an individual case form, or, by pressing F10, work on the whole spreadsheet showing all the questions and cases. The START file is included in the 3 1/2" diskette attached at the end of the thesis as D1.

#### 3.3.5 Data Entry

Immediately upon the completion of a questionnaire the answers were entered into the computer.

The capacity of the data-entry memory depends on the number of questions, length of answers and number of cases. The whole questionnaire contained 105 questions with 232 variables. The answers were split into two files because there was insufficient memory to accept the whole working form.

Appendix 5 shows all files related to this thesis on the attached 3 1/2" diskette (D1).

Further manipulation with the (DATA ENTRY II) sub-menu is also possible through the layout of this menu [SPSS/PC+ 1991]. This can be accomplished by accessing Data Entry through the START batch file.

In spite of the fact that inputting data is very easy, each case requires 40 minutes to transfer all answers/

choices into the computer due to the large number of variables for each case.

After completion of the data entry, the answers were ready for further data processing. The analysis, results and recommendations are discussed in Chapters 5 and 6.

## CHAPTER FOUR

### PRESENTATION AND EXPLANATION OF QUESTIONNAIRE ANSWERS

#### 4.1 RESULTS PRESENTATION

The purpose of this chapter is to explain and display the answers to the questionnaire survey in a tabular, numeric form.

Having entered all the data into the computer and using "Frequency All Bar Command", [SPSS PC+], a 400-page printout resulted, with all the information needed for analysis of the results (question no., question description, value labels, frequency, percentage, valid percent, cumulative percent, missing cases and bar charts of the answers). A sample page of the computer printout is attached as Appendix 8 to show how the information was presented.

The computer results were further analysed and examined. Based on the computer printout, a table containing the answers to the 105 questions was prepared. The table and the explanation of the answers are detailed in the next section. Without this table, it would be impossible or very difficult to create the bar charts, or proceed with the analysis of 400 computer printout pages. This table and the research results were given to all participating enterprises who answered positively to question 99 and to 40 delegates who attended the half-day results presentation seminar on 25 November 1992. Research results were also presented by the author on Cyprus TV (Channel 2, 5 February 1993) on the program "Financial World".

#### 4.2 PRESENTATION OF QUESTIONNAIRE ANSWERS

The sample page attached as Table 4.1 (next page)

presents for consultation all the answers/choices of the questionnaire in actual and percentage numbers. One should cross-reference the answers of the entire five-page table attached as Appendix 9 with the corresponding question on the questionnaire (Appendix 4).

QUESTION	A N S W E R S - C H O I C E S	MISSING
ACTIV 1	C:(13)22% F:(14)23% LF:(13)22% M:(14)23% WF:(6)10%	0
LOCAT 2	A:(39)65% B:(12)20% C:(9)15%	0
FORM 3	COOP:(1)2% PRIV.LTD:(35)58% PUPUBLIC:(2)3% SEMIG.:(1)2% SHARE CO:(20)33%	(1)
EMPL 4	9-19:(6)10% 20-49:(12)20% 50-99:(23)39% 100-199:(15)25% 200-500:(5)9%	0
OUTP\$ 5	MILL.POUNDS UP TO;0.5:(7)12% 1:(10)17% 5:(28)48% 17:(4)7%	(9)15%
CODE NO6	C:(13)22% F:(14)23% LF:(13)22% M:(14)23% WF:(6)10%	0
NAME 7	ANGELI:(35)58% BY HAND:(23)38% STUD.:(2)3%	0
TITLE 8	Q.ENG:(4)7% Q.PERS:(2)3% OWNER:(16)27% DIREC:(15)26% PROD.MAN:(23)39%	0
W.O.P 9	A:(13)22% B:(14)25% C:(11)19% D:(22)35%	0
OMANU 10	A:(11)19% B:(24)41% C:(10)17% D:(14)24%	0
ST.COM11	Y:(34)57% N:(26)43%	0
OBJ.CO12	A:(27)80% B:(6)18% C:(1)3%	(26)43%
RESP 13	A:(16)27% B:(1)2% C:(8)17% D:0 E:(15)25% F:(1)2% H:(18)30%	(1)2%
O.SYST14	Y:(18)30% N:(42)70%	
O.SYST14B	Q.A.STAN:(5)8% UNDER LIC.:(3)5% OTHER:(9)15%	(43)72%
O.OBJ 15	A:(22)37% B:(37)62% C:(1)2%	0
MAN.CO16	A:(54)90% B:(5)8% C:(1)2%	0
OBJ. 17	A:(37)62% B:(23)38%	0
ILOP 18	Y:(39)65% N:(21)35%	0
ALOP 19	Y:(17)28% N:(43)72%	0
DEP 20	A:(38)63% B:(16)27% C:(6)10%	0
DPA 21	Y:(13)22% N:(47)68%	0
APL 22	Y:(51)88% N:(7)12%	(2)3%
VIS 23	A:(5)8% B:(10)17% C:(45)75%	0
RECOR 24*	A:(42)70% B:(49)82% C:(52)87% D:(31)52% E:(59)98% F:(45)75%	0
SUPP 25	A:(5)8% B:(12)20% C:(14)23% D:(29)48%	0

Table 4.1 Questionnaire answers

#### 4.3 CODES, EXPLANATION, EXAMPLES

In this section the meaning of each symbol and column of Table 4.1 (part or appendix 8: Summarised survey results) will be explained in detail, accompanied by examples. This is to assist anyone who wishes to analyse or understand the results of each individual question.

##### 4.3.1 Explanation of important codes of Table 1 and Appendix 8

###### Definitions:

Valid Percentage : Valid answers only; total 100%

Actual Percentage : Valid answers + missing cases = 100%

###### Codes:

(no.): Number of times this choice has been selected out of 60 questionnaires (frequency).

no.%: The above number (frequency) converted into actual (%) or valid percentage.

**QUESTION:** Question label and number. The numbers and letters shown are the same as those used as variable labels in the computer frequency distribution printout.

(after Question \*) : Multi-answer question. The answer contains more than one choice. All numbers (answers) are given in actual percentage.

(after Question %) : All numbers (answers) are given in actual percentage.

**ANSWERS:** (A,B,C ..... or 1,2,3 ...). Answers or choices selected by interviewees during the survey. The same letters or numbers were used as choices on the actual Questionnaire. All numbers (answers) are given in valid percentage total 100% (neglecting missing cases)

**MISSING:** Missing cases or invalid answers. The number (1) and the percentage no. % are always given in actual percentage, i.e., out of 60 cases or 100%, which is the total population.

4.3.2 Examples illustrating the meaning of each symbol and number of table 4.1

Example 1: Usual case. The majority of answers were given in this form.

QUESTION	ANSWERS	MISSING
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> APL   Question Label </div> <div style="text-align: center;"> 22   Question Number </div> </div> <div style="text-align: center; margin-top: 10px;"> Both from computer printout </div>	<p>(no.) Number of times selected (Frequency, total 60)</p> $51 + 7 + 2 = 60$ <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> Y : (51) 88% </div> <div style="text-align: center;"> N: (7) 12% </div> </div> <p>Valid answers converted into valid percentage total 100%</p> $88 + 12 = 100$	<div style="text-align: center;"> (2) 3% </div> <p>% of missing cases out of 100 of actual percentage</p>



Example 2: After word question a % symbol. All answer numbers were given in actual percentage

QUESTION	ANSWERS	MISSING
SYST 32A%	<p>Number of times selected (Frequency total 60)</p> $9 + 4 + 4 + 43 = 60$ <p>CONTINUOUS: (9) 15%    OFTEN: (4) 7%    (43) 72%</p> <p>3 - 12 MONTHS: (4) 7%</p> <p>Actual percentage, total 100%</p> $15 + 7 + 7 + 72 = 100 \text{ (Rounded)}$	

Example 3: After word question an asterisk \* symbol. Multiple answer question (more than one answer).

QUESTION	ANSWERS	MISSING
CREQ 76*	<p>Number of times each choice was selected, more than 60</p> <p>A: (12) 21%    B: (8) 13%    C: (39) 57%</p> <p>D: (38) 63%    E: (3) 3%    F: (6) 10%</p> <p>Actual percentage of each choice, more than 100%</p>	(2) 3%

# CHAPTER FIVE

## DISCUSSION OF QUANTITATIVE RESULTS AND RECOMMENDATIONS

### 5.1 INTRODUCTION

This chapter will summarise the results & findings of quantitative assessment/questions and will present them in most of the cases in a graphical form followed by discussion, analysis and recommendations. Related answers were grouped together under ten topics (e.g., systems, culture, suppliers, etc.) which comprise the most important parts of the thesis. These topics are the same as those dealt within the questionnaire.

Some answers were grouped together in a graph form to show their common characteristics. For uniformity each topic follows the same methodology:

- a) Presentation of the results-finding in a graphical or numerical form,
- b) Discussion based on the results and interviews,
- c) Recommendations related to that topic. The letter Q followed by a number, either on top of graphs or in the text (e.g., Q. 51), indicates the questionnaire question related to that graph or text.

### 5.2 GENERAL CHARACTERISTICS

This is a report on the survey conducted by the author between March 1991 and December 1992, covering 60 Cyprus manufacturing enterprises from the five largest sectors, (Clothing 13, Food and Drinks processing 14, Leather & Footwear 13, Metal Industries 14, Wood and Furniture 6 (Q.1)). These enterprises, primarily private 58% and share-holding 33% (Q.3), were located all over the island, mainly in industrial estates near the large

towns: Nicosia 65%, Limassol 20%, Larnaca 15% (Q.2).

The gross financial output in monetary terms of these enterprises is 146 million Cyprus pounds, 16% of total gross output of manufacturing (Q.5), employing 5544 workers (Q.4), 11.4% of total manufacturing employment [Industrial Statistics 1990].

Something vitally important for continuation of this thesis is to assess whether the first part of the hypothesis set in the Introduction is true or not. "It is considered that the Quality standards of CMI fall short of those of other competitor countries". Before proving the hypothesis it is necessary that two questions be answered:

1. What is the opinion regarding joining the EC? 100% answered Yes (Q.94).

2. Does CMI trade or have plans to start trading with the EC? 58% of CMI is trading with the EC and another 31% is planning to start (Q.93). In addition to the above question figures show that out of 190 million pounds of manufacturing products, 112 million pounds are exported to EC countries [Economic Report 1989].

Having a positive answer to the above, the hypothesis can now be proved through Figure 5.1, where it is seen that 41% responded that the quality of Cyprus products is the same as EC products, while 59% gave a negative answer (Q.97). The results are even worse on Q.96 where only 12% answered that CMI is ready to join the EC; 41% answer that CMI products have the same quality levels as their European counterparts and approximately 46% believe that Cyprus is ready to join the EC.

Both answers have approximately the same percentage. Prior to joining the EC many prerequisites must be

# CYPRUS QUALITY AND EC ANSWERS TO Q96 AND Q97

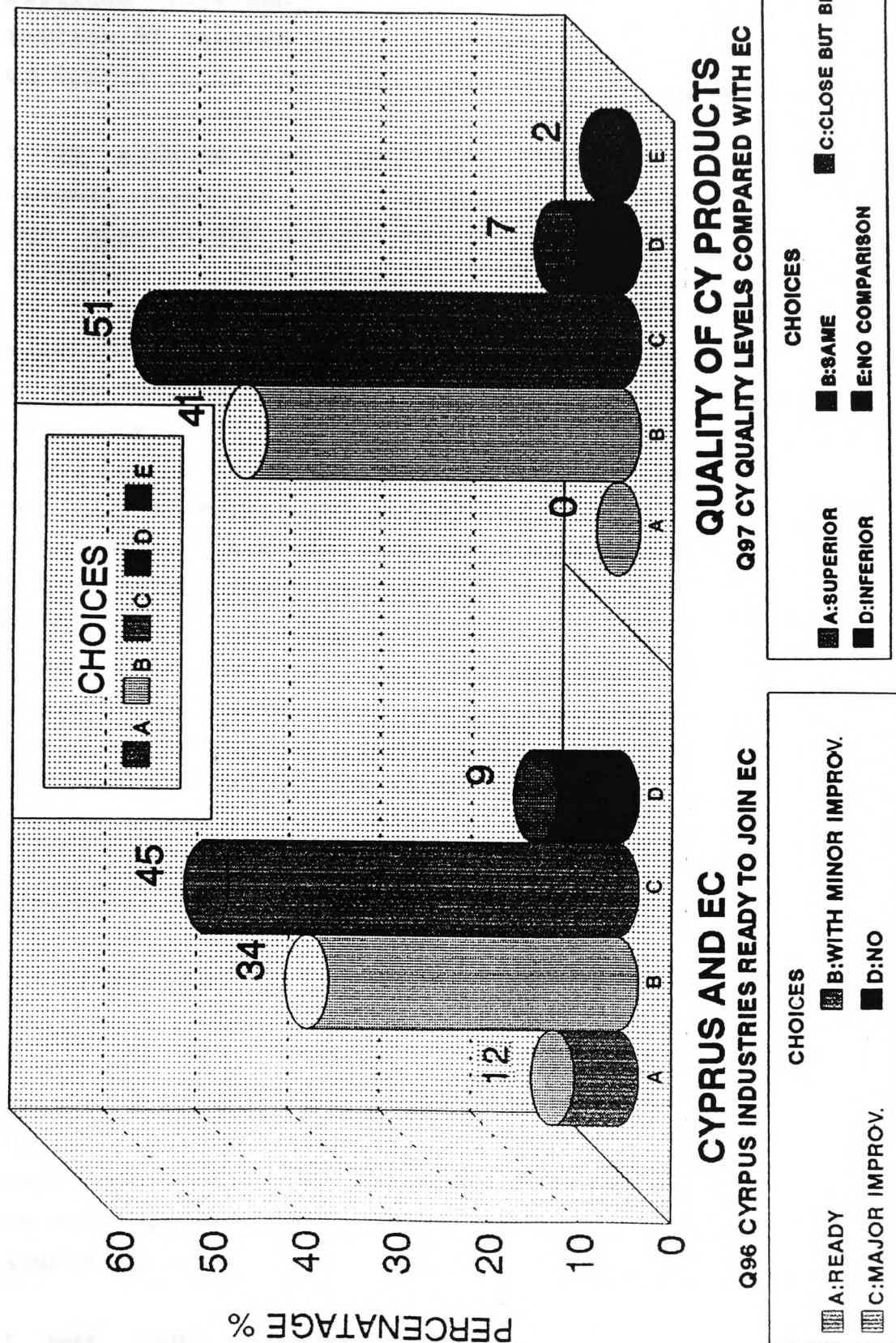


Figure 5.1.: Cyprus Quality and European Community

fulfilled (systems, banking, etc.), including quality. Question 97 assumes that investment in quality is needed and Cyprus is on the right track.

It is assumed that Cyprus will continue to trade with European countries. EC customers are interested in both high quality and low prices, but place more emphasis on quality.

It is therefore necessary to proceed to an investigation of how quality can be achieved and implemented at lower cost. The above statement is verified by a recent gallop poll conducted by ASQC surveying German, American and Japanese consumers, where they were asked what they were looking for in foreign goods. Consumers rank quality as the first or second requirement [Ryan J. 1991].

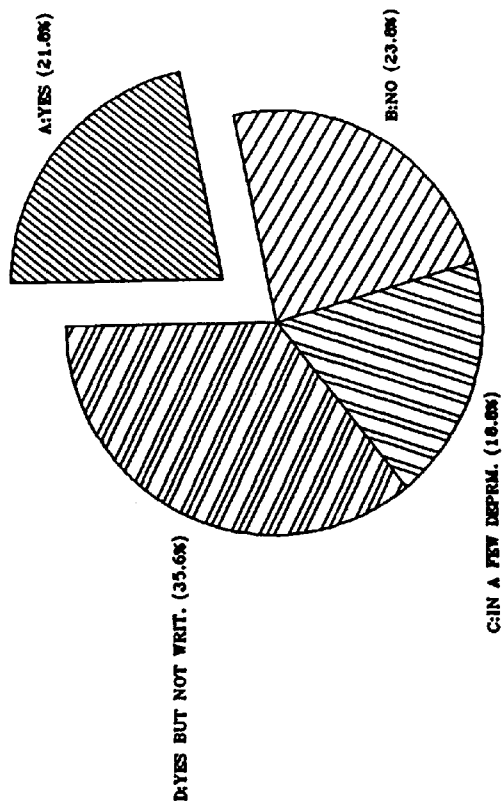
Having proved the first part of the hypothesis, the thesis will proceed to investigate the second part: "To address this deficiency, if it is true, it is considered that CMI should invest in Quality Systems at all levels, according to the requirements identified, spanning from simple Quality Control to Total Quality Management".

### 5.3 SYSTEMS

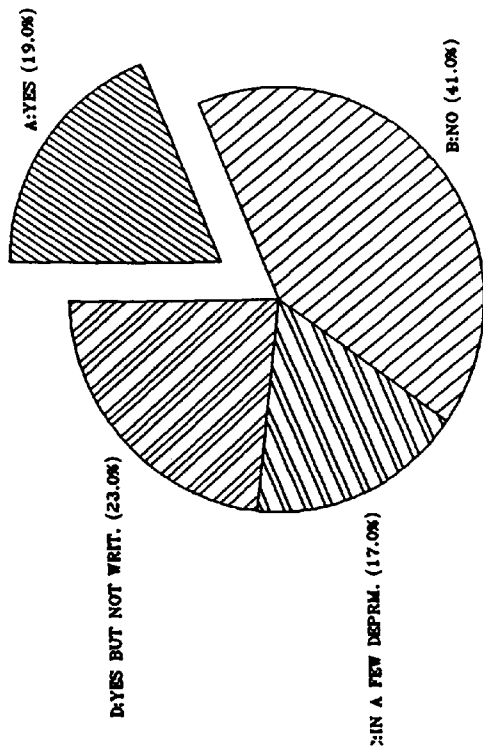
To the important question, "Do you have a written quality policy" (Q.9), only 22% claim that they had a written policy or manual. Another 35% answered that they had one, but not written. Figure 5.2 shows almost the same percentages (even worse) regarding quality manuals (Q.10).

It was found however, that only 5% of the companies could provide documents to support their claims. A cross-tabulation of the results reveals that only large companies working under licence have quality manuals.

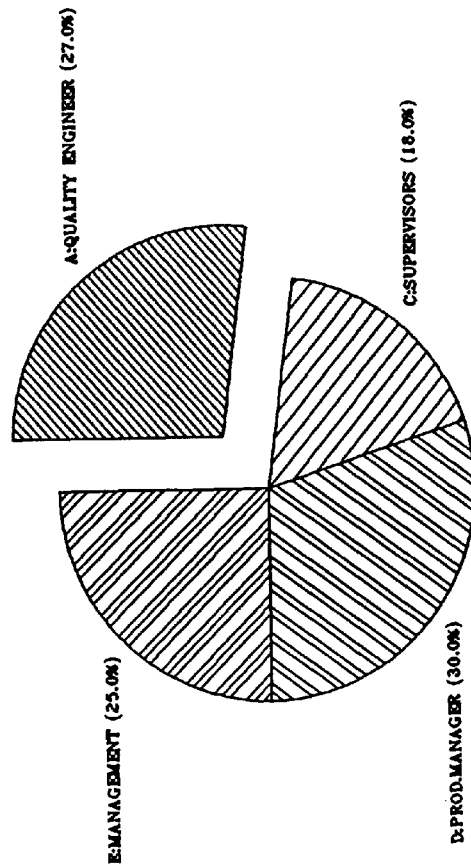
Q9 WRITTEN QUALITY POLICY



Q10 WRITTEN QUALITY MANUAL



Q13 WHO IS RESPONSIBLE FOR QUALITY



Q14 QUALITY SYSTEMS ASSESSMENT

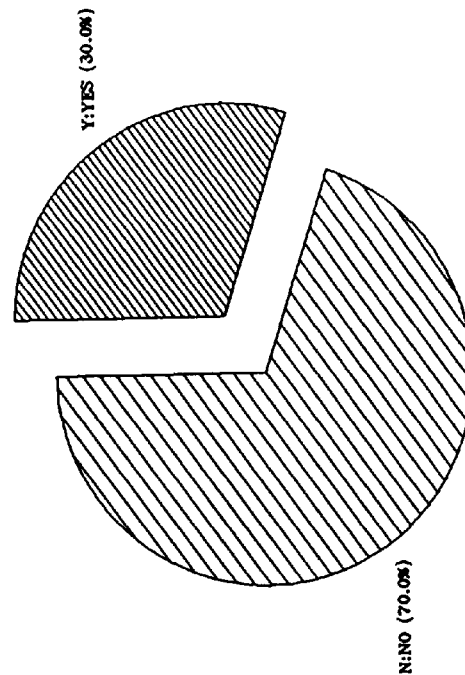


Figure 5.2.: Quality Systems  
(Answers to questions Q9, Q.10, Q.13, Q.14)

This is because somebody is assessing their quality system (Q.14) and because they also employ a Quality Engineer (Q.13).

The fact that only 57% (Q.11) have a committee for Quality matters, and 80% (Q.12) have no clear objectives, puts them in a disadvantageous position.

From the above it can be concluded that only a few companies (5 to 20%) have or use written instructions, and very few are using Quality Assurance Standards (none use ISO 9000) (Q.14). At this point the ancient Chinese wisdom is self-explanatory: "If you don't know where you are going you will certainly end up in a wrong place".

It is the responsibility of CYS and the CCCI to inform Cyprus manufacturers about the importance of standards and quality systems. Without them they will never achieve the standards required to enter the EC after 1992. The message which should be passed through not only for those trading with the EC countries, is clear: Without systems there can be no methodology regarding how Quality is perceived, executed, monitored and maintained.

The author believes that small countries (or even large ones) should concentrate on updating their Quality laboratories and pay attention to the implementation and assessment for certification, rather than placing emphasis on preparing standards, which is a laborious process. They can use ISO or BS or DIN Standards, which have been available for years and are accepted internationally. The Cyprus government, and more specifically CYS, should take measures or implement a system which will provide CMI with the necessary facilities for testing and certification. This could easily be covered by the EC-3rd financial protocol (Grant

of 15 million ECU).

Lack of standards, or having standards without providing means for testing and certification, produces the same effect. Producers are not required by any standard to deliver according to certain requirements and customers do not know or are not able to recognize if a product complies with requirements or standards. So the only basis for judgement in Cyprus is price; Quality is not easily detected or identified.

#### 5.4 CULTURE - PEOPLE

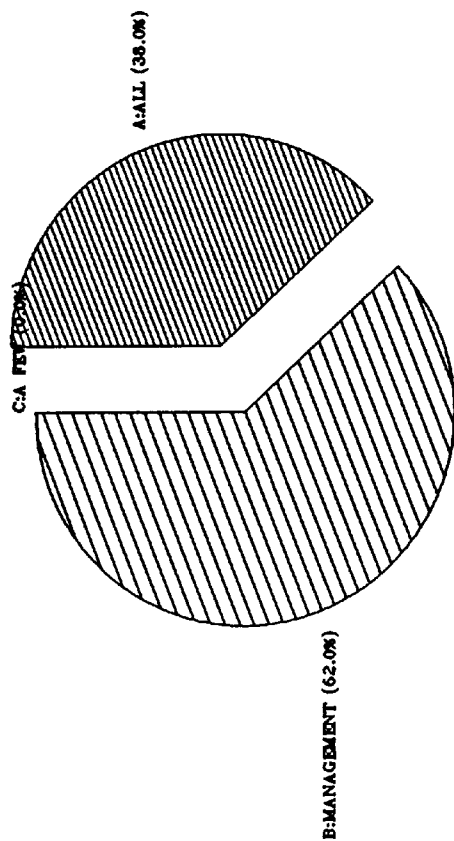
Culture - attitudes - behaviour are vital to CMI. These are the starting points for change. These are the most difficult and time-consuming, and give no quick results. This is where Cyprus has the biggest problem.

The problem is not clearly demonstrated in Figure 5.3 (People, Culture), because it is an attitude problem.

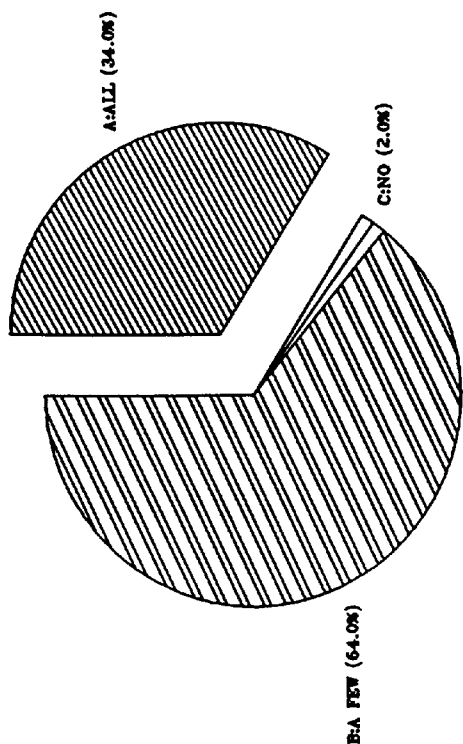
The majority of the discussion period and the comments of Q.105 were spent on people and culture. During that discussion manufacturers had a tendency to affirm that "all is well" with their company. The problems lie outside, and everyone else is to blame. The results of the four questions (Q. 15, 16, 17, 20) look to be encouraging. The questions touched only the surface; the main purpose was to stimulate the interviewees to participate in a discussion. The majority of the problems (findings/discussions) will be explained in Chapter 6 on Qualitative Assessment. That chapter contains all key issues related to quality and productivity which were not included in the questionnaire.



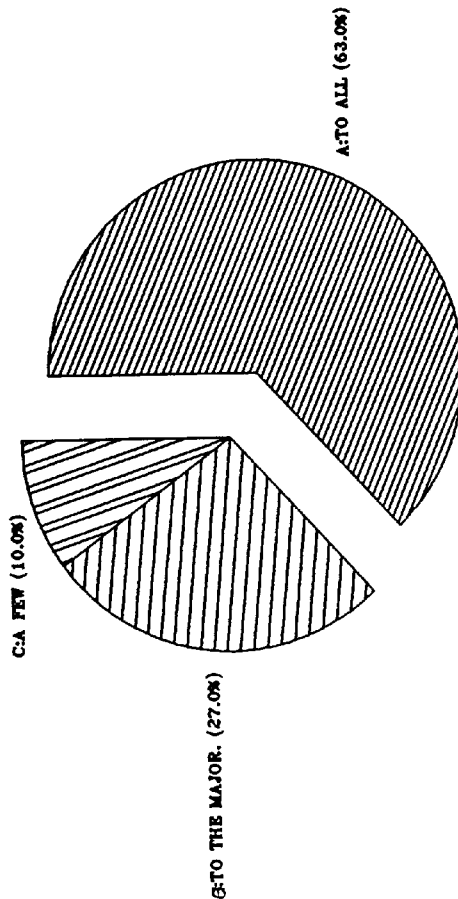
Q17 PRODUCT CLEAR OBJECTIVES TO ALL



QUALITY IS EVERYBODY'S JOB



Q20 DEPARTAMENTAL PURPOSES



Q16 MANAGEMENT COMMITMENT

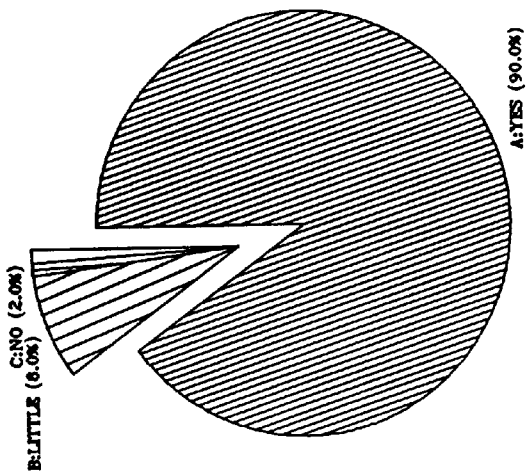


Figure 5.3: Questions related to people-culture  
(Answers to questions, Q.15, Q.16, Q.17, Q.20)

The four major problems and characteristics of the Cyprus society are written below. If it is decided to proceed with any implementation towards upgrading CMI with relation to quality these four characteristics must be very seriously considered.

- a. CULTURE (Attitudes, behaviour, ethics, etc.)
- b. SYSTEM (Structure, position, titles, etc.)
- c. DEPENDENCY ON POLITICAL PARTIES
- d. UNIONS' SUPERPOWER

## 5.5 SUPPLIERS

The majority of the suppliers are located in EC countries (52%, Q.26), followed by the local market (25%). This factor is very important because there is a great dependency on foreign raw materials, especially from the EC. Quality materials exist and Cypriot manufacturers must demand those through exact specifications and acceptance procedures.

Figure 5.4 shows that the majority of companies have more than 10 suppliers (Q.25) and 70% have no "suppliers assessment system" (Q.32). This places Cypriot manufacturers at a great disadvantage: they have not the means to assess the best and the most suitable supplier for their company. This deficiency could be overcome if the suppliers conform to a particular standard or to a quality system (ISO 9000). Unfortunately this is true for only 30% of enterprises (Q.14) which conform to a particular local product standard but not ISO 9000.

Without an assessment system qualitative judgement for the quality delivered by the suppliers is impossible. That is why manufacturers rarely (68%) or never (32%) change suppliers (Q.27).

# SUPPLIERS

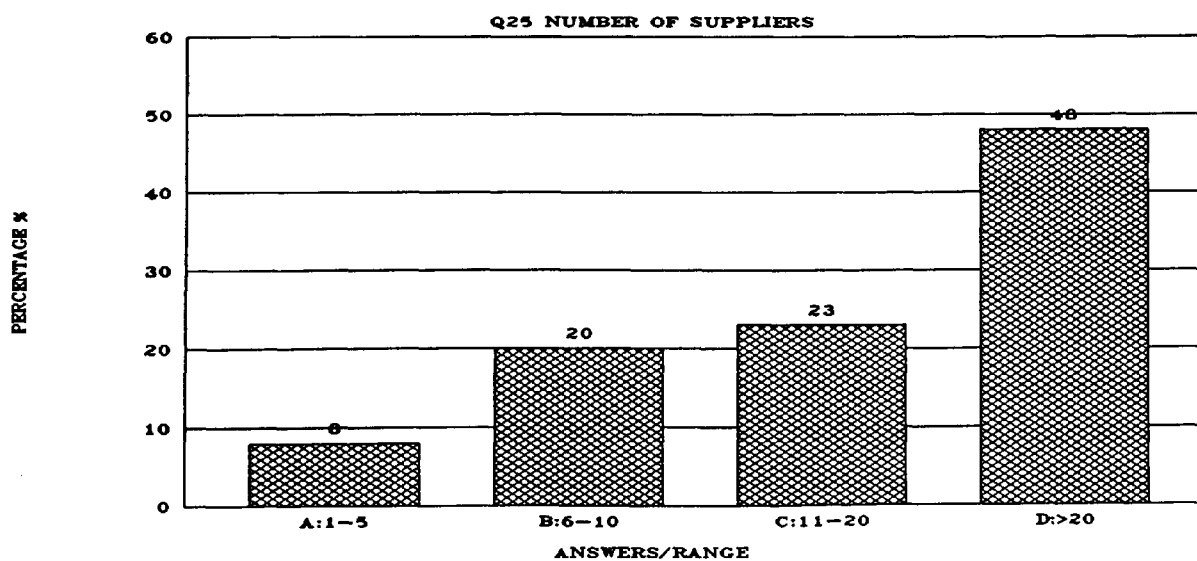
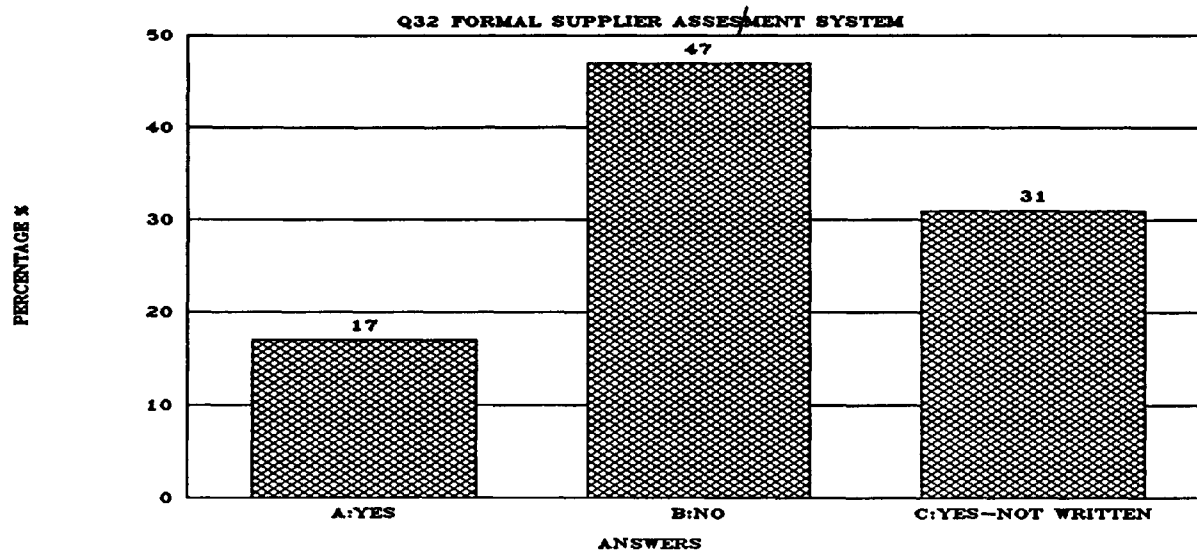
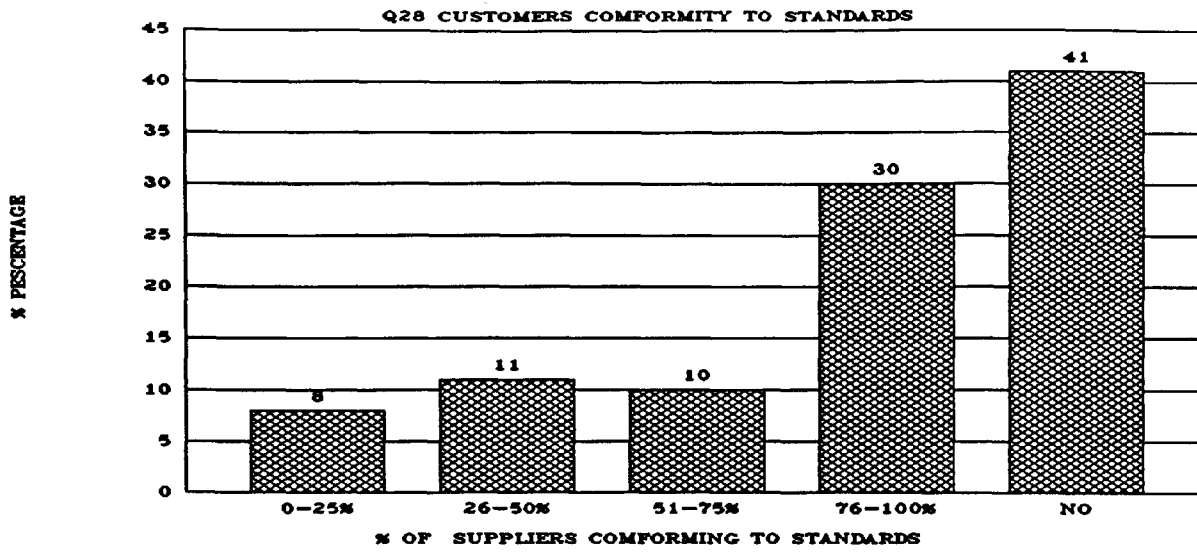


Figure 5.4: Questions related to suppliers  
(Answers to questions, Q.28, Q.32, Q.25)

The materials supplied are currently checked before (Q.29, 53%) and after storage (Q.31, 86%), while 15 - 20% have no system. When this occurs and without long-term supplier assessment records (Q.32), it is very difficult to identify the quality of materials especially after a long storage period. There should always be a measurement of performance: it should be recorded, analysed, and then improved.

Some of the answers given by the interviewees were conflicting or did not accurately represent the true image of the company. This is shown in Q.32 where 15-20% of companies answered positively that they possesses an assessment system but when they were asked to state or explain the system around 70%, could not answer the question (Q.32A, B).

## **5.6 QUALITY ASSOCIATED ACTIVITIES**

### **5.6.1 Quality Activities**

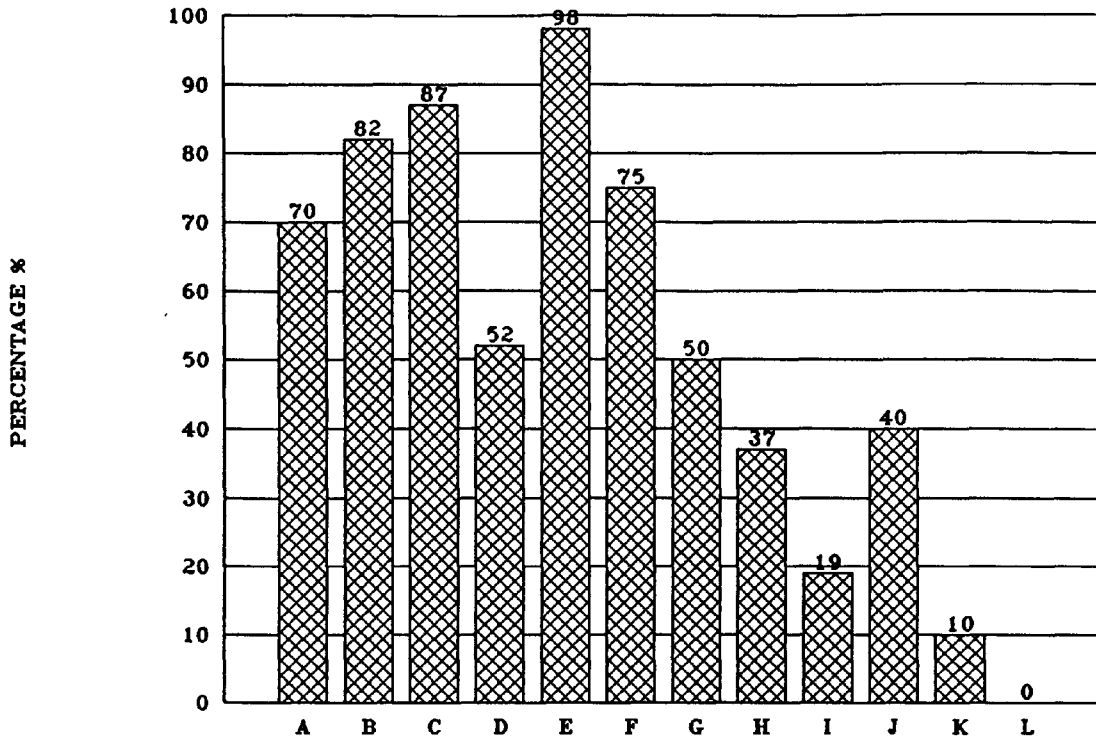
In Cyprus, quality is not given the importance it deserves, or may be covered or combined with other factors, such as upgrade the CMI, increase productivity, marketing, etc.

This is proven in Figure 5.5, which specifies what type of records a company maintains and where they are kept. The bar chart indicates clearly that records are kept in areas where money is involved. Records for quality related activities (productivity, SPC, customer complaints, quality costs, etc.) account for 20-40% or less.

Record keeping is vital for performance measurement. Without accurate records enterprises cannot judge where they stand. The importance of records is also a requirement of the ISO 9000 Quality Systems series, referenced in clause 16 [ISO 9000 pt.1].

# QUALITY ASSOCIATED ACTIVITIES

KEEP RECORDS FOR :



ANSWERS TO QUESTIONS:

A:Performance	E:Output production	I:Productivity
B:Absences	F:Production parameters	J:SPC
C:Shortages	G:Maintenance	K:Cust.Complains
D:Defectives	H:Investments	L:Quality Costs

Figure 5.5: Quality-Associated Activities

## 5.6.2 Inspection

Failure rates or defective percentages under normal conditions come under inspection activity. Those figures are valid only if they have been identified and calculated through intensive inspection, sampling and SPC. The figures shown in Figure 5.6 regarding failures and defectives are empirical, extracted from the experiences of the interviewees. It is worthwhile to mention that the majority of the interviewees argue that they are within the "acceptable limits" of defective components 1 to 3%. Who defined those "limits" it is unknown and is in conflict with ZD. Is believed it is a matter of culture and misleading information.

## FAILURES-DEFECTIVES FIGURES

% FAILURES INCLUDING MISSING CASES

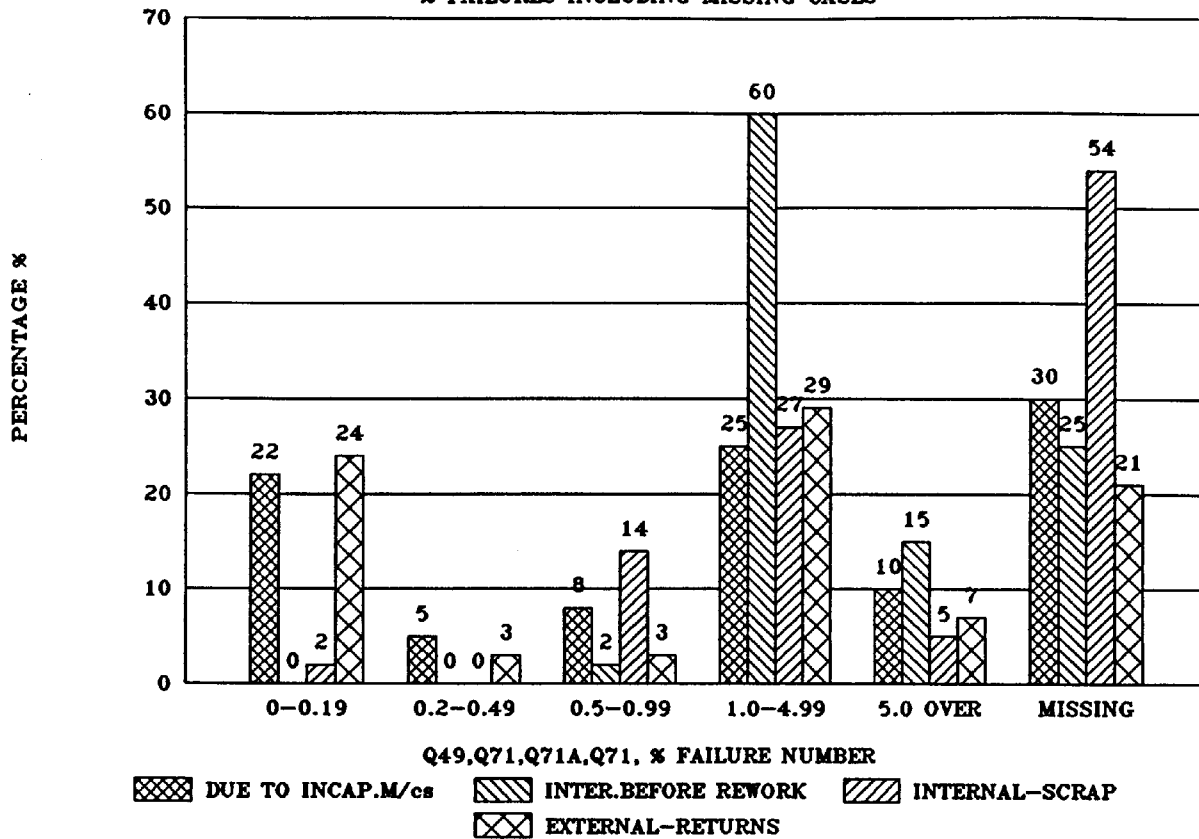


Figure 5.6: Failures and defectives figures (Y axis: How many failures falls within a region, X axis: Regions of % failures)

The figures for failures and defectives (Figure 5.6 Q.49, 71,71A, 72) averaged from 3 to 5% are the only figures which have been detected or identified. Thirty five to 40% the enterprises could not give even an empirical answer (missing cases). A small scale experiment conducted by the author in two enterprises where SPC was implemented in a pilot study reveals that the figures given in the questionnaire were well below the actual figures, especially for scrap and internal failures, before rework.

Forty percent of the enterprises had or were required to have, their own testing laboratories (Q.68). Assistance from government laboratories is available to these

facilities, but their services are utilized in only 50% of cases (Q.74).

Government Testing Centers or Laboratories function as advisory centers; they are not covered by any legislation, and are not tested or recalibrated. They are spread throughout the island resulting in the associated problems of communication, administration and coordination. Under-utilized centers (e.g., the HTI calibration laboratory) always cause problems such as unwillingness for new investments, misleading, inaccurate and unreliable measurements (manufacturers instruments) due to lack of recalibration, training, usage, etc.

Every nation should invest, expand and encourage use of testing centers. They are not productive units, but they contribute to better quality, standardization, competitiveness and productivity.

This process may be accelerated if these centres are advertised, encouraged or become compulsory through a standard. Especially if the testing or QC process carries a mark or identification symbol, placed on the product, which does not occur (80%) in Cyprus (Q.69). This process could be supervised and monitored by the existing scheme of factory inspectors.

As explained earlier regarding quality-associated activities (Chapter 5.5) there is a limited use of resources, systems and techniques/tools (SPC). To address this deficiency, factories aiming for defect-free products use several workers at the end of the production line or during the production process to identify the defective products for either scrap or rework. With this method and in certain cases, 100% inspection and re-work is avoidable with all the obvious repercussions related to costs, productivity, competitiveness, etc. This is the existing practice,

which is in conflict with Deming's 3rd point "Cease dependence on inspection to achieve quality".

## 5.7 ON-LINE QUALITY

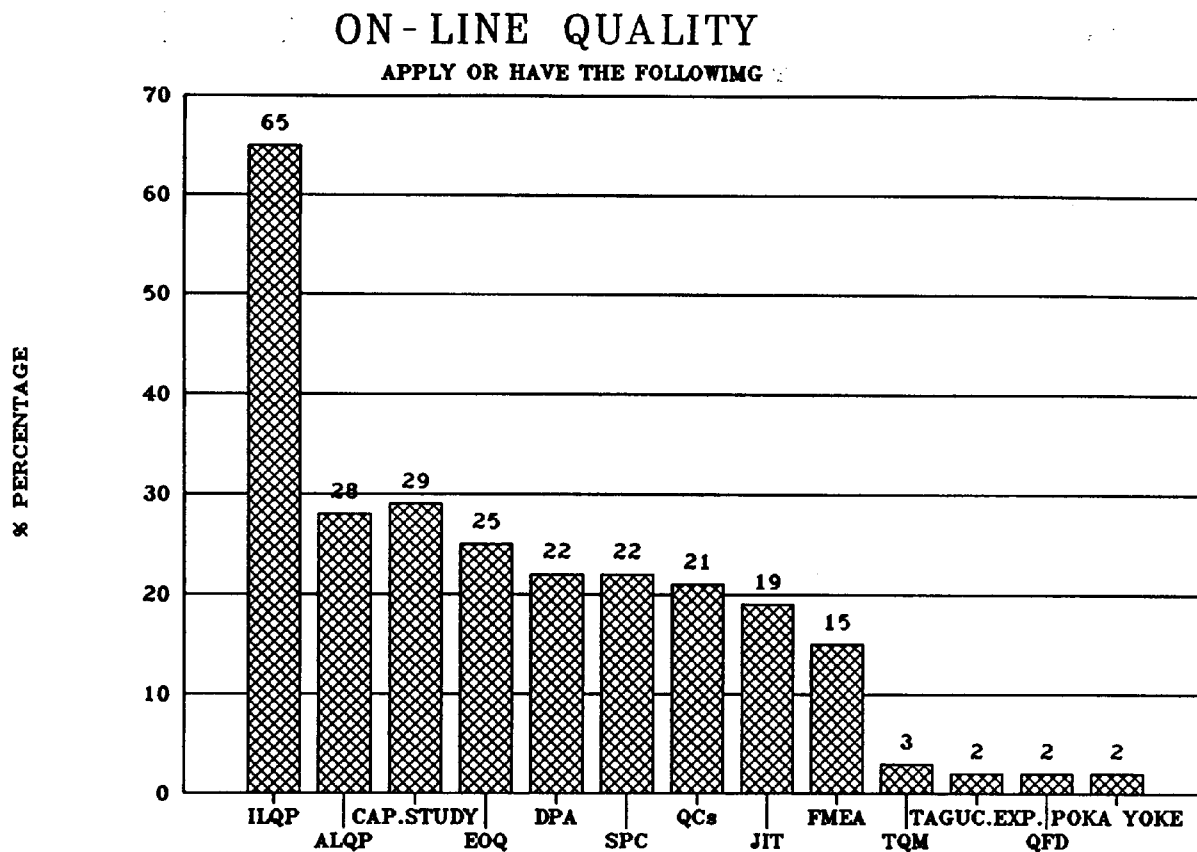


Figure 5.7: Answers related to on-line quality

TQM consists of three elements: Systems, Cultures and Tools/Techniques. Any healthy foundation must have the right balance between these elements. Figure 5.7 (on-line quality) proves again that there is lack of techniques methods usage and in certain cases a technique or tool is completely unknown. As a general comment more than 75% (Q. 38, 46, 53, 21, 33) do not use, or know anything about techniques (Q. 50, 63, 66, 91).

If an enterprise is using the right systems and has a positive culture but lacks the tools, it cannot proceed. Conversely, if techniques are familiar to some members of the company, improvements can be made even without



having the right system and/or culture. Investing in techniques training, which is easy, will give fast and productive results.

#### 5.7.1 Design Stage

Strictly speaking there is limited design of products in Cyprus, especially in the metal, furniture and food industries. The majority of the products are produced by copying or imitating other products. Quality is not built into production or taken into consideration during design. Around 50% argue that some analysis regarding quality problems is done but no records are kept (Q.41). Although Taguchi methods (Q.50) FMEA (Q.38), QFD (Q.66) are unknown techniques, their content and methodology are somehow being taken into consideration (Q. 51, 39, 67). Analyses regarding quality problems are primarily made during the design stage (Q.44), but there are cases (40%) where the western model is utilized, i.e., where the majority of modifications take place during manufacture rather than design.

#### 5.7.2 Capability

Process, machine and worker capability are important factors related to quality. They were always taken seriously into consideration by the manufacturers. Capability was measured by 28% of enterprises (Q. 46, 47) but without modern scientific techniques.

#### 5.7.3 Optimization

Past experience, standard practice, trial and error, change to certain parameters is the methodology utilized by 70% of the enterprises in their attempt to optimize their production. Only 10-15% used statistics or a statistical approach (Q.52) and 2% Taguchi Experiments (Q.50).

It is obvious that limited scientific methods are used. This is due to lack of training, limited awareness and management participation, lack of encouragement for team work and reliance on fire fighting.

#### 5.7.4 Manufacturing Stage

All questions related to the manufacturing cycle centered on techniques used, especially SPC. Only 35% use SPC (Q.53) and among these only 40% keep records (Q.53A). SPC without records equals inspection only, so the original figure, 35%, drops down to 14%. When asked to present sample charts, only 5 to 10% could produce records. So, the more accurate figure is 5 to 10%. SPC is applied mainly by companies that work under licence or are requested to adhere to a standard.

The above statement can be also proven by Q.54 and Q.55 where only 15% to 20% understood something about SPC, or could produce charts. Fifteen percent of the companies use SPC charts (Q.60, Q.61). This number is correct because it matches the number found in the previous paragraph. Generally the person responsible for entries is the supervisor (37%) (Q.57).

It can be concluded that the process/production is not monitored systematically and everything depends on inspection (as mentioned earlier, 5.6.2). When the process is out of control, if it is detected, the production line is stopped (73%), or total inspection at the end is adopted (40%), or the methodology is checked (68%, Q.59). All these choices are both more costly and more time-consuming than SPC.

The core of any manufacturing business, the production process, is in chaos and must be reorganised by educated professionals. At present, they spend their time

fire-fighting, fixing, rework, inspecting and detecting. In Cyprus the majority of enterprises are not designed for quality. There is limited professional personnel in managerial positions especially in terms of quality management (Q.13) and no vacancies seeking Quality personnel. Efforts should concentrate on training, upgrading, improving and controlling the manufacturing stage.

## 5.8 CUSTOMERS

Quality means "customer satisfaction". TQM focuses on the customer. Examination of Figure 5.8 shows that the customer is not very important or there is no systematic approach to identifying customer's needs and satisfaction (Q.76, 79, 80).

Communication between customer and supplier is a vital prerequisite for the success of any enterprise. Unfortunately the majority of products are produced in accordance with management decision, trends (Q.76, Q.80), etc. Systematic visits to customers or the opposite (customers to the supplier) are limited to the cases of serious quality problems. In most of these cases the problems are dealt with through correspondence.

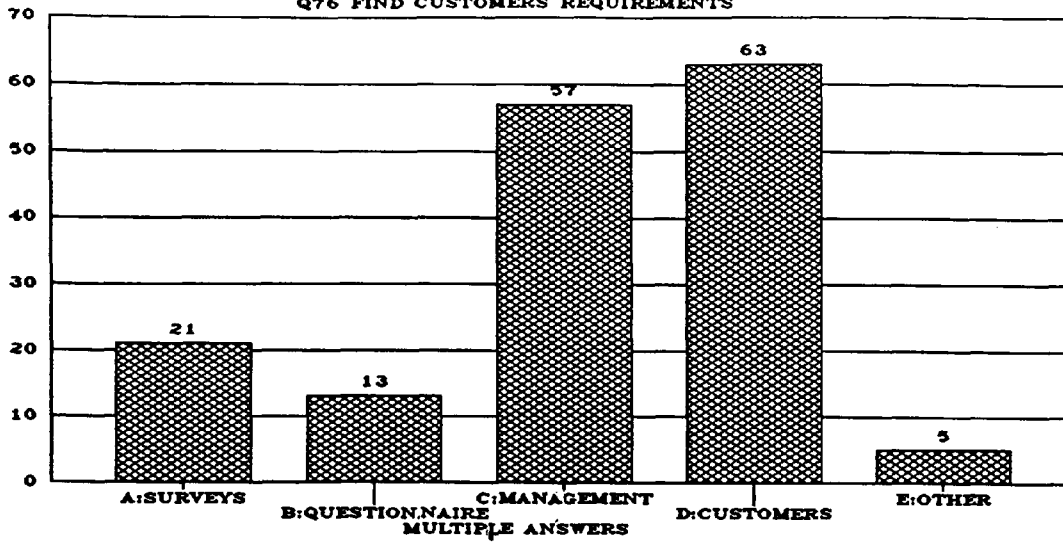
This is seen in Q.77, which shows that only 34% of enterprises keep records of customers' complaints and among them only 10% have actual figures on complaints. The figures are small because of limited communication and coordination between the two parties.

It is suggested that suppliers should arrange regular visits with their customers (after identifying them) to discuss matters concerning quality, standard and special requirements, specifications, standardization, capacity and capability of their enterprises, quality problems,

# CUSTOMERS

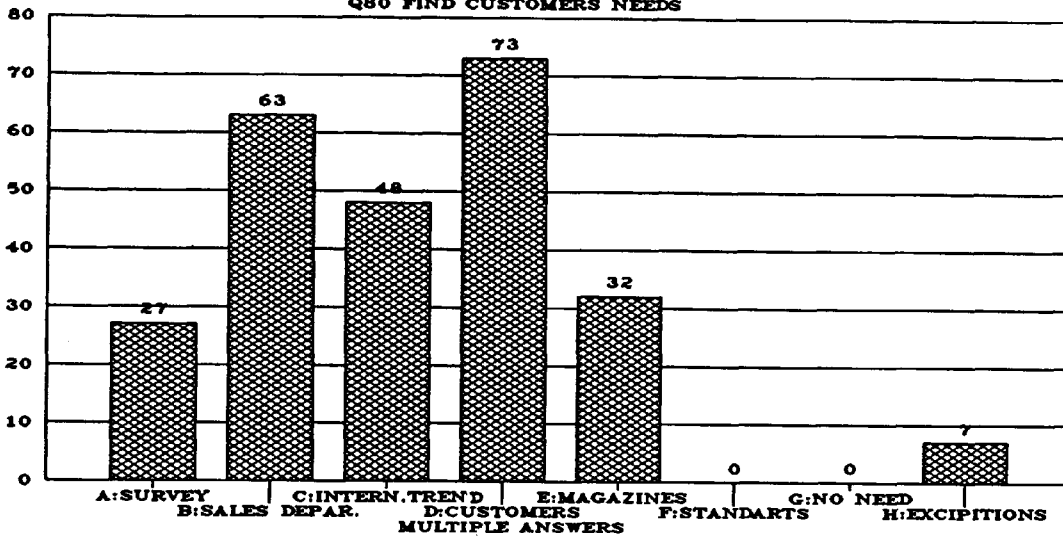
## Q76 FIND CUSTOMERS REQUIREMENTS

% PERCENTAGE



## Q80 FIND CUSTOMERS NEEDS

PERCENTAGE %



## Q79 FIND PRODUCTS QUALITY

PERCENTAGE %

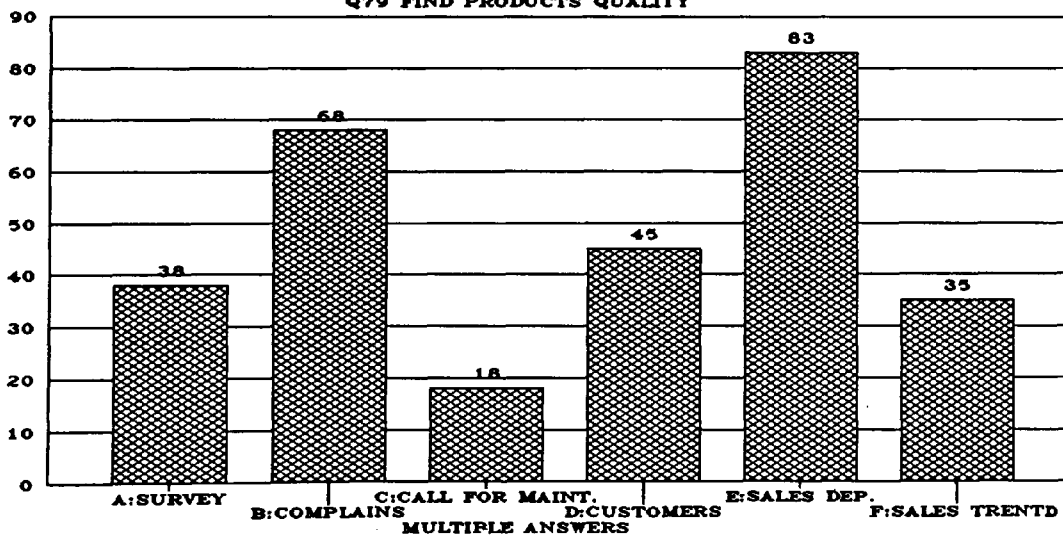


Figure 5.8: Answers related to customers (from where manufacturers get information and feedback)

techniques or methodology of production, new products, etc. The same questions should be answered by government officials in collaboration with CCCI and EIF.

When dealing with any customer, especially with EC customers, it is a great mistake to start by saying "What is the Quality you want?" This gives the impression to the customer that Cyprus is offering products with inferior quality. The correct statement should be "We are offering this product which is of high quality at this price" (but only if it is true) (Q.105).

## 5.9 TRAINING

"Training, Training, Retraining, Retraining": these are Peter's words. In one of his speeches delivered to CEOs in London, Tom Peters stressed again and again the importance of training [Peter T. video]. Deming's 10th point is "Eliminate slogans without providing the means of doing it". These "means" will be provided by "Instituting training on job (Deming's 6th point) or "Mount Training programmes on Quality Education" (Crosby's 8th point).

The CMI at present does not follow the philosopher's orders regarding training. Question 84 proves that only 25% have considered or have instituted an improvement program to train personnel. That question was substantiated when they were asked if staff or foremen received any formal training on Quality. Forty five percent of staff (Q.85) and 33% of foremen (Q.86) have had this opportunity. When interviewees were asked to give details, more than 75% could not answer the question (Q.85A, 86A). It is obvious that there is no adequate, formal on-the-job training. The only training which is offered to the manufacturer's personnel are short courses organised by HTI, CPC, and other institutions. There are general courses for all manufacturing sectors and personnel.

The results shown in Figure 5.9 about willingness for training indicate that management and staff are quite

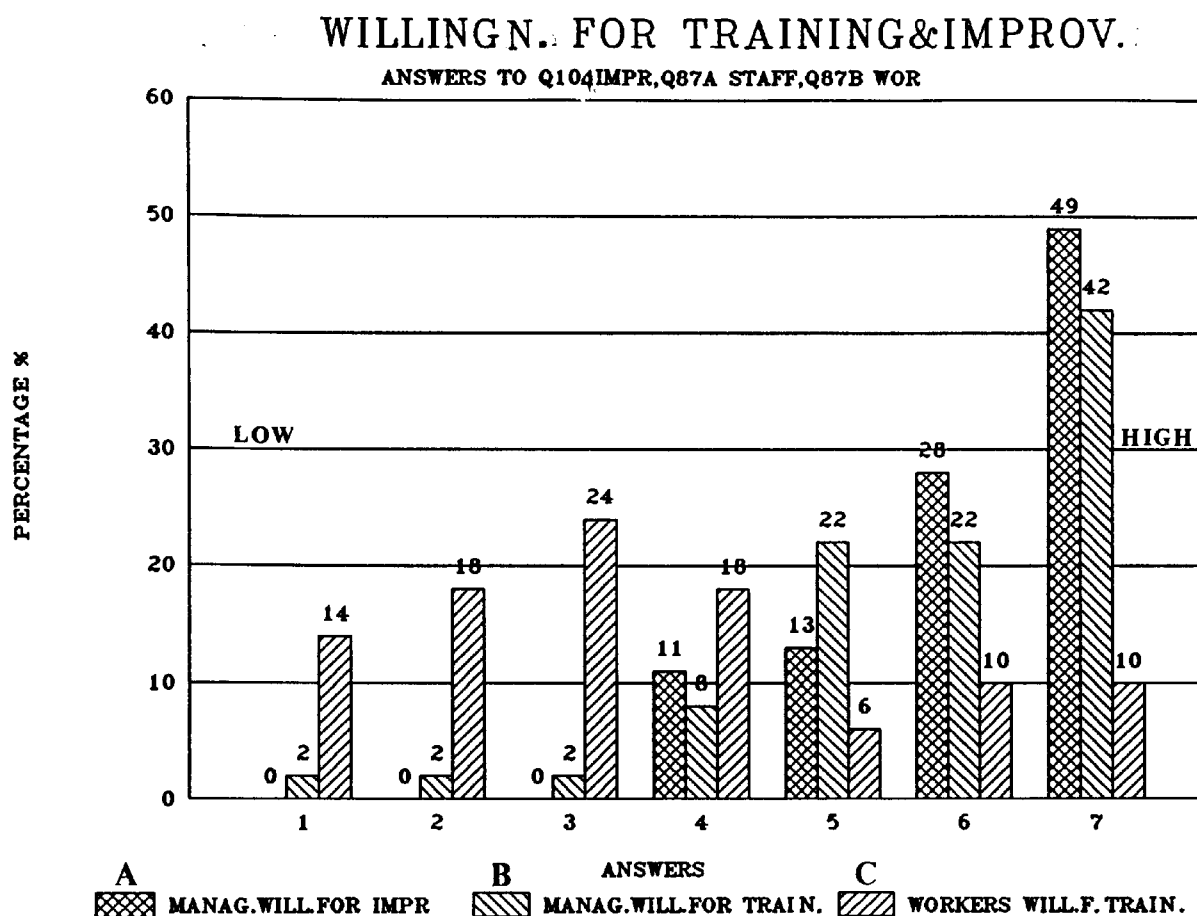


Figure 5.9: Willingness for Training & Improvements  
(Management willingness for improvements (A) and willingness for training (management (B), workers (C))

interested in training, (Q.87A), compared with the willingness of the workforce (Q.87B). This small deficiency could be overcome by adopting an on-the-job training program, by motivating, rewarding and encouraging workers to get educated for their own good and, by extension, the company's.

It is taken for granted that personnel are willing to be trained [Crosby's video 1989]; there are plenty of educational institutions, and there are professionals. The secret is to match them correctly. There should be the right course, for the suitable sector, with the most

appropriate instructor. Cypriots and foreign instructors should participate in courses, seminars, conferences, etc.

Examination and study of Figure 5.10, on training methodology and content, provides the means to transform thought into action.

Cypriots are willing to participate in a short (2-3 day) specialized course for different levels, lab work, practice and on-the-job application (Q.88). They wish to be guided through a specialised course and then shown how to do it through "on-the-job application". What is needed are an instructor, a coordinator and then a facilitator to stand by their side and assist the company to implement what it has been taught. The knowledge, experience and theoretical background of the facilitator combined with the experience and the familiarization with the needs of the company personnel will give the best possible results owing to a correct balance of knowledge, experience, and theoretical background.

The practice of inviting experts and foreign consultants is a good one, which is widely used. But it will never solve the problems. Local personnel should learn from these experts, and then act themselves in the capacity of instructors and facilitators. The second step is to start training manufacturing personnel. Close supervision of the instructors by the experts will assure the correct implementation at the beginning. Deming's Funnel Experiment should be seriously considered and the entire action plan should be carefully prepared.

A local supervisor is always in an advantageous position because of his familiarity with the culture, attitudes, behaviour and needs of his staff.

# TRAINING CONTENT AND METHODOLOGY

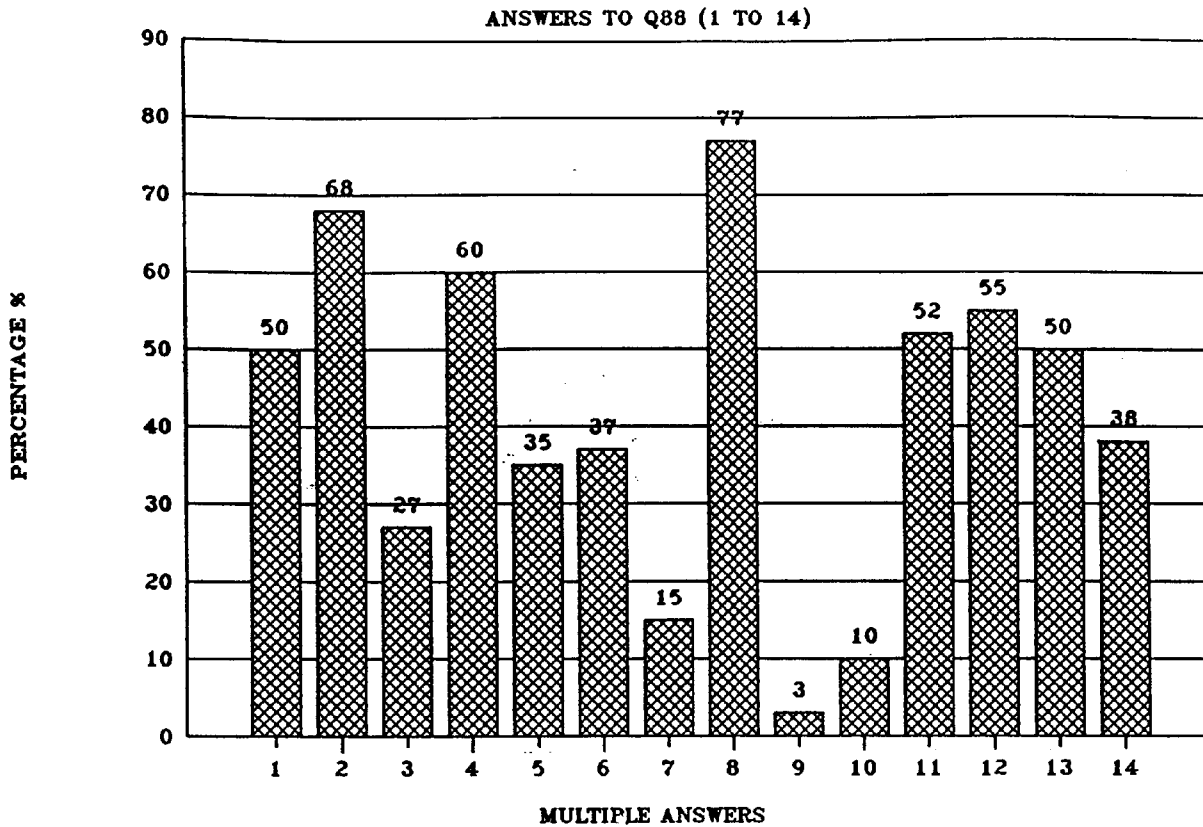


Figure 5.10: Training content and methodology

## INDEX

1. Separate course for staff-engineers
2. Separate course for supervisors
3. One course for everybody
4. A seminar
5. A short intensive course 2-3 days
6. A short course once per week (20-40 hours)
7. A short course once per week (40-60 hours)
8. A special course suitable for specific industries only (e.g., textiles, shoes, clothing)
9. A general course suitable for all industries
10. A theoretical course with practice
11. A course with practice, lab and application
12. Special short courses for techniques (e.g., SPC optimization methods, FMEA, etc.)
13. Individual visits to interested parties and discussion of individual quality problems
14. A theoretical course with on-the-job application



Manufacturers would welcome a paid expert or a facilitator (Q.90), for a short on-site visit (Q.91) to identify quality problems and advise them on how these problems could be tackled.

Cyprus manufacturers realise their deficiencies and are ready for discussion, willing to change things and implement new methods (Q.104). The ground is ready for training. The implementation methodology should be carried out by institutions with the personnel, equipment and means to provide the appropriate training. Prior to that, there should be a masterplan of the implementation methodology to answer the crucial questions, what, when, who, how. This should be a product of close coordination, and after the establishment of correct channels of communication between interested institutions and parties (ITA, HTI, CPC, CYS, EIF, CCCI). This will break down the barriers which now exist among these institutions and eliminate the possibility of duplicating courses, rejecting courses, doubling investments, working independently, etc.

#### 5.10 QUALITY COSTS

In section 5.2 the quality of Cyprus products was compared with that of European competitors, and it was shown that approximately 40% of Cyprus products are of similar quality to those of EC countries, but at WHAT COST? and for how long? If the prices of the 40% Cyprus products keep increasing are they going to be competitive in the near future?

Unfortunately there are no figures (or they have never been measured in a systematic way) related to Quality Costs, as specified by the BS [BS 6143], e.g. prevention, appraisal, lost opportunity, total costs

(Q.98). Percentage figures were given only for failures (internal and external) by 40% of the enterprises. These figures were not converted into money because as mentioned earlier (5.6.2), these figures were estimated or identified only through experience. There is no systematic recording either through SPC or through quality cost reports [BS 6143 pt 2]. It is obvious that quality-related costs, appropriate to the organisation, are not identified or monitored.

The above-mentioned brings us to the conclusion that a business cannot run effectively without having quality cost data and measurement of performance. In Cyprus the total cost for every product is calculated without including quality cost or is based on rough estimations. This has an impact on the selling price which is either low (loss to the company) because of underestimating quality costs or high (against company competitiveness) because an estimated percentage for quality cost, scrap, returns, etc. is added to basic product cost.

#### 5.11 GENERAL QUESTIONS

The feelings and reactions of those participating in this survey were quite encouraging and interesting. In spite of the fact that the questionnaire was very lengthy, specialized and time-consuming, interviewees enjoyed it and were very enthusiastic in answering all the questions (more than 95% of the time). Interviewees stressed that they learned a lot from the questionnaire because a number of techniques, statements, and ideas were unknown to them. They were especially interested to learn that the questionnaire choices were formulated in such a way to include the right or best answers in an ascending order A right .... E worse. Due to this fact the majority asked for a copy of the questionnaire and almost all of them (97%) stated that they were interested in the results and findings of the research

(Q99).

It should be reiterated that never has a study of this kind been conducted before in Cyprus (Q.103, 100%) and the survey results are unique to the subject area.

The atmosphere of the interviews was friendly, beneficial and enthusiastic. There were lengthy discussions with Directors and on some occasions other company representatives were invited to participate in the discussions, which lasted up to four hours. As a result of these beneficial discussions, relations for future cooperation have been established. This explains the very high percentage (91%) of company representatives who trusted the researcher to advise or recommend TQM methods and techniques applicable to their enterprises for the purpose of this research (Q.100), or during any implementation stages.

One of the most important questions was related to the establishment of the first Quality Assurance Institution/Organisation (QAI), and there were long discussions regarding its status and content. All agreed (97%) that the establishment is a necessity (Q.101) and 70% stated that they will join the organisation (Q.101, H) when it starts operating. There were certain disagreements on the form/status of the institution and who would be responsible. Figure 5.11 details the status of QA Institution. Analysis of figure 5.11 reveals that the government is not preferred as the body responsible for that organisation. An independent body is the most favourable choice, 38% (Q. 101 F). This is how all QA Institutions operate throughout Europe.

## STATUS OF Q.A. INSTITUTION

Q101 ESTABLISHMENT OF THE 1st Q.A.INST.

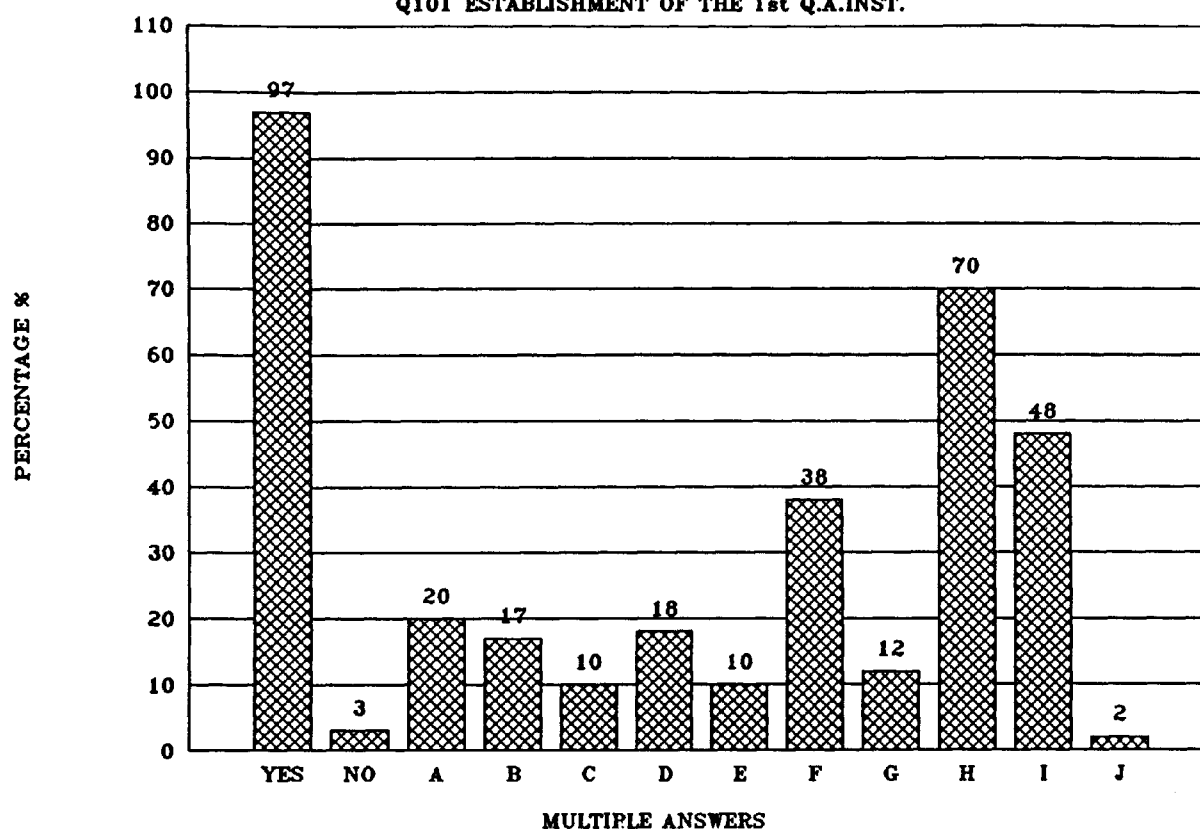


Figure 5.11: Status of QA Institution

### INDEX

- Q.97: In favour of the establishment of the first QAI
- A. To be semi-government
  - B. To be independent
  - C. To be a government department
  - D. Under CCCI
  - E. Under EIF
  - F. Independent with all the above
  - G. Belong to manufacturers
  - H. I am willing to be a member of that organisation
  - I. I am willing to be among the first
  - J. Other specifications

It is both the government's and the industrialists' responsibility to work together for the establishment of a body/institution in which each one has a role to play.

This will lead to better communication and a single strategy. It is beyond the scope of this research to outline the status of that body. What is essential for this thesis is to outline and draw the structure of the first Quality Assurance Institution/Organisation. Figure 5.12 shows the suggested structure of this institution.

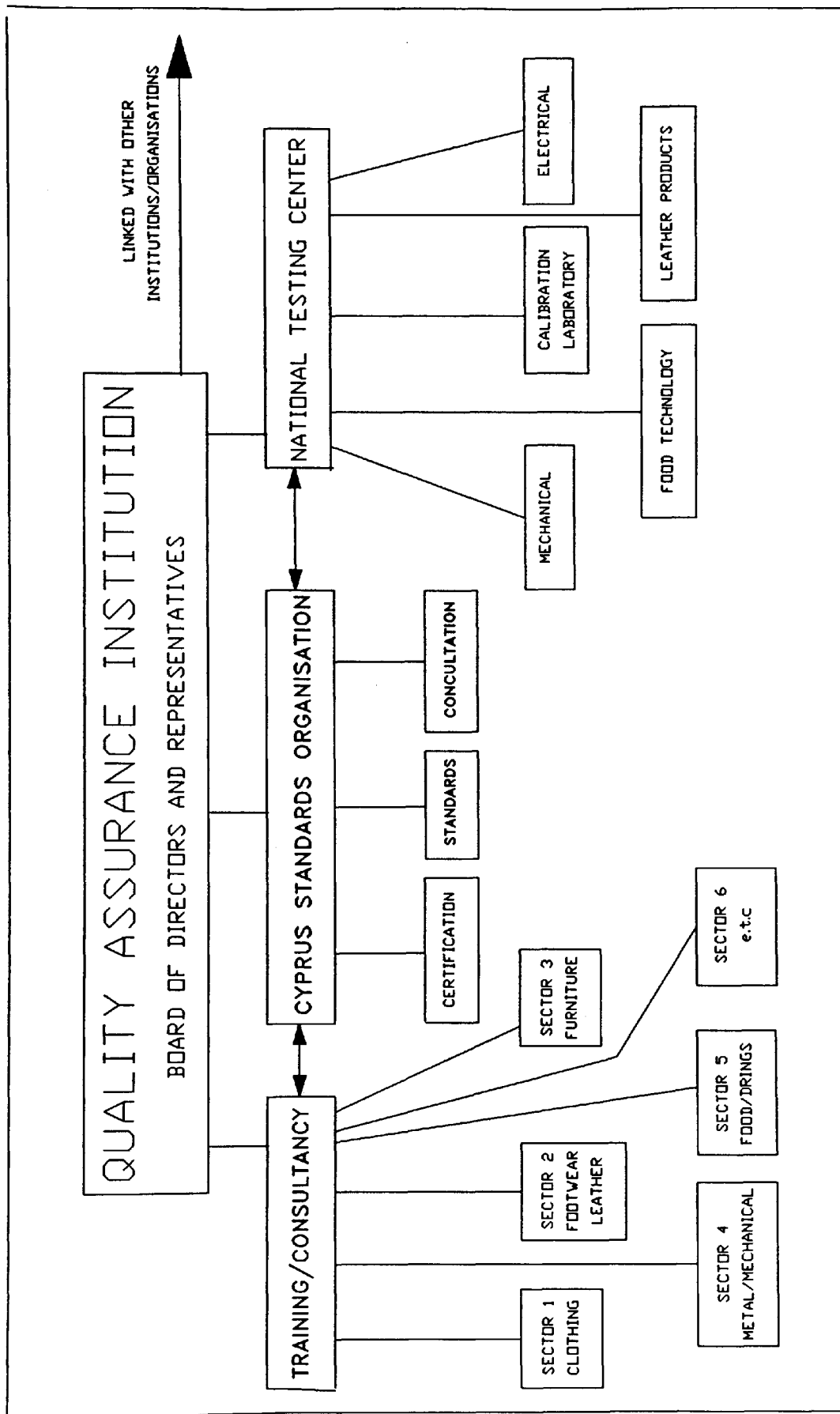


Figure 5.12: Suggested structure of QAI

# CHAPTER SIX

## LISTING OF QUALITATIVE RESULTS

### 6.1 INTRODUCTION

This Chapter summarises all the qualitative key issues related to quality & productivity which were collected, noted, recorded and discussed during the personal interviews and are not included in the previous Chapter. It also includes all the suggestions and opinions of the respondents which were discussed upon completion of the questionnaire (Q.105).

Suggestions and opinions from non-industrialists are also included. Senior officers from different reputable institutions, such as ITA, CPC, HTI, CYS, Consumers Association, and consultants were asked to comment on the status of Cyprus quality, productivity and competitiveness.

The structure of this Chapter follows the same as the previous Chapter but with limited elaboration and no priority.

### 6.2 SYSTEMS

Problems identified were:

- Lack of standards for some sectors, i.e. hygiene, safety, leather, etc. For those sectors where standards exist, that standard is very detailed with too many requirements. In addition there is no equipment to test the standard requirements.
- Each company has a different policy, determined by

managerial decision. There is no uniform industrial or government policy.

- Shortage of CYS staff members. CYS now employs only 8 people. This number is very small in relation to the size and activities of Cyprus. The ratio for European countries is approximately 10-20 people per million [ISO member bodies].
- There is no connection with foreign data banks, especially with the EC for directives, standards etc.

Some suggestions for change were:

- Requirements for joining the EC: Awareness, standards, legislation, banking system, structure.
- Adequate information should be given on Cyprus products, i.e., composition, use, units, contents, etc.

### 6.3. CULTURE-PEOPLE

Problems identified were:

- Too many committees (QMC: Quality Management Committee, ACIT Advisory Committee for Industrial Technology, ACDHP: Advisory Committee for Development of Human Resources, ITDC: Industrial Technological Development Committee) targeted for upgrading CMI. All use a different methodology without coordination and a strategic plan.
- The majority of decision-makers for industrial policy, financing improvement, are nonindustrialist. (They are government employees, officers, economists, lawyers, politicians.)



- Allocation of money from the EC is subject to the decision of subcommittees in different ministries.
- For any problem the government tendency is to invite a highly paid expert, to write a report and disappear. No implementation, no responsibility.
- Among the three organizations responsible for industry (ITA, CCCI, EIF) there is no person responsible for quality, standards, certification, etc.
- Until now no vacancy, either in the government or the private sector has been advertised seeking a Quality Engineer, or any personnel related to quality.
- Employment of women is low due to close relationship with parents. No need for work. As a result they are not seriously concerned with suggestions for Quality improvements.
- The educated (high school graduates), prefer to work in the tourist industry, sales, insurance, etc. CMI currently employs older, less educated workers, who show limited interest in training, understanding, cooperation.
- Shortage of workers causes numerous problems, especially in districts where older people with low productivity and physical problems are employed.
- Due to nonexistent customer-supplier agreements, orders and deliveries suppliers are forced to deliver products in short time against product quality, e.g., food products, etc.
- Over-protection of certain local products, especially agricultural and food products (e.g., milk, juices, vegetables) has a direct impact on prices and

competitiveness. Cypriot manufacturers are forced by legislation to buy all local products or raw materials at prices higher than those abroad.

- With certain local products used for further processing or as raw materials there is monopoly or oligopoly which causes the price to rise (e.g., Cyprus refinery, Cyprus Forest Industry, etc.).
- Only a limited number of government officials pay on-site visits to factories, to identify and discuss individual problems with industrialists.
- Managers and directors of mutual-related organisations generally follow government policies and approach.
- Money from external loans (e.g., EC protocol) is not utilized correctly, under-utilized or invested in other less productive sectors.
- Shortage of workers. Importing workers is not a solution. Better utilization of local workers (through motivation) and machinery resources will solve this problem.
- No awards, rewards, prizes for Quality and productivity.
- Job hopping, workers' mobility, due to workers looking for more money or wishing to start their own business similar to the one they have been working in.
- Jobs, savings, are converted into nonproductive units (e.g., precious stones, cars, houses, etc.).
- "Cypriots are like a Drum, big voice and noise but nothing inside" "Foreign industrialist".

- There is always an excuse for everything. Lay the blame elsewhere.
- No professionalism. Workers work 2-3 jobs to survive.
- Cypriot manufacturers shifted from traditional Cyprus products for which Cyprus was famous, to common and easy money products (e.g., silk, perfumes, oils, wines, etc.)
- There is a tendency to take advantage of certain drawbacks of the system and the society as a whole.

Some suggestions for change were:

- Provide motivations and benefits to married women to increase the female working population and reduce the labour shortage problem.
- There should be special training courses for union employees.
- Generalization in manufacturing sectors destroys or levels down all individual trials. This should be avoided (e.g. All workers in manufacturing are unskilled).

#### 6.4 SUPPLIERS

Problems identified were:

- The quality of local raw materials changes daily due to lack of legislation and weather conditions (e.g., meat, milk, citrus products, cement, leather etc.).
- Wrong judgment or selection of suppliers destroys or closes down some Cyprus manufacturing industries.

- All materials imported from abroad carry transportation and insurance expenses, which add extra cost to the final product.

Some suggestions for change were:

- Ordering policy should be organised in collaboration with CCCI to attain lower prices, certification, low administration expenses, etc. Orders could be arranged on behalf of a group of industries using common raw materials.

## 6.5 QUALITY ASSOCIATED ACTIVITIES

Problems identified were:

- The promotion of Cyprus products and Quality awareness is negligible. Cyprus Broadcasting Corporation (CBC) could offer more on the above issues.
- Everyone discusses and addresses management techniques, while only a few speak about Quality.
- Vacancies for managerial positions related to manufacturing are primarily open to economists, business management, lawyers. Engineers are wrongly considered to be second-class degree holders.
- The government's and semi-government's low productivity and bureaucracy have a direct impact on manufacturers, especially those dealing with exports and imports (customs, licence, loans, investments, etc.).
- High taxation on certain raw materials and products increases the final product price. This becomes worse when money from a particular tax is used for nonproductive purposes (e.g., Refugee fund, Defense

fund, etc.).

- Lack of programming and bureaucracy in financing policy make manufacturers reluctant to invest (e.g., CDB, laws concerning loans, oligopoly in banks, etc.).

**Some suggestions for change were:**

- The formation of share-holding companies or a consortia [Industrial Strategy 1986] will reduce individual capital investments. This will benefit individual companies from investing in high technology machinery, will reduce duplication, and provide full utilization of machinery. It will reduce costs and increase quality and productivity.
- More surveys should be conducted which target each sector, leading to more accurate results.
- Large companies could work more effectively if they split into smaller ones, specialising in some products only. Flexible manufacturing [Industrial Strategy 1986].

## **6.6 ON LINE QUALITY**

**Problems identified were:**

- Industrialization and specialization. No adequate machinery for certain products and process. This could be solved with share-holding companies or consortia.

**Some suggestions for change were:**

- Simplification of process to prevent mistakes. There should be a movement from dependence on workers to dependence on machines and correct design.

## 6.7 CUSTOMERS

Some suggestions for change were:

- The best means to identifying customers' requirements is through personal contact and regular on-site visits. This will establish and maintain strong relations between the two parties.
- It is always worthwhile to inform customers about the enterprise capacity, capability and diversification. This will lead to arrangements for larger orders and production of similar products.
- Failure rates are directly related to exact, accurate and strict requirements set by the customers. These requirements should be studied carefully before accepting an order and giving the exact cost.

## 6.8 TRAINING

Problems identified were:

- Insufficient coordination and communication among educational institutions (ITA, CPC, HTI, etc.).
- No professional personnel or consultants in matters concerning quality and productivity in Cyprus. No QA specialist personnel.
- Limited amount of information technology and quality activities.
- The calibre of technical and vocational schools graduates is far below what it should be, considering the amount of money spent on each student. This is good area to start quality awareness.

- Workers mobility. Manufacturers invest money to train personnel, who leave after 2-3 months to work for somebody else. Opposite effect for training investments.

**Some suggestions for change were:**

- Industrial Training Authority (ITA) should adopt a planning study or pilot training for specific production units and identify the current need for full implementation (German prototype).
- ITA should reconsider the methodology of training and the approval of courses. There should always be follow-up.
- It is of top priority to educate top management first regarding TQM.
- Training and re-training workers will cover labour shortages.
- Reward workers who show interest in quality training and productivity.
- Establishment of training schools for each sector.

## **6.9 QUALITY COSTS**

**Problems identified were:**

- Workers know they will receive salary increase and cost of living allowance (COLA Union power). So attention to quality and productivity is limited.
- There is no relation or agreement between unions and manufacturers to correlate productivity and salary

increase. Everyone gets a raise every year. This causes to companies several problems for those highly paid old workers with low productivity, and young productive workers with lower earnings.

- The system and the items selected for COLA are wrong, according to CCCI and EIF. The allowance given to the workers has a direct impact on the product cost and competitiveness. There should be government intervention in prices to work as a balancing factor.

#### 6.10 CYPRUS QUALITY PROBLEMS IN A C & E DIAGRAM (Fishbone)

Figure 6.1 (produced by Auto Cad V.10) includes the quality problems and causes identified and discussed during qualitative and quantitative assessment of the survey. These causes/ factors address the areas where Cyprus falls short in Quality Standards and levels compared with those of other competitor countries.

The usual approach of a C & E diagram is the utilization of the 5 Ms & E. Since this chapter evaluates TQM activities a different approach was adopted. It is divided into the same subject areas as Chapters 5 & 6.

According to Ishikawa (the first to have used this diagram), if a diagram consists of many complex elements it means that the knowledge of the causes is deep and the diagram is very detailed and accurate. This large C & E diagram will help greatly in the decision making process, which consists of too many complicated stages [Ishikawa K. 1976, Adair J. 1985].

This diagram also includes some causes identified by the author and the other members of the National Quality Management Committee of the Ministry of Commerce and Industry in November 1991.



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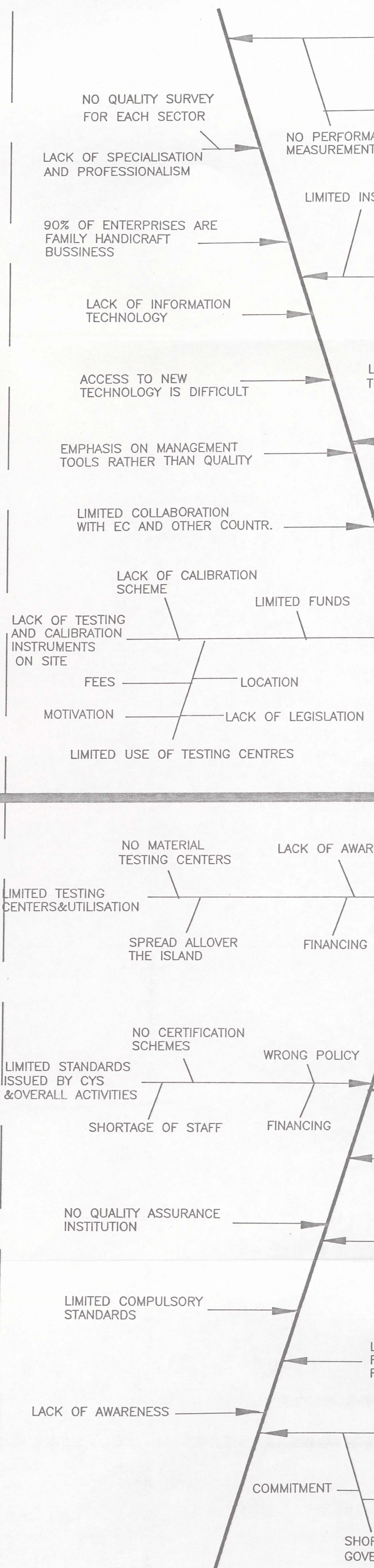
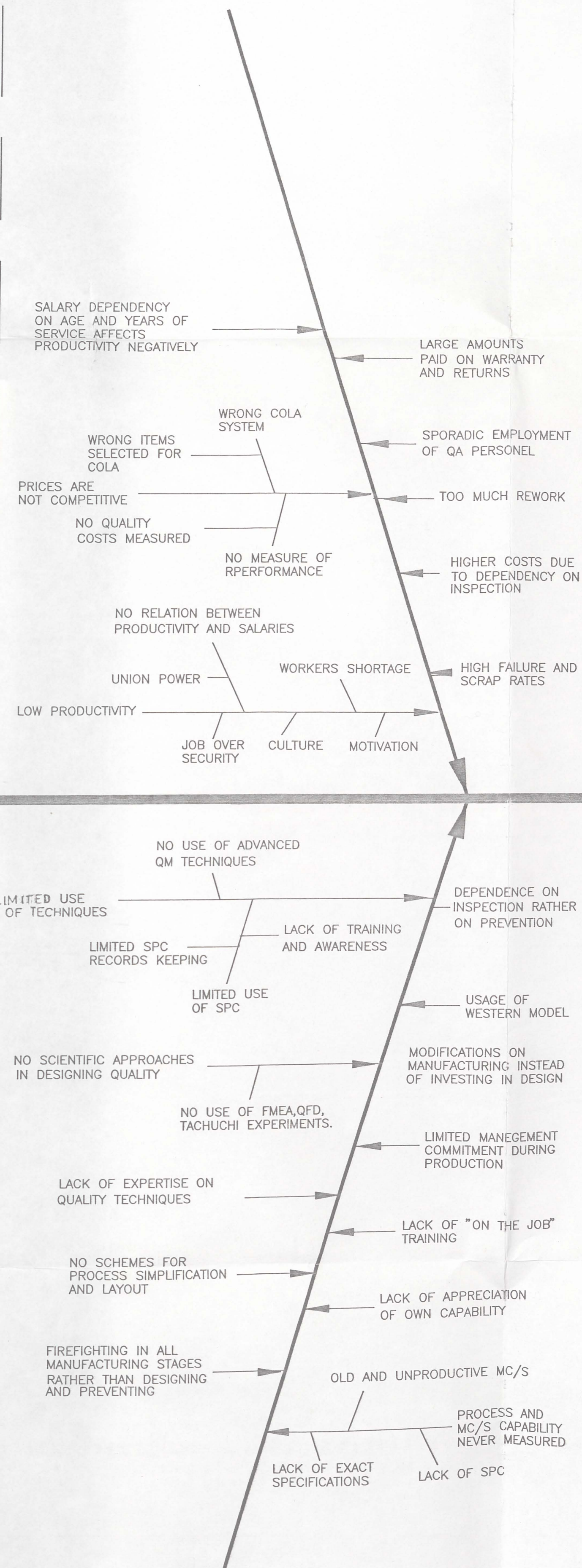
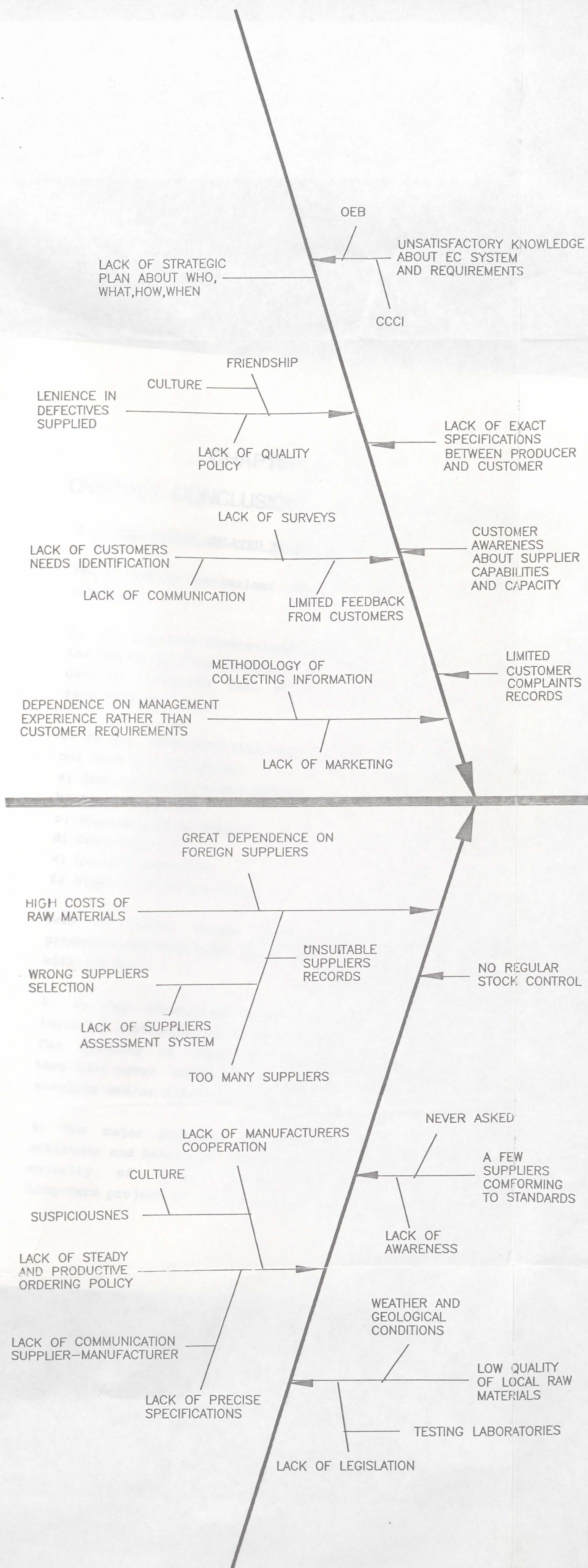
*Figure 6.1 FINDINGS OF AN EVALUATION  
OF THE STATUS OF TQM  
IN CYPRUS MANUFACTURING  
INDUSTRY IN A C&E DIAGRAM*



# CUSTOMERS

# QUALITY COSTS

# QUALITY ASSOCIATE



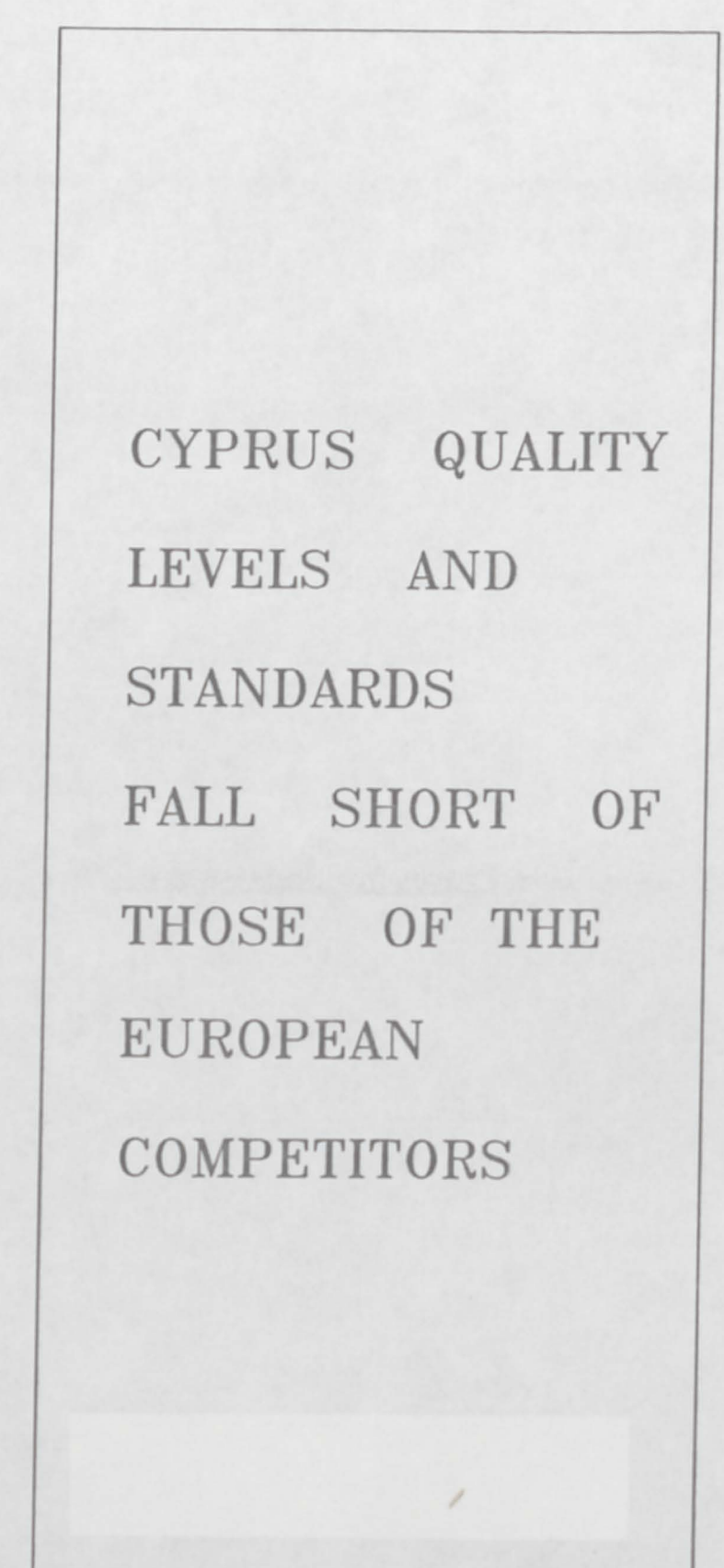
# SUPPLIERS

# ON LINE QUALITY

# SYSTEM



Figure 6.1 FINDINGS OF AN EVALUATION  
OF THE STATUS OF TQM  
IN CYPRUS MANUFACTURING  
INDUSTRY IN A C&E DIAGRAM



PREPARED AND DRAWN BY: I.I. ANGELI  
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NO PART OF THIS DIAGRAM MAY  
REPRODUCED BY ANY MEANS

CULTURE



## CHAPTER SEVEN

# OVERALL CONCLUSIONS AND RECOMMENDATIONS

### 7.1 CONCLUSIONS RELATED TO EVALUATION

The following conclusions have been drawn from this research.

1. It has been demonstrated that the hypothesis set at the beginning (see Chapter 1) is true, i.e., "Cyprus Quality Standards fall short of competitor countries" (see Chapter 5.2).

2. It was identified that the majority of companies did not have the following:

- a) Quality policies and manuals
- b) Quality systems
- c) Appropriate standards
- d) Legislation
- e) Quality personnel
- f) Right culture attitudes

Lack of these, causes several serious problems to producers and customers alike, especially those dealing with the EC.

3. It was identified that there is insufficient and incorrect communication between customers and suppliers. The majority of suppliers conform to no standard and they have never undergone assessment regarding their services and/or materials supplied.

4. The major problems are those dealing with people, attitudes and behaviour. These are the areas where the majority of efforts should be concentrate, if a long-term project or program is to be implemented. At

every stage the anticipated resistance to change should be seriously considered.

The following four opposing forces should be weakened or preferably reversed before any large scale implementation can take place.

- a) CULTURE (attitudes, behaviour, ethics)
- b) SYSTEM (structure, positions, titles)
- c) DEPENDENCY ON POLITICAL PARTIES
- d) UNION POWER

These are discussed in Chapter 5.3.

5. Quality-associated activities are limited to those activities dealing with money. (e.g., absences, output production, etc.) They are never concerned with productivity, quality costs, etc. For this reason records are kept only for such activities. Thus, most of the data for this thesis are extracted from empirical numbers based only on experience (Limited records, see Chapter 5.6). To address this deficiency there is great dependency on end production line inspection, with all the well-known unproductive results.

6. Use of quality techniques/tools is very limited, and in some cases is negligible. The most powerful tool, SPC, is used by only 10% to 15% of the large companies or companies working under licence.

7. The term "customer" has a confused meaning. The definition of Quality as "customer satisfaction" is not clear to everybody. Identification of who the customer is, what his requirements are and how these requirements can be satisfied, is limited only to few companies (20-30%).

8. Although there is a proliferation of training

programs, the appropriate training at all levels of an enterprise is not currently implemented. The characteristics of insufficient training offered are demonstrated below:

- a) Lack of professionals on Quality matters
- b) Over-dependency on foreign experts
- c) Lack of coordination between training establishments
- d) Unsuitability of training
- e) Lack of fees - funding
- f) Non-existence of "On-the-job training"
- g) Unwillingness/motivation for training

9. Performance was rarely measured. Quality costs, productivity, failure rates, customer complaints, etc. are vital factors which were seldom measured or were given inadequate attention.

10. A number of reasons for poor quality are hidden or never exposed due to some characteristics particular to Cypriots (passive, suspicious, wait for somebody else, etc.).

## 7.2 RECOMMENDATIONS

### 7.2.1 National Level

1. The problems and causes identified through the survey and elaborated in Chapters 5 and 6 (summarised in Figure 6.1 in a C & E diagram) need to be examined individually, evaluated and ranked. The solution should be the result of a team effort in which all the interested parties take a part and have an active role.

2. The research has demonstrated that TQM cannot be implemented at many Cyprus enterprises or on a large scale, because the majority of industrialists do not know what TQM is. It could be implemented by a few

large enterprises having the right structure, system, training and culture.

3. Most important for those who wish to proceed with TQM implementation are:

- \* consider TQM as a major project
- \* give it major project status
- \* guarantee management commitment
- \* have a steering group with top management involvement
- \* prepare a strategic plan/training plan with responsibilities
- \* use ISO, SPC, Quality tools.

4. As mentioned previously, the Quality problem should be analysed and evaluated by a team. That team/committee should come up with an action plan/strategic plan, using all data available from previous research, reports, etc. The action plan should be harmonized and integrated with the National Master Plan for upgrading Cyprus Industry (submitted to the Ministry of Commerce and Industry in 1991).

Upgrading and reinforcement of the already existing "Quality management" committee in which all the interested parties are involved, and assistance from the Institute of Technology (IOT) will contribute positively to the above target. A suggested structure of the preparation of an action plan for quality improvement are shown in Figure 7.1.

The new plan should not be buried once again in government drawers, as has happened in the past. Someone (see Figure 7.1) should proceed to a pilot implementation in some industries with common interests/sectors (consortia) assisted by different institutions (ITA, CPC, HTI, IOT, etc.) and EC funds.

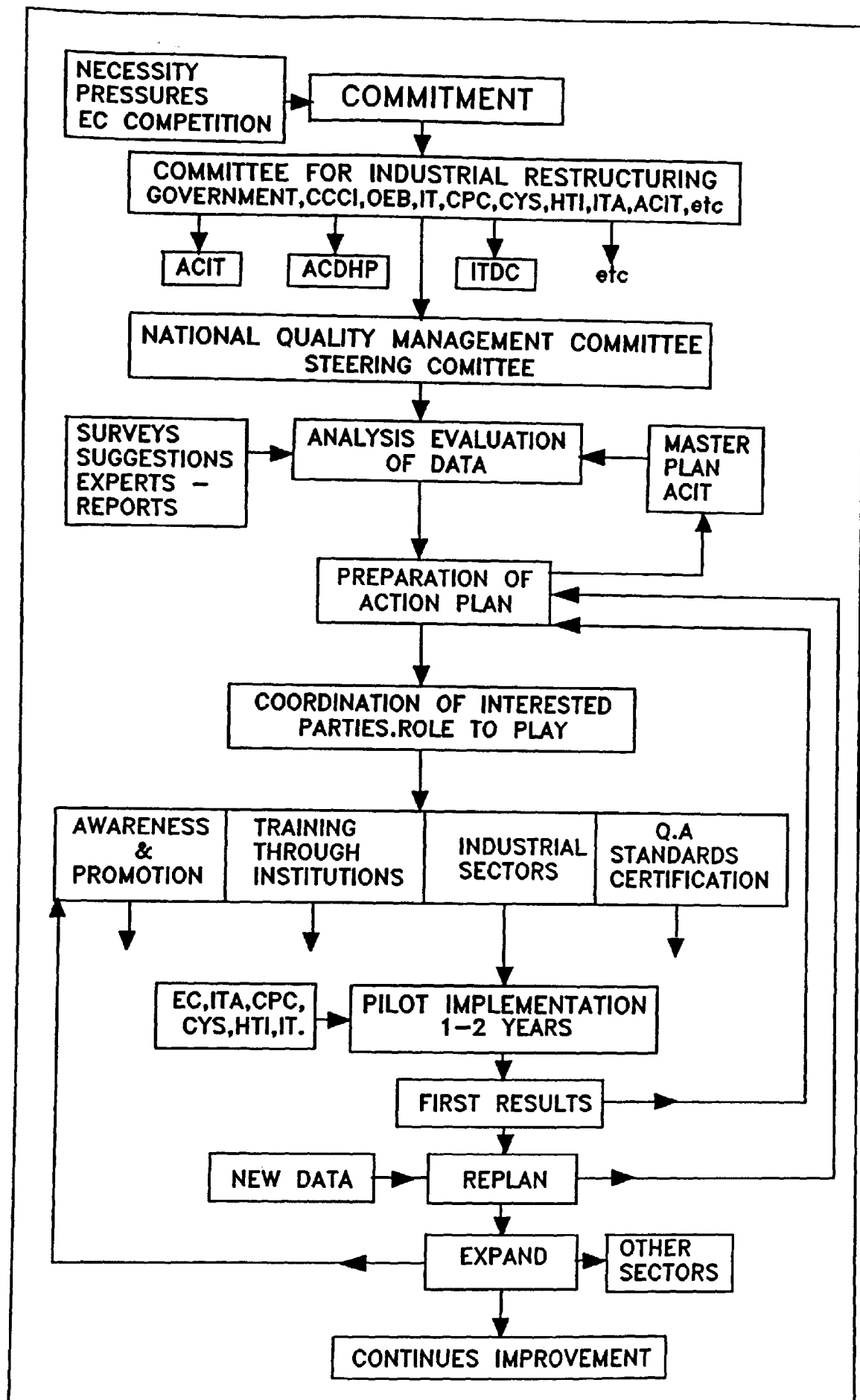


Figure 7.1.: Suggested structure of an act of preparation of an action plan for Cyprus quality improvement



This is the starting point. The continuous feedback, experiences and re-plan will guide to the implementation of more advanced plans and lead to expansion to other industrial sectors (Figure 7.1).

There are numerous ways in which the entire process and action plan could be assisted or even accelerated: by decisions and actions taken by people beyond the company level, awareness campaigns, seminars, training, talks, prizes, articles-programs via the media, legislation, standards, formation of QA bodies, lab-testing centres, etc.

#### 7.2.2. Company Level

In order to answer the second part of the original hypothesis (Chapter 1 up to what extent). Taking into consideration the Cyprus reality (how slow everything moves) until the above-mentioned measures are implemented Cypriot manufacturers should not mobilise; they should take their fortune and their future in their hands now.

Having secured the measures (manageable at company level) outlined above (7.2.1 paragraph 3) and taking into consideration the characteristics particular to Cyprus society (culture, systems, labour, shortages, passive, etc,) it is suggested that Cyprus industrialists:

- Do not wait for someone else to address their problems.
- Do not wait for help from anybody (Government, institutions, etc.).
- Begin first by securing senior management commitment.

- Draw up an action plan, implementable immediately for their enterprise, in coordination or under the supervision of a responsible institution/organisation.
- FIND a professional outside the company who is accepted by the majority of the personnel.
- FORM a small group with some other willing manufacturers to cut down expenses. Share action learning methodology.
- DRIVE out fear and suspiciousness. Study Quality Gurus.
- TRAIN local personnel on Quality matters.
- GUIDE-LEAD them forward the correct way for continuous improvement.
- STAY with them and SHOW the way of doing things right first time and every time.
- START with easy techniques that give quick results (i.e., SPC) and
- EXPAND to more advanced concepts, more laborious and difficult techniques by involving everybody in the business.
- GRASP any opportunity offered, i.e. EC financial protocol, training, special funds, etc.

Combining the professional's knowledge of Quality matters with the local personnels' experience in the identification and the solution to problems will give the maximum benefit and results toward competitiveness, quality and continued improvement.

The core is the company, centered around management. The quality "disease" should be injected by "doctors" to management. That disease will spread to other company levels both nearby and above. This will cause pressures from companies on government committees to create an environment of change. Naturally this is an upside-down approach.

The rest is a matter of time; the others will follow. If they don't follow, the game will be lost especially when they have to compete with EC prices and quality. After all "Survival is not compulsory".

### 7.3 RECOMMENDATIONS FOR FURTHER RESEARCH WORK

1. Analyse in detail the findings from the previous survey. Evaluate and rank the importance of each parameter, identifying the starting points.

2. Investigate how TQM can be implemented in any manufacturing industry.

3. Prepare proposals for a National Quality Improvement Programme to include courses, conferences, quality awareness programmes, legislation, implementation of TQM, information on costs of quality, quality awards, benefits of TQM in the short term and long term, etc.

This will be carried out in close cooperation with CYS and the Ministry of Commerce and Industry.

4. Pilot implementation of earlier findings, in a group of the largest manufacturing industries in Cyprus. This project would utilize the action learning methodology under close supervision of the researcher. A proposed plan of this project, suggested to HTI management, is attached as Appendix 9.

5. Conduct the same survey in three year's time with the same enterprises to determine what has been changed and in what areas. The first measurable figures and degree of improvement will be established by combining the results of the two surveys.

## APPENDICES

# APPENDIX 1

## PROCEEDINGS - NINTH INTERNATIONAL CONFERENCE OF THE ISQA - 1992

### ISO 9000 AND THE PHILOSOPHIES OF THE QUALITY GURUS- A Quality Function Deployment Analysis

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#### ABSTRACT

The purpose of this paper is to compare the requirements of the International Quality Assurance Management System Standard ISO 9000 with the philosophies of five of the leading quality gurus; namely, Crosby, Deming, Feigenbaum, Ishikawa and Juran. This is achieved by constructing a Quality Function Deployment (QFD) matrix. On the horizontal lines of the matrix the 20 "WHAT" requirements of ISO 9000 are identified. On the vertical lines of the matrix the "HOWS", the main points of each of the 5 gurus is presented; a total of 60. The correlation between the "WHATS" and "HOWS" is represented and analysed in the QFD matrix. The correlation between the respective philosophies of the gurus are represented and analysed in the matrix representing the roof of the House of Quality.

#### INTRODUCTION

The interest in Quality Management is growing throughout the world. Customers are becoming more demanding. They are no longer willing to accept inferior quality products or services. The quality revolution has indeed witnessed the emergence of numerous different kinds of quality programs, each with its own merits.

To establish a uniform approach to Quality Assurance Management we have recently seen the establishment of ISO 9000 as an International Quality Management System Standard. This standard is recognised in the United Kingdom by the series reference code BS 5750 and in the European Community and EFTA countries by the series reference code EN 29000. The text and requirements are identical under all three reference codes.

Most quality management theories can be traced back to the ideas and philosophies of a group of distinguished men often referred to as "Gurus", because they form a cornerstone of quality management theory. Five of the most important are Crosby, Deming, Feigenbaum, Ishikawa and Juran.

The overall major messages, objectives and philosophies of the gurus are consistent, varying only in detail. They all agree top management should take responsibility when implementing new quality programmes.

This paper will identify the requirements of ISO 9000 and compare the requirements with the philosophies of the gurus. The correlation between the philosophies of the gurus is also explored.

#### ISO 9000

The ISO 9000 quality assurance series is a harmonizing standard.

It is not a product specification standard but a quality management system standard. According to the standard quality equals "fitness for purpose" and the guiding principle is "right first time". Everyone in an organisation has a role to play in this system.

BS 5750 was the first quality assurance system for quality management. It was first published in 1977 and in 1989 was harmonised with ISO 9000.

ISO 9000 was first published in 1987 and was updated in 1989. Since then, over 91 countries have or are adopting the standard. From a recent survey May (91) 42 countries confirmed that either they use ISO 9000 or have identical or equivalent national standards.

One of the common issues that is associated with the European Community 1992 deadline is the formation and acceptance of common standards. ISO 9000 series standards have been adopted by EC as EN 29000 to assure consistency of product (or service) quality and reliability. The standards tell suppliers and manufacturers what is required from a quality oriented system.

ISO 9000 and 9004 are advisory in nature, whereas ISO 9001-9003 constitutes a three level series of quality assurance standards.

They are:  
Quality Systems for Design Development, Production, Installation and Servicing (9001).  
Production and Installation (9002).  
Final Inspection and Test (9003).

# PROCEEDINGS - NINTH INTERNATIONAL CONFERENCE OF THE ISQA - 1992

The series are accompanied by ISO 8402 "Quality Vocabulary".

The following is a summary of what each clause in the Part 1 standard means. They have the same numbers and sequence as they appear in the standard.

1. **Management Responsibility** - Management shall define in a document, its policy, objectives and its commitment to quality and ensure it is understood throughout the organisation.
2. **Quality System** - A documented quality system shall be established and maintained to ensure product quality and conformance. This will include the preparation and implementation of appropriate procedures and instructions.
3. **Contract Review** - Procedures shall be established and maintained for contract review and coordination and maintaining records.
4. **Design Review** - Procedures shall be established to control and verify all activities responsible for technical specification, design, planning, design input, output, verification and changes.
5. **Document Control** - Procedures shall be established and maintained to control all documents and data; including the review and removal of obsolescent documents. The procedures must provide document changes and modification control.
6. **Purchasing** - This clause includes selection of sub-contractors, and records of supplier capabilities and performance. It also addresses purchasing data verification of purchased product, and product identification and traceability.
7. **Purchaser Supplied Product** - Procedures shall be established and maintained for the verification, storage and maintenance of purchased supplied product provided for incorporation into the supplies.
8. **Product Identification and Traceability** - Procedures for identifying the product from drawing and specifications shall be established and maintained at all stages of production delivery and installation. Individual product or batches shall have a unique identification.
9. **Process Control** - To ensure quality, production and installation shall be planned so that they are carried out under controlled conditions. This will include, where appropriate, work instructions, written standards, monitoring and control, and approval of processes and equipment.
10. **Inspection and Testing** - This covers verification of in-coming goods, in-process and final inspection procedures and records.
11. **Inspection, Measuring and Test Equipment** - This covers the control, calibration and maintenance of all inspection, measuring and test equipment, and demonstrates the conformance of product to the specified requirements.
12. **Inspection and Test Status** - This covers the requirement for the inspection and test status to be identified at all stages of the production and installation processes.
13. **Control of Nonconforming Product** - Procedures shall be established and maintained to ensure control and identity products that do not conform. Thus prevented from inadvertent use or installation.
14. **Corrective Action** - Procedures shall be established for documenting and maintaining procedures for tracing causes, introducing corrective action and recording resulting procedure changes.
15. **Handling, Storage, Packaging and Delivery** - Procedures shall be defined that prevent damage to components at all stages of production, storage, handling and delivery.
16. **Quality Records** - Procedures shall be established for identification, collection, indexing, filing, storage, maintenance and disposal of quality records.
17. **Internal Quality Audits** - A comprehensive system of planning and documented internal quality audits need to be established to determine the effectiveness of the quality system.
18. **Training** - This covers procedures for identifying the training needs that are to be satisfied on the basis of qualifications required to perform work tasks, and the requirement for maintaining such records.
19. **Servicing** - Where servicing is specified in a contract, procedures shall be established and maintained.
20. **Statistical Techniques** - Where appropriate, procedures shall be established for identifying adequate statistical techniques required for verifying the acceptability of process capability and product characteristics.

# PROCEEDINGS - NINTH INTERNATIONAL CONFERENCE OF THE ISQA - 1992

## THE GURUS

A brief synopsis of the philosophies and methodology of the gurus is now provided.

### CROSBY

Philip B Crosby is one of the quality gurus, who has developed his own distinctive approach to Total Quality. He was the corporate vice president and director of quality at the ITT Corporation. In 1979 he established a Quality College in Florida, USA, to spread his philosophy.

Crosby uses a disciplined and highly structured approach which is not solely product oriented, but is based entirely on "prevention" and readily applicable to any enterprise.

With his four "absolutes" for quality management, Crosby provides the well-defined road map for attaining a new management quality commitment and culture programme. A well-structured approach which demonstrates how the culture can be changed, and a process improved, is provided through the 14-step quality improvement process.

Because of his focus on first, changing the management culture, Crosby's approach is clearly a top-down process.

The approach and main doctrines of Crosby, as well as, the other four gurus in the field of quality management are summarised in abbreviated form in Table 1.

### DEMING

Dr W Edwards Deming is an American Statistician from Yale University. He worked at Western Electric and in March 1950 went to Japan. Deming spent 30 years helping to lead the Japanese economy out of the devastation of war to become one of the dominant industrial powers of the 1980's. He was, and still is, a national hero in Japan. The most prestigious National Quality Award "The Deming Prize" carries his name.

Deming's philosophy is as much about management style and leadership as a practice of quality itself. Through his 14 points of management obligations and management commitment he removes the major roadblocks in quality improvement, enabling the renaissance in quality attitude and promoting a participative management style.

Apart from the 14 points (which appear in Figure 1) his book "Deming Management Style" review Deming's seven deadly diseases and obstacles, many of which are so serious as to be fatal to an organisation unless corrected. Deming is as much a part of total quality management today as he was 30 years ago. His teaching is as vital as ever.

### FEIGENBAUM

Feigenbaum is a strong advocate of the "Total Quality System" approach. He argues that any single activity can create a quality problem, there is therefore a need for integrated and continuous control of all activities. The total Quality system should offer customers the quality they seek.

He also states two organising principles for quality "quality is everybody's job" and "everybody's job tends to become nobody's job"

Feignebaum argues that the requirements from the organisation point of view is for quality programmes to be maintained which must be recognised as a systematic group of quality disciplines, and be continuously coupled with the buyer and customer. The need for integrated high level control is primary, than secondary importance.

### ISHIKAWA

Kaoru Ishikawa was a Japanese chemist who graduated from Tokyo University in 1939. Ishikawa has long been considered one of the world's foremost authorities on quality control. His practical methods have helped many companies produce higher quality products at lower costs.

The main issues of his methodology includes involvement of all employees in all stages of decision making, use of quality circles for problem solving and extensive use of statistics and quality control at all stages.



# PROCEEDINGS - NINTH INTERNATIONAL CONFERENCE OF THE ISQA - 1992

He states the 14 points difference between the Japanese and the Western experience. The 14 points are compared again with ISO 9000 in Figure 1.

## JURAN

Juran breaks quality tasks into two distinct categories: break through, and control. He also divides the solving effort into two journeys: a journey from symptom to cause and a journey from cause to remedy. The first is the most difficult.

One of the theories for management of quality is "The Juran Trilogy". These three managerial processes are expressed as quality planning, quality control and quality improvement.

Similar to the other gurus, Juran places emphasis on the importance of quality control, setting goals for improvement, providing training, monitoring and recording the progress in achieving those goals.

Dr Juran suggested 10 steps for quality improvements. These are identified in Figure 1.

Table 1: A comparison of the gurus

<b>CROSBY</b> Definition: conformance to requirements	<ul style="list-style-type: none"> <li>* Zero Defects</li> <li>* Cost of quality</li> <li>* Hidden factory</li> <li>* Slogans</li> <li>* Management culture</li> <li>* Process model</li> </ul>
<b>DEMING</b> Definition: has no meaning except the definition that you give it	<ul style="list-style-type: none"> <li>* Process orientation</li> <li>* Use of statistics</li> <li>* Drive our fear</li> <li>* Reduction of variation</li> <li>* All one team</li> </ul>
<b>FEIGENBAUM</b> Definition: is everybody's job	<ul style="list-style-type: none"> <li>* Total quality system</li> <li>* Design quality in</li> <li>* Customer orientation</li> <li>* Quality programs</li> </ul>
<b>ISHIKAWA</b> Definition: conformance to customer requirements	<ul style="list-style-type: none"> <li>* Use of statistics</li> <li>* Quality circles</li> <li>* Involvement of employees</li> <li>* Quality control</li> </ul>
<b>JURAN</b> Definition: fitness for purpose	<ul style="list-style-type: none"> <li>* Management involvement</li> <li>* Quality planning</li> <li>* Quality Control</li> <li>* Quality improvement</li> </ul>

## THE QUALITY FUNCTION DEPLOYMENT METHODOLOGY (QFD)

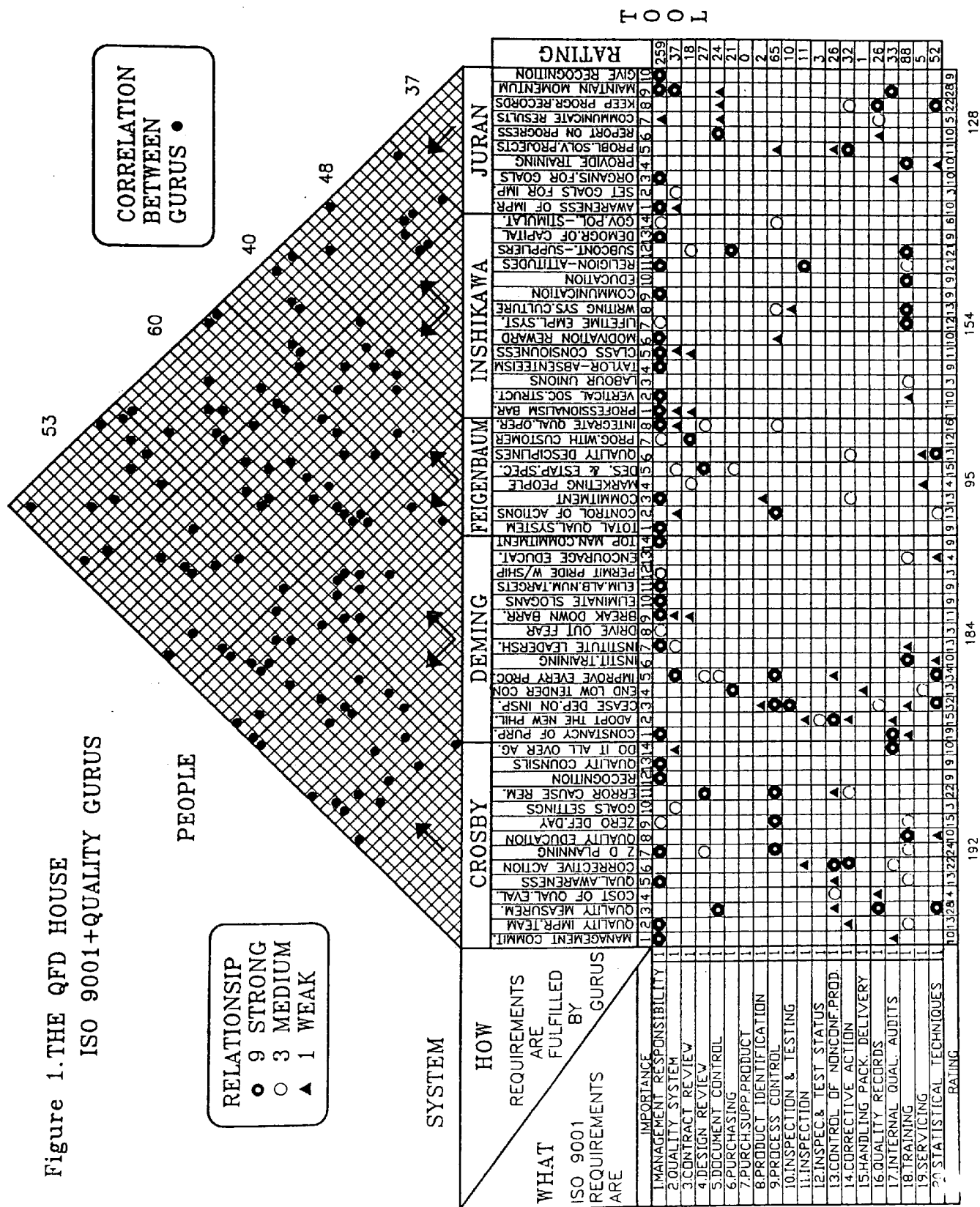
The QFD methodology has been selected to demonstrate the relations between the requirements of ISO 9000 and the philosophies of the gurus.

On the horizontal lines of Figure 1, the 20 "WHAT" requirements of ISO 9000 are identified. On the vertical columns the points of each guru are presented (total 60), showing "HOW" these requirements are supported by the methodology of the gurus. In QFD worksheets the relationship between what and how is given by the symbols shown on the top of the worksheet, the symbols represent the numerical values of 9,3,1. A strong correlation is denoted by 9, medium by 3 and weak by 1. A blank indicates no correlation.

On the "importance" vertical column of ISO 9000, the same number of importance 1, was allocated to each requirement. It was decided at this stage not to differentiate between the importance of the individual requirements as ISO argues that they are all of equal importance. In a normal QFD worksheet an important number ranging from 1 to 9 can be allocated to each requirement. That number is then multiplied by the value appearing on the vertical rating column to determine the total value of support for each requirement.

The roof of the QFD house shows the correlation between the points of each guru. The correlation symbols used on a standard QFD worksheet, have not been used. A shaded circle here

Figure 1. THE QFD HOUSE  
ISO 9001+QUALITY GURUS



# PROCEEDINGS - NINTH INTERNATIONAL CONFERENCE OF THE ISQA - 1992

indicates that there is relation between the two corresponding points.

The last horizontal and vertical lines of the rectangular matrix show the summation of the relation (numbers) between requirements, i.e. the vertical line, shows by how much the gurus points relate to that particular requirement of ISO. The horizontal line shows how much one particular point of a guru relates to the ISO 9000 requirements.

When there is a symbol inside the square boxes (Rectangular matrix) it means that there is relationship (strong, medium or weak) between the corresponding ISO requirement and the Guru's points. To identify the relationship follow the line to the left to find the ISO requirement. By drawing a vertical line upwards from the same box it will identify the particular point of a particular Guru which relates to that requirement.

The same principle operates for the triangular matrix. Each circle in the boxes indicates that there is correlation between one point of a particular Guru with a point of another Guru. Again in this matrix follow the two directions of the lines downwards and at right angles to each other.

The numbers below the horizontal line ratings (192, 184, 95 etc) indicates the total points in relation to each Guru with ISO. The number (53, 60, 40 etc.) shown on the right above the triangular matrix indicates how many times points of one particular Guru have a correlation with the others.

## CONCLUSIONS

From an examination of the QFD chart (Figure 1) some conclusions can be drawn.

### A. ISO 9000 AND THE GURUS

1. The chart revealed that not one of the five gurus points cover all the ISO requirements. By adding all the points together at least 15 requirements are covered very thoroughly. However some of the guru's points are not covered by the standard or there is not strong relationship (refer to the horizontal rating line).
2. Considering the vertical rating column the most important requirements or points, stressed by the gurus, were identified. They are as follows, in rank order.

a. Management responsibility	259
b. Training	88
c. Process control	65
d. Statistical techniques	52
e. Quality system	37
f. Internal Quality Auditing	33
3. In spite of the fact that the number of points of each guru investigated is unequal, it can be stated that "Crosby's and Deming's" points are more strongly related to ISO (refer to horizontal vertical rating, 192, 184).

### B. COMPARISON BETWEEN THE GURUS

The correlation of the guru's points shown in the roof of the QFD house consist of 119 entries.

The correlation and similarities can be identified. It reveals again that Crosby and Deming have the largest number of similarities with the rest of the gurus.

By combining and following the ISO requirements and the gurus approach, an enterprise can follow the path to continuous improvement, leading to expanded and continued market share, credibility and profit. The methodology described in this paper can be used by companies to help to identify a strategy for Total Quality Management implementation, and to decide the teachings of which Guru would be most suited to their company.

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The following publications and video tapes have been used in the preparation of this paper

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- Mason Ted, Total Quality Management, Briefings of a 4 day Seminar, PLQ Limited, Nicosia, Nov. 1991, Cyprus.
- ISO, ISO 9000 Series, Quality Systems, First Edition, 1987.

### Video Tapes:

- Crosby on Quality, Part I & II, Video cassette, VHS, 40 min, BBC Training videos.
- The Road map for change, The Daming approach, Video cassette, VHS, 35 min, An encyclopedia Britanica Film.
- Juran on Quality Planning, video cassette, VHS, 35 min, Juran Institute.
- International Quality Assurance Management System Standard, Session I & II, video cassette, VHS, 43 min, BSi Quality Assurance.

## APPENDIX 2

# INDUSTRIAL STUDIES ON THE STATUS OF CYPRUS MANUFACTURING INDUSTRY

### A.2.1. INTRODUCTION

This Appendix outlines the production, productivity and manpower of the CMI and presents statistical and general information, and the structure of Cyprus industries.

This material was compiled to furnish the author with the facts and information necessary for the formulation of the questionnaire. In addition, the criteria for selection of the appropriate sample was based on this material.

### A.2.2 BRIEF REVIEW OF CYPRUS MANUFACTURING INDUSTRY

#### A.2.2.1. Definitions

According to the 1968 ISIC, "Manufacturing" [Industrial Statistics 1989] is defined as the mechanical or chemical transformation of inorganic or organic substances into new products whether the work is performed by power driven machines or by hand, whether it is done in a factory or in the worker's home, and whether the products are sold at wholesale or retail".

The main sectors of the Cyprus Manufacturing Industry are written below [Industrial Statistics 1989, Census of Ind. Prod. 1986]:

- Food, beverages and tobacco
- Textiles, wearing apparel and leather
- Wood and wood products, including furniture
- Paper and paper products, printing and publishing
- Chemicals and chemical, petroleum, rubber and plastic products

- Non-metallic mineral products
- Metal products, machinery and equipment
- Other Manufacturing Industries, including cottage industry.

#### A.2.2.2. General Information

The main indicators of Cyprus are presented below [Economic Report 1989].

By referring to "Economic report" [1989] it can be seen that industry plays one of the most important roles in the GDP, accounting for approximately 20%. Compared with the other productive areas, manufacturing shows a declining trend, which is matter of concern. This is due to the emphasis in recent years on services (banking, tourism).

Area : 9.300 sq.km

Population: 695.000

Labour force: 274.000

Unemployment: 1.8%

Gross Domestic Product: US\$5.5 bilions

Annual rate of Growth: 6.1%

Inflation: 3-5%

The position of the manufacturing industry with respect to overall industrial production and contribution to the GDP is encouraging. There is an increasing trend for manufacturing to play a vital role in Cyprus. So while industry shows a declining trend, the manufacturing industries show an increasing trend compared with other sectors of industry.

#### A.2.2.3. Contribution and Distribution of Manufacturing Industries

Figure A.2.1. depicts the most important sectoral groups

within the manufacturing industry in Cyprus.

### STRUCTURE OF MANUFACTURING, 1990

(at current market prices)

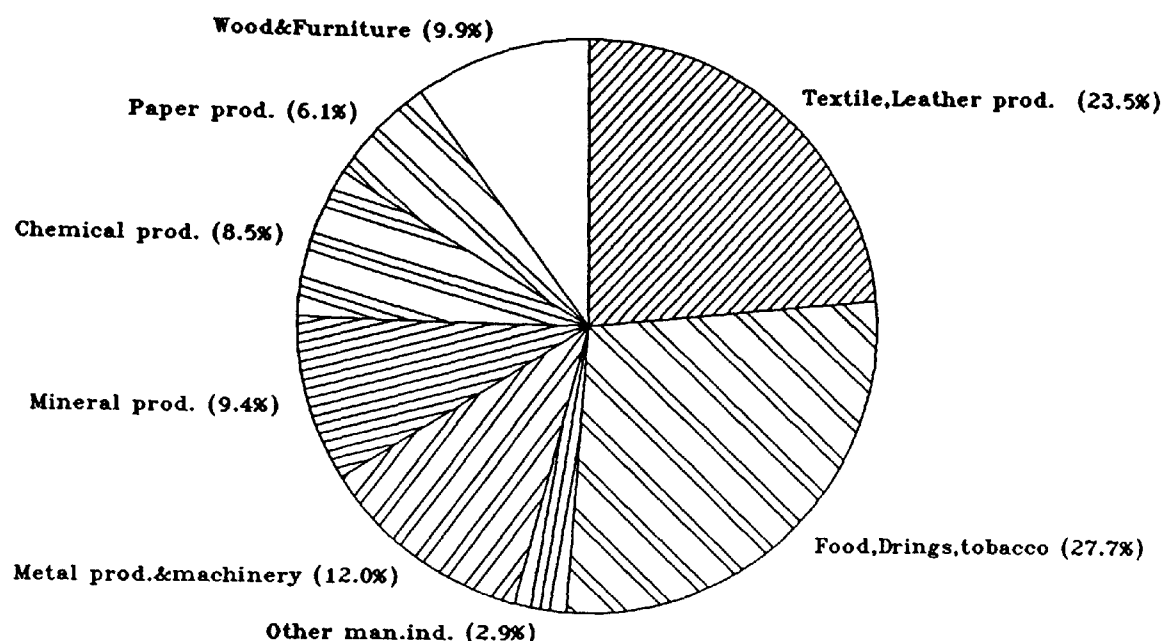


Figure A.2.1.: Composition of Cyprus Manufacturing Industry 1990

Based on the above information it was decided to interview or question the four largest manufacturing industries (groups) whose overall contribution to the GDP (manufacturing) is approximately 75%.

These are:

- Textile & Wearing Apparel, and Leather	23.5%
- Food, Beverages and Tobacco	27.6%
- Metal Products, Machinery & Equipment	12.1%
- Wood and Wood Products, including Furniture	10.3%

The same industrial sectors were chosen by a team of experts who were invited by the Cyprus Government in

1987 to study the Cyprus manufacturing industry. The visiting team of experts was organized by the Institute of Developing Studies of Sussex University, under the general programme of the UNDP in an effort to upgrade Cyprus industry. The reports were written under the general heading "CYPRUS INDUSTRIAL STRATEGY" and there were five reports [UNDP 1987]:

- (i) Main Reports V.I & V.II
- (ii) Clothing
- (iii) Footwear
- (iv) Metal Industry
- (v) Furniture

Some of the conclusions of those experts, especially those related to quality, will be related in Chapters 5 & 6, which reports on discussions and suggestions.

Clothing, food processing, footwear, metal industry and furniture are the largest sectors of manufacturing selected by the experts and for this research.

#### A.2.2.4. Cost-Structure of Manufacturing

According to Industrial Statistics [1990] on costs structure of manufacturing, it can be seen that 66.1% is spent on materials and the rest on labour and other expenses. It is important to note that the expenses proportion for materials and services has decreased in the last 10 years. This is because the majority of materials are imported from abroad, mainly from EC countries. The reasons for that decrease are either (1) new, more productive methods, (2) the import of materials at lower cost and inferior quality, or (3) the labour cost increase in Cyprus. In some cases the second reason is the most common. Quality is always of top priority in EC countries. Attention should be paid to identify suppliers and materials with top quality,



since they account for 66% of the total costs.

Labour and administrative expenses are increasing worldwide and have an unavoidable increasing trend. These expenses can be balanced through increased productivity to counterbalance labour costs.

By referring to the price index of manufacturing production by industry 82-89 [Industrial Statistics 1989] it can be seen that in general the price of manufacturing products increases at a rate of 3.5% per year. Specifically the rates are: food 4.0%, clothing 4.5%, footwear 4%, furniture 4.5%, metal products 6%. The opposite is true for the price index of inputs for manufacturing 85-88 which showed a declining trend. By adding those two numbers (3.5 + 2.5) the total 6% is higher than the inflation rate which is approximately 2-5% for the last 7 years. This has a detrimental effect for the competitiveness of Cyprus products.

#### A.2.2.5. Size of Enterprises

The majority of enterprises in Cyprus are family-owned businesses with a very small number of enterprises working as share-holding or public companies (i.e, banks, insurance companies, private clinics, building and construction firms, etc).

The size of Cyprus enterprises in terms of number of employees (see figure A.2.2.) is very small. Out of 45,600 enterprises in the free territories (not occupied by the Turkish troops), 53% employ only one person and only 1% of this number has more than 50 employees. This led to the conclusion that in Cyprus the majority of enterprises are small-scale businesses (handicraft).

The majority of the enterprises (72%) are located in industrial estates near the large towns and employ 82%

of the labour force. The number of employees has increased by 3% each year since 1985, reaching a total of 203,000 in 1989. The percentage of women in the labour force increased from 30% in 1976 to 37% in 1989 [Labour Statistics 1989].

As only 1% of the enterprises employs more than 50 persons it was decided to interview the majority of these companies. According to statistical information kept by the Ministry of Commerce and Industry, the industries with the highest contribution to exports (especially to EC) are the largest industries (i.e., with the greatest number of employees).

Enterprises employing 10-45 persons were also interviewed.

#### SIZE OF ENTERPRISE 1989

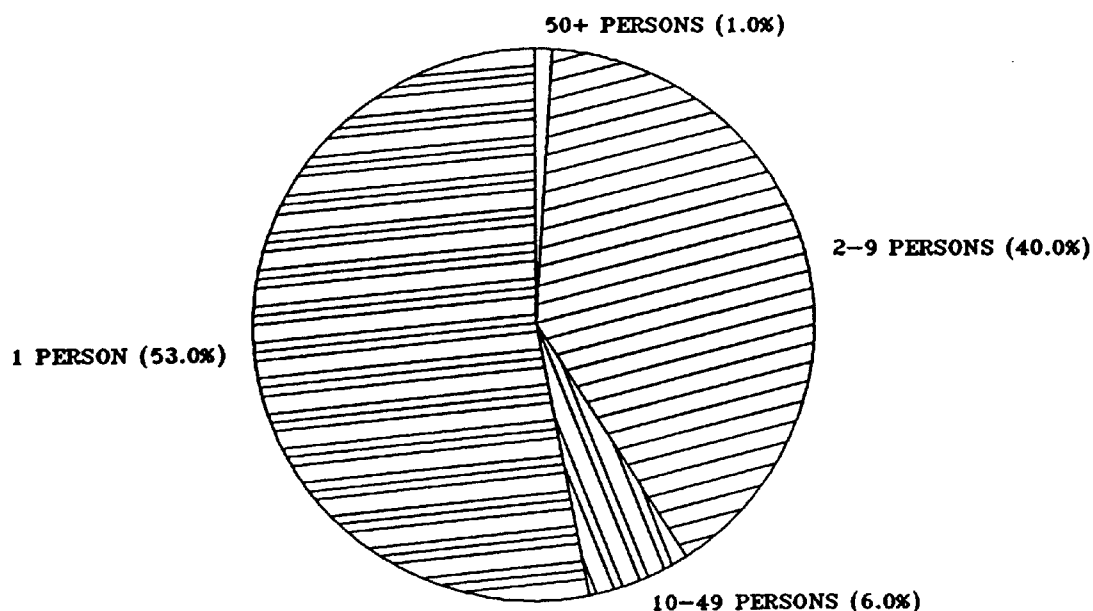


Figure A.2.2.: Size of Enterprise 1989  
(persons employed in one  
factory)

Figures regarding employment in manufacturing and the

number of persons employed per sector are given below  
[Labour Statistics 1988]:

<u>Sector</u>	<u>No. of persons</u> (Thousands)
- Food	5.861
- Apparel-clothing	11.636
- Footwear	2.697
- Furniture and Fittings	3.043
- Metal Products except Machinery	3.078

#### A.2.2.6. Supplementary Information

##### Production Output:

In 1989 the GDP for manufacturing was C£309.1 out of C£1,992.1 mn of the national GDP. This means that manufacturing contributes more than 18% to the national GDP. The increasing importance of the manufacturing industry to the economy of Cyprus reinforces the argument that the introduction of TOM to CMI is necessary and vital for survival and competitiveness.

Due to the leading and important role of manufacturing to the Cyprus economy it was decided to focus on this sector. Cyprus is a small island which is easily affected by internal and external factors, especially if one sector is entirely dependent on external factors (such as the tourist industry). The recent example of the repercussions to the tourist industry because of the Gulf War reinforces the opinion that even more attention and investments should be made in manufacturing sectors.

##### Expenditure on Fixed Assets

Referring to the expenditure on fixed assets by major manufacturing groups [Industrial Statistics 1989] it can

be seen that the majority (66 to 68%) of the total investments goes to machinery and equipment and the rest goes to construction and transport equipment (22% and 10% respectively). Further analysis of fixed assets information with respect to the GDP indicates that the results are not so encouraging. The 1980 percentage of 24.4 dropped down to 13.9 in 1989. The investment in construction was also reduced, with an equal increase in transport equipment. The percentage amount of investments is very low compared with other European countries. It is rather difficult to increase quality by reducing investments on machinery, training, etc.

### Domestic Exports

The tourist industry is the greatest contributor to foreign currency earnings, followed by domestic exports. Therefore exports are of great importance to the income of Cyprus. Out of £231.987 million for total exports, C£187.165 million come from industrial products [Economic report 1989]. So 80% of Cyprus exports depend on industrial products, but with a decreasing trend in the last 4 years.

The total exports absorbed by the EC average 60%, followed by the Eastern Trading Area. Exports to EC countries show a steadily increasing trend, indicating that Cyprus should concentrate efforts to harmonize its manufacturing industry with that of EC countries.

Hence it was decided to first interview industries with exports to the EC (mainly to the UK, Belgium, Luxembourg, Greece, Germany) and then to several Arab countries (Libya, Lebanon, Egypt, etc.).

### Imports

The majority of imports come from EC countries,

(approximately 60%), followed by Japan (15%) [Imports & Exports statistics 1989]. So there is a balance of payments between imports and exports with EC countries. European Community countries can provide quality products, and Cyprus should benefit from that and import the best quality from the EC.

### Inflation

Overall Cyprus has a healthy economy at least for the present. This is shown on the National accounts, the Balance of payments, money and banking in "Cyprus Economic Report" [1989]. The Cyprus image is completed by comparing the inflation rates with those of EC countries. The same pattern, during recent years, applies for both communities (3-5% on average).

## APPENDIX 3

### PEOPLE & ORGANISATIONS INVOLVED IN THE PREPARATION OF THE QUESTIONNAIRE

- 1) Mr J.A. Smith, Director of Studies, University of Glamorgan, UK.
- 2) Prof. D.L. Hawkes, Second supervisor, University of Glamorgan, UK.
- 3) Dr I. Karis, Local Second Supervisor, Cyprus Standards Organisation, Cyprus.
- 4) Dr I. Fessas, Advisor Private Consultant, Proplan Ltd, Cyprus.
- 5) Dr Adrian Ioannou, Advisor, Senior Consultant, Coopers & Lybrand, Cyprus.
- 6) Dr Lazaris Lazari, Lecturer, Higher Technical Institute, Cyprus
- 7) Mr Mikis Michaelides, Quality Engineer, Cyprus Refinery, Cyprus
- 8) Mr F. Karis, Cyprus Chamber of Commerce and Industry.
- 9) Mr G. Christofides, Employers & Industrialist Federation.
- 10) Mr G. Shekkeris, Industrial Training Authority of Cyprus.
- 11) Mr A. Kyriakou, Cyprus Productivity Centre, Cyprus.

## **APPENDIX 4**

### **QUESTIONNAIRE USED FOR THE EVALUATION OF TQM ACTIVITIES DISTRIBUTED TO 60 MANUFACTURING INDUSTRIES IN CYPRUS**

# THE POLYTECHNIC OF WALES

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENG.

WALES — U.K.

IN COLLABORATION WITH

## HIGHER TECHNICAL INSTITUTE

DEPARTMENT OF MECHANICAL AND MARINE ENG.

NICOSIA — CYPRUS

RESEARCH ON

”IMPLEMENTATION OF TOTAL  
QUALITY MANAGEMENT”  
IN CYPRUS

BY:

IOANNIS IONA ANGELI



Director of Studies: Mr J.A. Smith, MPhil, DICE, C.Eng., MIMech.E  
Reader, Mechanical & Manufacturing  
Engineering Department  
Polytechnic of Wales

Supervisors : Professor D.L. Hawkes  
Mechanical & Manufacturing  
Engineering Department  
Polytechnic of Wales, UK

Dr I Karis  
Director CYS  
Cyprus

Advisors : Dr Ioannis Fessas  
Consultant  
Cyprus

Dr Andrian Ioannou  
Ioannou & Iambelas Consultants  
Cyprus

Sponsor : "WOLF" Wire & Tine Industries  
Nicosia, Cyprus



COVERING LETTER

This research is carried out by Mr Ioannis Iona Angeli, member of the academic staff of the Higher Technical Institute under the guidance and supervision of the Polytechnic of Wales (Mechanical and Manufacturing Engineering Department) in collaboration with HTI and the assistance of CYS and Q.C.Organisation. Provided that Cyprus will join E.E.C.in the near future the Cyprus government and more specifically the Cyprus Manufacturing Industries are concentrating their efforts in upgrading the Cyprus economy and industry and increase our competitiveness by improving quality.

The aim of this investigation is to improve the performance of the manufacturing industry in Cyprus.This will be achieved by introducing modern concepts of Total Quality Management together with appropriate statistical methods,and by designing and developing a quality assurance implementation methodology.

The purpose of this questionnaire is to identify the current state of Cyprus manufacturing industries i.e.what quality means in Cyprus what methods are used, up to what levels it is implemented and what is left to be done.The information provided by the survey will be analysed,and lead hopefully to useful comprehensive information to assist the completion of the final report with the findings.

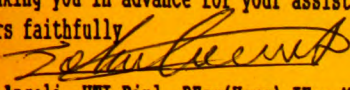
This is the first time such a survey is conducted in Cyprus, and we are therefore seeking your assistance and cooperation.All information collected will be treated as strictly confidential and will used solely for statistical purposes.

Please allocate approximately one hour from your valuable time to answer accurately as many questions as possible following the instructions in each question by entering your answer in the answering box or more than one answer when it is specified above the box. Use the envelope provided to send back the questionnaire.

In case of any difficulties, or if you prefer a personal interview please do not hesitate to contact Mr I Angeli at HTI, tel: no.02-305050.

Thanking you in advance for your assistance and cooperation, I remain.

Yours faithfully

  
I I Angeli, HTI Dipl.,BEng(Hons),IEng,MASQC,GMIProdE,GMIMechE  
Laboratory Assistant 1st Grade HTI

ΣΗΜΕΙΩΜΑ

Η έρευνα αυτή διεξάγεται από τον κο Ιωάννη Ιωνά Αγγελή μέλος του ακαδημαϊκού προσωπικού του Ανώτερου Τεχνολογικού Ινστιτούτου κάτω από την επίβλεψη και τις οδηγίες του Πολυτεχνείου Ουαλλίας (Τμήμα Μηχανολογίας) και σε συνεργασία με το ΑΤΙ και την βοήθεια του Κυπριακού Οργανισμού Προτύπων και Ελέγχου Ποιότητας.

Λαμβάνοντας υπόψη ότι ο Κύπρος θα ενωθεί με την Ευρωπαϊκή Οικονομική Κοινότητα στο εγγύς μέλλον η Κυπριακή Κυβέρνηση και ιδιαίτερα οι Κυπριακές βιομηχανίες συγκεντρώνουν όλο τους το ενδιαφέρον στην αναβάθμιση της Κυπριακής οικονομίας,βιομηχανίας και στην αύξηση της ανταγωνιστικότητας μας με την καλλιέργεια της ποιότητας.

Ο στόχος της έρευνας είναι η αύξηση της αποδόσεως της Κυπριακής βιομηχανίας.Αυτό θα επιτευχθεί με την εισαγωγή μοντέρνων θεμάτων της ολοκληρωτικής Ποιοτικής Διεύθυνσης (TQM) σε συνάρτηση με τις ανάλογες στατιστικές μεθόδους και με τη μελέτη και ανάπτυξη μιας μεθοδολογίας εφαρμογής ποιοτικής επιβεβαίωσης.

Ο σκοπός του ερωτηματολογίου αυτού είναι να βρεθεί το ποιοτικό επίπεδο των Κυπριακών βιομηχανιών δηλαδή τι σημαίνει για την Κύπρο ποιότητα,τι μέθοδοι χρησιμοποιούνται,μέχρι ποιού σημείου εφαρμόζονται και τι απομένει να γίνει.Οι πληροφορίες που θα αποκομισθούν από την έρευνα θα αναλυθούν και τα συμπεράσματα θα αποτελέσουν την βάση για την σύνταξη της τελικής αναφοράς.

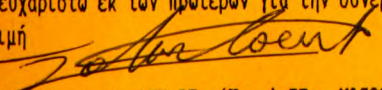
Είναι η πρώτη φορά που διεξάγεται τέτοιου είδους έρευνα στην Κύπρο,γι' αυτό το λόγο ζητούμε την βοήθεια και τη συνεργασία σας. Όλα τα στοιχεία που θα συλλεγούν θα κρατηθούν άκρως εμπιστευτικά και θα χρησιμοποιηθούν μόνο για στατιστικούς σκοπούς.

Παρακαλούμε να αφιερώσετε περίπου μία ώρα από τον πολύτιμο χρόνο σας για να απαντήσετε με ακρίβεια όσο περισσότερες ερωτήσεις μπορείτε ακολουθώντας τις οδηγίες της κάθε ερώτησης βάζοντας την απάντησή σας στο κουτάκι απαντήσεων ή περισσότερες απαντήσεις όπως αναγράφεται πάνω από το κουτί. Χρησιμοποιήστε το φάκελλο που σας έχει δοθεί για να αποστείλετε πίσω το ερωτηματολόγιο.

Σε περίπτωση οποιασδήποτε δυσκολίας των ερωτήσεων ή της προτίμησης προσωπικής συνέντευξης μή διστάσετε να επικοινωνήσετε με τον κο Ιωάννη Αγγελή στο ΑΤΙ, τηλ.02-305030.

Σας ευχαριστώ εκ των προτέρων για την συνεργασία και βοήθεια σας.

Με τιμή

  
I I Αγγελή, Διπλ. ΑΤΙ,BEng(Hons),IEng,MASQC,GMIProdE,GMIMechE  
Εργαστηριακός Βοηθός 1ης Τάξης ΑΤΙ



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## TOTAL QUALITY MANAGEMENT

---



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## QUALITY THAT WINS BUSINESS

---

Name of Enterprise or name of Holder .....  
Όνομα επιχείρησης ή όνομα ιδιοκτήτη

Address : .....  
Διεύθυνση :

Name of person and title providing data: .....  
Όνομα και τίτλος του ατόμου που δίδει τα δεδομένα:

Note: This part will be removed.  
Σημ.: Αυτό το μέρος θα αφαιρεθεί.

Code No: .....

QUESTIONNAIRE ON TOTAL QUALITY MANAGEMENT

SECTION I/TΜΗΜΑ Ι  
GENERAL CHARACTERISTICS - ΓΕΝΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ

A) CHARACTERISTICS OF ENTERPRISE  
ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΕΠΙΧΕΙΡΗΣΗΣ

1. Type of activity (describe fully) .....  
Είδος εργασίας (περιγράψτε πλήρως)
2. Location/Τοποθεσία  
A:Nicosia B:Limassol C:Larnaca D:Paphos E:Famagusta  
Λευκωσία Λεμεσός Λάρνακα Πάφος Αμμόχωστος
3. Legal form of enterprise .....  
Νομική μορφή επιχείρησης
4. Number of Employees (Average) .....  
Αριθμός εργαζομένων (μέσος όρος)
5. Total output production in money :.....  
Ολικός αριθμός παραγωγής σε χρήματα:  
in numbers :.....  
σε αριθμό :

FOR OFFICIAL USE/ΓΙΑ ΕΠΙΣΤΗΜΗ ΧΡΗΣΗ

6. Code no: .....

7. Name of person conducting the interview: .....  
Όνομα ατόμου που θα εκτελέσει τη συνέντευξη:  
Date : ..... Duration: .....  
Ημερομηνία : ..... Διάρκεια: .....
8. Title of person providing data: .....  
Τίτλος ατόμου που παραχώρησε τα δεδομένα:

**B) ORGANISATIONAL - STRUCTURE/ΟΡΓΑΝΩΣΗ - ΔΙΑΡΘΡΩΣΗ**

9. Do you have a written Quality Policy?

Έχετε γραμμένη τη Ποιοτική Πολιτική της επιχείρησης;

A: Yes/Ναι, B: No/Όχι, C: In a few departments/Σε λίγα τμήματα, D: Yes but not written/Ναι αλλά δεν είναι γραμμένα

☐

10. Do you have a Quality Manual?

Έχετε εγχειρίδιο ποιότητας;

A: Yes/Ναι, B: No/Όχι, C: In a few departments/Σε λίγα τμήματα, D: Yes but not written/Ναι αλλά δεν είναι γραμμένα

☐

11. Is there any steering committee or department responsible for Quality matters?

Υπάρχει οιαδήποτε κατευθυντήρια επιτροπή υπεύθυνη για θέματα ποιότητας;

Y: Yes/Ναι, N: No/Όχι

☐

12. Are the aims and objectives of the steering committee clear to everybody?

Οι σκοποί και οι στόχοι της κατευθύνουσας επιτροπής είναι ξεκάθαροι σε όλους;

A: Yes/Ναι, B: Little/Λίγο, C: No/Όχι

☐

13. Who is responsible for Quality matters?

Κποιος είναι υπεύθυνος για θέματα ποιότητας;

A: A Q. Engineer/Μηχανολόγος Ποιότητας, B: A trained person/Εκπαιδευμένο άτομο, C: A supervisor/Επόπτης, D: Operator/Χειριστής

E: Management/Διεύθυνση, F: The person in charge of steering committee/Ο υπεύθυνος της κατευθύνουσας Επιτροπής,

G: Nobody/Κανένας, H: Production manager/Υπεύθυνος παραγωγής

☐

παραγωγής

14. Do you have third party independent assesment of your quality system e.g.ISO 9000/EN 27000/BS5750

Έχετε οτιδήποτε τρίτο ανεξάρτητο μηχανισμό για να αξιολογήσει το Σύστημα Ποιότητας σας; π.χ.ISO 9000/EN27000/BS5750

Y: Yes/Ναι, N: No/Όχι

☐

If yes state who.

Εάν ναι δηλώσατε ποιος. ....

**C. COMPANY CULTURE/ΚΟΥΛΤΟΥΡΑ ΤΗΣ ΒΙΟΜΗΧΑΝΙΑΣ**

15. Is everybody convinced that Quality is everybodys' job?

Είναι όλοι πεπεισμένοι ότι η ποιότητα είναι έργο του καθενός;

A: All/σε όλους, B: A few/σε λίγους, C: No/Όχι

☐

16. Is there full commitment of management in matters concerning Quality?

Υπάρχει υποχρέωση και πλήρης ανάμιξη της Διεύθυνσης σε θέματα ποιότητας;

A: Yes/Ναι, B: Little/Λίγο, C: No/Όχι

☐

17. Is the mission, the objectives and the specification for each product unit clear to everybody?

Η αποστολή, το αντικείμενο και οι προδιαγραφές του κάθε προϊόντος είναι ξεκάθαρα σε όλους;

A: All/σε όλους, B: Management only/Διεύθυνση μόνο, C: Workers only/Εργάτες μόνο, D: No/Όχι

☐

18. Do you have any ideal levels of Quality performance factors?

Έχετε οτιδήποτε ιδανικά επίπεδα ποιοτικής απόδοσης;

Y: Yes/Ναι, N: No/Όχι

☐

19. Did you measure the actual level of Performance for a Quality factor?

Έχετε μετρήσει το ακριβές/αληθές επίπεδο αποδόσεως για ένα ποιοτικό παράγοντα;

Y: Yes/Ναι, N: No/Όχι

☐

#### D) DEPARTMENTAL PURPOSE/ΣΚΟΠΟΙ ΤΜΗΜΑΤΩΝ

20. Is it clear to anybody what is the purpose of their department and their job?  
Είναι ξεκάθαροι σε όλους οι σκοποί του τμήματος τους και ποιά είναι η δουλειά τους;  
A: To all/σε όλους, B: to the majority/στην πλειονότητα, C: few/σε λίγους ☐
21. Are you familiar with Departmental Purpose Analysis (DPA) and perform any study in your enterprise?  
Είστε γνώστη η θεωρεία της ανάλυσης του σκοπού κάθε τμήματος και έχετε οιαδήποτε μελέτη στην επιχείρησή σας;  
Y: Yes/Ναι, N: No/Όχι ☐
22. Are you willing to evaluate the Actual Level of Performance (APL) of your employees through a questionnaire?  
Είστε πρόθυμοι να υπολογίσετε το πραγματικό επίπεδο απόδοσης των εργαζομένων σας μέσω ενός ερωτηματολογίου;  
Y: Yes/Ναι, N: No/Όχι ☐
23. Do you keep any charts or posters related to Quality on the walls visible to anybody?  
Έχετε οιασδήποτε πίνακες ή επιγραφές σχετιζόμενους με την ποιότητα αναρτημένους στους τοίχους που να μπορούν να τους βλέπουν όλοι;  
A: Too many/πολλούς, B: few/λίγους, C: No/Όχι ☐
24. Do you keep any records for: Tick one or more  
Κρατάτε παρατηρήσεις για:
- a) Performance data/δεδομένα απόδοσης ☐
- b) Absenteeism/απουσίες ☐
- c) Shortages/Ελλείψεις υλικών ☐
- d) Defects per unit/Ελαττώματα κατά μονάδα προϊόντος ☐
- e) Output production/Ευνοητική παραγωγή ☐
- f) Production Control Parameters/Παράμετροι Ελέγχου Παραγωγής ☐

#### E) SUPPLIERS-INPUTS/ΠΡΟΜΗΘΕΥΤΕΣ-ΕΙΣΕΡΧΟΜΕΝΑ

25. How many suppliers do you have?  
Πόσους προμηθευτές έχετε;  
A: 1-5, B: 6-10, C: 11-20, D: >20 ☐
26. Who is your supplier or from where do you get your raw materials. Give percentages Choose one or more  
Ποιοί είναι οι προμηθευτές σας και από που προέρχονται οι πρώτες ύλες σας; Δώστε ποσοστά  
A: Local market/Εντόπια αγορά, B: E.C./ΕΟΚ, C: Other countries/Άλλες χώρες ☐ A ☐ B ☐ C ☐
27. Do you change suppliers very often?  
Αλλάζετε προμηθευτές πολύ συχνά;  
A: No/Όχι, B: Rarely/σπανία, C: very often/πολύ συχνά ☐
28. Do your suppliers conform to any standards, BS, ISO, DIN and provide you with any certificate?  
Οι προμηθευτές σας πληρούν τα πρότυπα BS, ISO, DIN και σας έχουν προμηθεύσει με οτιδήποτε πιστοποιητικό;  
A: Yes, give percentage/Ναι, δώστε ποσοστό, B: never ask/Δεν ερωτήθηκαν ☐ ☐
29. Do you check your raw materials supplied by the suppliers?  
Ελέγχετε τα υλικά που σας προμηθεύουν οι προμηθευτές σας;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: From time to time/Από καιρού εις καιρό, E: No/Όχι ☐

30. Do you carry out stock control procedure?

Εκτελείτε καταγραφή αποθηκευμένων υλικών;

A: Very often/Πολύ συχνά, B: Twice per year/Δύο φορές το χρόνο, C: Once per year/Μία φορά το χρόνο, D: No/Όχι

☐

31. Do you check your products or materials after they have been stored for a long period for their quality and fitness of purpose?

Ελέγχετε τα προϊόντα σας ή τα υλικά σας μετά την αποθήκευση για αρκετό χρόνο για την ποιότητα τους και για το σκοπό που έχουν κατασκευαστεί;

Y: Yes/Ναι, N: No/Όχι

☐

32. Do you have a formal supplier assessment system?

Έχετε τυποποιημένο σύστημα αξιολόγησης των προμηθευτών σας;

A: Yes/Ναι, B: No/Όχι, C: Yes but not written/Ναι αλλά όχι γραμμένα

☐

(a) If yes, how often do you assess suppliers?

Εάν ναι κάθε πότε αξιολογείτε τους προμηθευτές;

Every/Κάθε .....

(b) If yes, please give a brief explanation of the system

Εάν ναι παρακαλώ δώστε σύντομη επεξήγηση του συστήματος.

.....  
.....

#### F) QUALITY ASSOCIATED ACTIVITIES/ΑΡΧΗΘΕΡΠΙΟΤΗΤΕΣ ΣΥΝΑΦΑΡΜΕΝΕΣ ΜΕ ΠΟΙΟΤΗΤΑ

33. How often do you order and which ordering policy do you apply?

Πόσο συχνά και πια πολιτική παραγγελιών εφαρμόζετε;

Choose one or more

(a) Fixed number of items but of different time

Επασθερό αριθμό αλλά σε διαφορετικούς χρόνους

☐

(b) Fixed time but different number of items

Επασθερό χρόνο αλλά διαφορετικό αριθμό

☐

(c) Different time and quantity

Διαφορετικό χρόνο και ποσότητα

☐

(d) Order when we are out of stock

Παραγγελία όταν τελειώσουν τα αποθέματα

☐

(e) Just in time method (JIT)

Ακριβώς στην ώρα τους, Ειδική μέθοδος

☐

(f) Order just before the product finishes

Παραγγελία λίγο πριν τελειώσουν τα προϊόντα

☐

(g) Have always large quantities of goods in stock?

Υπάρχουν πάντοτε μεγάλες ποσότητες στις αποθήκες;

☐

(h) Take in consideration lead time

Λαμβάνοντας υπόψη το νεκρό χρόνο

☐

(i) Take in consideration inventory control before you order

Λαμβάνοντας υπόψη την απογραφή πριν παραγγείλετε

☐

(j) Analyse and develop a product structure tree

Κατόπιν ανάλυσης και επεξεργασίας ενός σχεδίου κατασκευής του προϊόντος

☐

(k) Apply Economic Order Quantity (EOQ)

Εφαρμόζω την μέθοδο της Οικονομικής Ποσότητας Παραγωγής

☐

34. Do you apply materials requirements planning (MRP)?  
Εφαρμόζετε την μέθοδο του προγραμματισμού των αναγκών υλικών (MRP);  
A: Yes/Ναι, B: No/Όχι ☐
35. What is your cost in percentage of total output of repairs, maintenance of m/c inclusive spare parts etc. for the last five years?  
Ποιόν είναι το κόστος επί τοις εκατόν της συνολικής παραγωγής σε επισκευές, συντήρηση μηχανημάτων συμπεριλαμβανομένων και των εξαρτημάτων;

%: 86 ☐, 87 ☐, 88 ☐, 89 ☐, 90 ☐, no records/δεν υπάρχουν στοιχεία ☐

36. What is your investment in machinery and other mechanical equipment in percentage of total output for the last five years?  
Πόσες είναι οι επενδύσεις σας σε μηχανήματα ή άλλες μηχανικές συσκευές επί τοις εκατόν της συνολικής παραγωγής για τα τελευταία 5 χρόνια.

%: 86 ☐, 87 ☐, 88 ☐, 89 ☐, 90 ☐, no records/δεν υπάρχουν στοιχεία ☐

37. Do you have any records concerning productivity figures of your enterprise for the last five years?  
Έχετε δεδομένα που να δείχνουν την παραγωγικότητα της επιχείρησής σας για τα τελευταία 5 χρόνια;

%: 86 ☐, 87 ☐, 88 ☐, 89 ☐, 90 ☐, no records/δεν υπάρχουν στοιχεία ☐

## SECTION II/ΤΜΗΜΑ II

### INHOUSE QUALITY ACTIVITIES/ΕΣΩΤΕΡΙΚΕΣ ΑΡΑΙΣΤΗΡΙΟΤΗΤΕΣ ΠΟΙΟΤΗΤΑΣ

#### G) DESIGN STAGE/ΕΤΑΙΟ ΜΕΛΕΤΗ

38. Do you apply any Failure Mode and Effect Analysis? (FMEA)  
Εφαρμόζετε την μέθοδο της ανάλυσης των αποτυχιών και ποιά θα είναι τα αποτελέσματα τους;  
Y: Yes/Ναι, N: No/Όχι ☐

39. Are you doing any analysis of potential failures of your products or process?  
Κάνετε οιαδήποτε ανάλυση πιθανών αποτυχιών των προϊόντων σας ή της επεξεργασίας παραγωγής;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: On a few products/Σε μερικά προϊόντα, E: No/Όχι ☐

40. Where do you use computers, choose from the list one or more.  
Πού χρησιμοποιείτε ηλεκτρονικούς υπολογιστές, διαλέξτε από τον κατάλογο.

FMEA ☐, SPC ☐, INVENTORY/Απογραφή ☐, PURCHASES/Αγορές ☐, STOCK CONTROL/Έλεγχος Υλικών ☐  
PAYMENTS/Πληρωμές ☐, DATA/Δεδομένα ☐, MAINTENANCE/Συντήρηση ☐, QUALITY CONTROL/Έλεγχος Ποιότητας ☐,  
CNC ☐ TO DRIVE MACHINES/Καθοδήγηση μηχανών ☐, DESIGN/Μελέτες ☐, DRAWINGS/Σχεδίαση ☐ (Tick one or more)  
No where/πουθενά ☐

41. Are you doing any analysis on the potential affects in cases of failure of your products or process?  
Κάνετε οιαδήποτε ανάλυση των πιθανών αποτελεσμάτων σε περιπτώσεις αποτυχιών των προϊόντων σας ή κατά την διάρκεια της επεξεργασίας;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Never/Ποτέ ☐

42. Are you taking into account the potential causes which might cause failure of your products or process?  
Λαμβάνετε υπόψη τις πιθανές αιτίες που θα μπορούσαν να έχουν σαν αποτέλεσμα την αποτυχία των προϊόντων ή την διαδικασία παραγωγής;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Never/Ποτέ ☐  
If yes, do you keep any records/Εάν ναι, κρατάτε παρατηρήσεις;  
Y: Yes/Ναι, N: No/Όχι ☐



43. Are you doing any analysis to identify the possible causes of Quality problems?  
Κάνετε οιαδήποτε ανάλυση για να επισημάνετε τις πιθανές αιτίες των προβλημάτων ποιότητας;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Ελάχιστα, D: No/Όχι . . . ☐
- (a) Please indicate if your answer for the above questions refer to:  
Παρακαλώ αναφέρατε εάν οι απαντήσεις σας στις πιο πάνω ερωτήσεις αναφέρονται στην  
A: Process only/Διαδικασία παραγωγής μόνο, B: Products/Προϊόντα, C: Both/Και τα δύο . . . ☐
44. When do you apply the above mentioned Questions?  
Πότε εφαρμόζετε τις πιο πάνω ερωτήσεις;  
A: Design stage/Ετάδιο μελέτης, B: Manufacture stage/Ετάδιο παραγωγής, C: Afterwards/Μετά . . . ☐
45. During design stage do you take in consideration the capability of your process and machines?  
Στο στάδιο της μελέτης λαμβάνετε υπόψη την δυνατότητα των μηχανημάτων σας και της επεξεργασίας κατασκευής;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Ελάχιστα, D: Time to time/από καιρού εις καιρό, E: No/Όχι, F: No design/Όχι μελέτες . . . ☐

## B) MACHINES-PROCESS CAPABILITY/ΔΥΝΑΤΟΤΗΤΑ ΜΗΧΑΝΩΝ ΚΑΙ ΕΠΕΞΕΡΓΑΣΙΑΣ

46. Have you performed any capability study in your factory?  
Έχετε εκτελέσει οιαδήποτε μελέτη δυνατότητας στο εργοστάσιο σας;  
A: Many times/Πολλές φορές, B: Very few/Πολύ λίγες, C: Never/Ποτέ . . . ☐
47. Have you performed any process capability study to decide whether your process which is affected by equipment, people, material, environment method, is capable to meet the specifications in order to satisfy customer needs.  
Έχετε κάνει οιαδήποτε μελέτη δυνατότητας κατά πόσον η επεξεργασία παραγωγής σας που επηρεάζεται από τις συσκευές, ανθρώπους, υλικά, περιβάλλον, μέθοδο, είναι ικανά να ανταποκριθούν στις προδιαγραφές και να ικανοποιήσουν τις ανάγκες του πελάτη;  
A: Always/Πάντοτε, B: Very often/Πολλές φορές, C: Few/Λίγες, D: Once/Μία φορά, E: Never/Ποτέ . . . ☐
48. Does your production process, or machines meet the specification of your product?  
Τα μηχανήματα σας, η παραγωγή σας και η επεξεργασία κατασκευής ανταποκρίνονται στις προδιαγραφές των προϊόντων σας;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Ελάχιστα, D: Time to time/από καιρού εις καιρό, E: No/Όχι, F: No Study/Δεν μελετήθηκε . . . ☐
49. How many of your defectives are due to incapable machines or process to meet the specifications when analyzing defective components?  
Πόσα από τα ελαττωματικά σας ωφείλονται στο ότι τα μηχανήματα ή η επεξεργασία κατασκευής αδυνατούν να ικανοποιήσουν τις προδιαγραφές, όταν αναλύσετε τα ελαττωματικά προϊόντα;  
A: Give percentage/Δώστε ποσοστά, B: No data/Δεν υπάρχουν δεδομένα . . . ☐

## I) OPTIMIZATION/ΚΑΛΥΤΕΡΕΣ ΑΝΤΙΣΤΑΣΕΙΣ

50. Have you performed or applied any Tachuchi experiment to optimize process or product?  
Έχετε εφαρμόσει πειράματα Tachuchi για να συντονίσετε την διαδικασία παραγωγής ή προϊόντος;  
A: Yes/Ναι, B: No/Όχι, C: I don't know/Δεν γνωρίζω . . . ☐
51. Have you performed any experiment to optimize some of the parameters which might affect the quality of your products? (Temperature, pressure, time, composition etc.)  
Έχετε εφαρμόσει οιαδήποτε πείραμα για να συντονίσετε-καλυτερεύσετε μερικές από τις παραμέτρους που μπορούν να επηρεάσουν την ποιότητα των προϊόντων σας; (θερμοκρασία, πίεσις, χρόνος, αναλογία κλπ.)  
A: Many times/Πολλές φορές, B: A few/Λίγες, C: Very little/Ελάχιστα, D: Never/Ποτέ, E: Not applicable/Δεν εφαρμόζεται . . . ☐
52. Choose methods from the list below which may be the most applicable to your company, to optimize your product or process when you are designing and manufacturing a product.  
Διαλέγετε τις μεθόδους από το κατάλογο πιο κάτω που είναι πιο εφαρμόσιμες στην εταιρεία σας για να συντονίσετε-καλυτερέψετε τα προϊόντα ή την επεξεργασία παραγωγής σας όταν μελετάτε και κατασκευάζετε ένα προϊόν;  
Choose one or more

(a) By trial and error/Δοκιμασία και λάθος . . . ☐

(b) By varying only one parameter and record it/Αλλάζοντας μόνο ένα συντελεστή και σημειώνοντας τον. . . ☐

- (c) By changing 2-3 parameters at the same time/Αλλάζοντας 2-3 συντελεστές την ίδια ώρα. . . . . ☐
- (d) Use past experience/Χρησιμοποιώντας την πείρα του παρελθόντος. . . . . ☐
- (e) Use standard practice/Χρησιμοποιώντας κοινή μεθοδολογία. . . . . ☐
- (f) By chance/Ετην τύχη. . . . . ☐
- (g) Use Statistics/Χρησιμοποιώντας Στατιστικές. . . . . ☐
- (h) Use Statistical approach/Χρησιμοποιώντας στατιστική προσέγγιση. . . . . ☐
- (i) Others/'Άλλες. . . . . ☐

#### J) MANUFACTURING STAGE/ΕΤΑΙΟ ΚΑΤΑΚΕΥΗ

53. Do you apply statistical process control during your manufacture (SPC)?  
Έχετε εφαρμόσει στατιστικό έλεγχο στην επεξεργασία παραγωγής κατά τη διάρκεια της κατασκευής (SPC) ; ☐  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Time to time/από καιρού εις καιρό, E: Never/Ποτέ ☐  
  
If yes do you keep records?/Εάν ναι κρατάτε παρατηρήσεις;  
Y: Yes/Ναι, N: No/'Όχι . . . . . ☐
54. Have any members of your staff received adequate format training on S.P.C.methods and Techniques  
Έχει οιοδήποτε μέλος του ανώτερου προσωπικού σας εκπαιδευτεί σε ειδικό τυποποιημένο σχέδιο για τις μεθόδους και τεχνικές του S.P.C.; ☐  
A: Yes/Ναι, B: Little/Λίγο, C: Very little/Πολύ λίγο, D: No/'Όχι . . . . . ☐
55. Do the supervisors of your shop floor know the basic principles of statistical recording and process control?  
Οι επόπτες παραγωγής σας γνωρίζουν τις βασικές αρχές της στατιστικής καταγραφής και ελέγχου επεξεργασίας;  
A: Yes/Ναι, B: Little/Λίγο, C: Very little/Πολύ λίγο, D: No/'Όχι . . . . . ☐
56. Do you have any control limits where the process should operate (U.C.L., L.C.L, mean, range etc.)  
Έχετε οιοδήποτε όρια ελέγχου που η επεξεργασία παραγωγής πρέπει να κυμαίνεται (Α.Σ.Ε., Κ.Σ.Ε., μέρος, όρος, διακίμανση κλπ.)  
Y: Yes/Ναι, N: No/'Όχι . . . . . ☐
57. If you apply S.P.C. who is responsible for the entries of the charts?  
Εάν εφαρμόζετε S.P.C ποιός είναι υπεύθυνος για την ενημέρωση των πινάκων;  
A: Workers/Εργάτες, B: Inspectors/Επιθεωρητές, C: Supervisors/Επόπτες, D: Q. Engineer/Μηχανολόγος Ποιότητας, ☐  
E: Quality man/Υπεύθυνος Ποιότητας, F: Management/Διεύθυνση, G: Production Manager/Υπεύθυνος Παραγωγής, H: Nobody/'Κανένας ☐
58. Do you take any samples during a continues process, tabulate them on process charts, and identify when the process is out of control?  
Κάνετε οιοδήποτε δειγματοληψία κατά τη διάρκεια της επεξεργασίας, τα καταγράφετε σε πίνακες, και επισημαίνετε πότε η επεξεργασία παραγωγής είναι εκτός ελέγχου;  
A: Yes/ Ναι, B: Sometimes/Μερικές φορές, C: Rarely/Σπάνια, D: No/'Όχι . . . . . ☐
59. When the process is out of control what actions do you take?  
Όταν η επεξεργασία είναι εκτός ελέγχου τι μέτρα λαμβάνετε; Choose one or more  
a) Stope the production line and take action.  
Σταματώ τη γραμμή παραγωγής και λαμβάνω μέτρα. ☐  
b) Try to identify the causes when the process is running.  
Προσπαθώ να επισημάνω τις αιτίες ενώ η επεξεργασία συνεχίζει να εργάζεται. ☐  
c) Continue with the production and identify the defectives during inspection.  
Συνεχίζω με την παραγωγή και επισημαίνω τα ελαττωματικά στον έλεγχο. ☐

- d) Apply 100% inspection at the end of the process. ☐  
Εφαρμόζω 100% έλεγχο στο τέλος της επεξεργασίας.
- e) Go back and check materials, design, methodology. ☐  
Πηγαίνω πίσω και ελέγχω τα υλικά, τη μελέτη και τη μεθοδολογία
60. Which of the following charts do you apply in your production line?  
Ποιόν από τους πιο κάτω πίνακες εφαρμόζετε στην γραμμή παραγωγής σας;
- a) The np chart (The number of defective charts) ☐  
Ο πίνακας np (Πίνακας αριθμού ελαττωματικών)
- b) The p chart (The proportion defective charts) ☐  
Ο πίνακας p (Ποσοστιαίος πίνακας ελαττωματικών)
- c) The C chart (The number of defects charts) ☐  
Ο πίνακας C (Πίνακας και αριθμοί ελαττωματικών)
- d) The U chart (The number of defects per unit chart) ☐  
Ο πίνακας U (Πίνακας αριθμού ελαττωματικών κατά μονάδα)
- e) Use our own charts ☐  
Χρησιμοποιούμε δικούς μας πίνακες
- e) None/Κανένα ☐
61. When you are producing products with variable dimensions weights, etc. do you use any control charts (X mean or R range charts) to control your process?  
Όταν παράγετε προϊόντα με διάφορες τιμές διαστάσεων, βαρών κλπ. χρησιμοποιείτε οιονδήποτε πίνακα ελέγχου (X μέσος όρος ή R διακίμανσις) για να ελέγχετε την επεξεργασία;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Time to time/από καιρού εις καιρό, E: Never/Ποτέ,  
F: N.A./Δεν εφαρμόζεται. ☐
62. When you finish with a particular product do you keep any records of the SPC charts mentioned before?  
Όταν τελειώνετε με την παραγωγή ενός προϊόντος κρατάτε οτιδήποτε δεδομένα από τους πίνακες SPC που αναφέρθηκαν προηγουμένως;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Time to time/από καιρού εις καιρό, E: Never/Ποτέ, ☐
63. Have you heard before of POKA-YOKE or Fool Proof devices?  
Έχετε ακούσει προηγουμένως για το POKA-YOKE ή συσκευές επαληθεύσεως-παλλινοθρώσεως;  
A: Yes/Ναι, B: No/Όχι, C: I don't know/Δεν γνωρίζω ☐
64. Do you apply any techniques, devices, sequence of operations to identify any faulty operation or warn you in order to eliminate defective components and take action?  
Έχετε εφαρμόσει οιοσδήποτε τεχνικές, συσκευές, σειρά λειτουργείας για εντοπισμό ελαττωματικών λειτουργιών για να ελαττώσετε στο ελάχιστο τα ελαττωματικά τεμάχια και να πάρετε μέτρα;  
A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Time to time/από καιρού εις καιρό, E: Never/Ποτέ,  
G: N.A./Δ.Ε ☐
65. Do you have any Fool proving devices within all stages of the production process to drive you towards zero defects?  
Έχετε οιοσδήποτε συσκευές επαλήθευσης - παλλυνόρθωσης σε όλα τα στάδια της επεξεργασίας παραγωγής που θα σας οδηγήσουν σε μηδέν ελαττωματικά;  
A: Everywhere/Παντού, B: Most/Περισσότερες, C: A few/Λίγες, D: No/Όχι, E: N.A./Δ.Ε ☐
66. Do you apply Quality Function Deployment (Q.F.D.) in your enterprise for problem solving?  
Έχετε εφαρμόσει την θεωρία της Ανάπτυξης της Ποιοτικής λειτουργικότητας (Q.F.D.) στην επιχείρησή σας για επίλυση προβλημάτων;  
A: Yes/Ναι, B: No/Όχι, C: I don't know/Δεν γνωρίζω ☐

67. OR do you identify what problems you might have during design and manufacture and how those problems can be eliminated to satisfy customer Quality requirements.?

Έχετε εντοπίσει πια προβλήματα δυνατόν να παρουσιαστούν στο στάδιο της μελέτης και της κατασκευής και πώς αυτά τα προβλήματα μπορούν να εκμηδενιστούν για να ικανοποιηθείτε τις ανάγκες του πελάτη στην ποιότητα;

A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Time to time/από καιρού εις καιρό, E: Never/Ποτέ, ☐

G: N.A/A.E

#### K) INSPECTION/ΕΛΕΓΧΟΣ

68. Do you have any Q.C.lab or the adequate facilities for inspection?

Έχετε εργαστήριο ελέγχου ποιότητας ή τα αναγκαία μέσα για έλεγχο;

A: Everything/Όλα, B: V.G.Facilities/Π.Κ.Μέσα, C: Very little/Μολύ λίγα, D: No/Όχι, E: N.A/A.E ☐

69. Do you stamp or put any sign to certify that your products have been passed through Quality Control?

Μήπως σφραγίζετε ή βάζετε οτιδήποτε σήμα που να πιστοποιεί ότι τα προϊόντα σας έχουν περάσει από έλεγχο ποιότητας;

A: In all/Σε όλα, B: Majority/Περισσότερα, C: In some/Σε μερικά, D: No/Όχι ☐

70. When there is a defective component, do you analyse and take into consideration the individual defects to rectify your process or method of manufacture?

Όταν έχετε ελαττωματικά προϊόντα αναλύετε και λαμβάνετε υπόψη σας τα επιμέρους ελαττώματα για να αλλάξετε την επεξεργασία ή την μέθοδο κατασκευής;

A: Always/Πάντοτε, B: Very often/Πολύ συχνά, C: Rarely/Σπάνια, D: Time to time/από καιρού εις καιρό, E: No/Όχι ☐

71. What is your internal failure or defective products before rework if there is rework (percentage of total output)

Πόσος είναι ο αριθμός εσωτερικών αποτυχιών ή ελαττωματικών πριν από οιαδήποτε επιδιόρθωση εάν υπάρχουν επιδιορθώσεις; (Δώστε αριθμό επί της εκατόν της συνολικής παραγωγής).

A: % Number/% Αριθμόν, B: No record/Όχι δεδομένα

A: , B:

- 71.A What is your failure or defective products after rework (scrap). Give percentage of total output

Πόσος είναι ο αριθμός αποτυχιών ή ελαττωματικών μετά από οιαδήποτε επιδιόρθωση (άχρηστα). Δώστε αριθμό επί τοις εκατόν της συνολικής παραγωγής.

A: % Number/% Αριθμόν, B: No record/Όχι δεδομένα

A: , B:

72. What is your external failure or defective products (complains, returns, etc) Percentage of total.

Πόσος είναι ο εξωτερικός αριθμός αποτυχιών ή ελαττωματικών προϊόντων (Παράπονα, επιστροφές κλπ.)

A: % Number/% Αριθμόν, B: No records/Όχι δεδομένα,

A: , B:

73. Can you recommend any Testing Centers or Quality Assurance Institutions or other bodies which might be needed except of those which are operating now in Cyprus (CYS, HTI, EMS, etc.)

Μπορείτε να μας εισηγηθείτε οιαδήποτε άλλα κέντρα ελέγχου ή Ινστιτούτα επισφαλίσσεως ή άλλα Σώματα που θα μπορούσαν να χρειαστούν εκτός από εκείνα που ήδη εργάζονται (Κυπριακά Πρότυπα, ΑΤΙ, ΕΜΥ κλπ.)

.....  
.....  
.....

74. Have you used any of the facilities of the existing centres.

Έχετε χρησιμοποιήσει οτιδήποτε από ότα προσφέρουν τα παρόντα κέντρα;

A: Many Times/Πολλές φορές, B: A few/Λίγες φορές, C: Once/Μία φορά, D: Never/Ποτέ ☐

#### SECTION III/ΤΜΗΜΑ ΙΙΙ

#### OUTDOORS QUALITY ACTIVITIES/ΕΞΩΤΕΡΙΚΕΣ ΑΡΑΛΤΗΡΙΟΤΗΤΕΣ ΠΟΙΟΤΗΤΑΣ

#### L) CUSTOMERS/ΠΕΛΑΤΕΣ

75. Who is your customer? (give percentage). Fill one or more.

Ποιός είναι ο πελάτης σας; (Δώστε επί της εκατόν.). Γεμίστε ένα ή περισσότερα.

A: Internal/ Εσωτερικός (Εργοστασιακός) :  , B: Local Market/Επιτόπιος αγορά :  , C: E.C./ΕΟΚ :  ,  
 D: Other countries/Άλλες χώρες :  .

76. Do you have any formal mechanism for finding customer requirements or needs?

Έχετε οιονδήποτε τυποποιημένο μηχανισμό για να διαπιστώνετε τις ανάγκες του πελάτη σας;

Tick one or more: A: Surveys/Έρευνες  , B: Questionnaire/Ερωτηματολόγιο  , C: Management/Διεύθυνση  ,

D: Customers/Πελάτες  , E: Other/Άλλοι  , F: No/Όχι  .

77. Do you keep any records of customers complains?

Διατηρείτε στοιχεία με παράπονα πελατών σας;

A: Always/Πάντοτε, B: Rarely/Σπάνια, C: A few/Αίγα D: No/Όχι

If yes how many complains have been recorded during the last five years? Give numbers.

Εάν ναι πόσα παράπονα έχουν καταγραφεί τα τελευταία 5 χρόνια;

6  , 87  , 88  , 89  , 90  , N/A

78. What actions have been taken for any complains or suggestions?

Τι μέτρα έχετε λάβει για οτιδήποτε παράπονα ή εισηγήσεις;

.....  
 .....

79. From where do you obtain feedback for the Quality of your products?

Από πού πέρνεται πίσω δεδομένα για την ποιότητα των προϊόντων σας;

Tick one or more/Σημειώστε ένα ή περισσότερα

A: Survey/Έρευνες  , B: Complains/Παράπονα  , C: Call for maintenance/κλήσεις για συντήρηση  ,

D: Experience/Πείρα,  E: Sales Dept/Τμήμα Πωλήσεων  , F: Sales Trent/Κίνηση Πωλήσεων  ,

G: No feedback/Δεν πέρνουμε,  H: Other/Άλλα

80. From where do you get information concerning customers needs or expectations?

Από πού παίρνετε πίσω πληροφορίες όσον αφορά τις ανάγκες και το τί θέλουν οι πελάτες σας;

Tick one or more/Σημειώστε ένα ή περισσότερα

A: Survey/Έρευνα,  B: Sales Dept/Τμήμα Πωλήσεων  , C: International Trent/Διεθνής κίνηση  ,

D: Customer/Πελάτης  E: Magazines/Περιοδικά  , F: Standards/Πρότυπα  , G: No need/Δεν χρειάζονται

H: Excipitions/Εκθέσεις

**8) TOTAL QUALITY MANAGEMENT/ΔΙΕΥΘΥΝΣΗ ΟΛΟΚΛΗΡΩΤΙΚΗΣ ΠΟΙΟΤΗΤΑΣ**

81. Have you implemented any Total Quality Management (TQM) to your enterprise before?

Έχετε εφαρμόσει στο παρελθόν Διεύθυνση Ολοκληρωτικής Ποιότητας στην επιχείρηση σας;

A: Yes/Ναι, B: No/Όχι, C: I don't know/Δεν γνωρίζω . . . . .

82. Do you operate any Quality Circles?

Έχουν λειτουργήσει ποτέ κύκλοι Ποιότητας;

Y: Yes/Ναι, N: No/Όχι . . . . .

Η) TRAINING/ΕΚΠΑΙΔΕΥΣΗ

83. Have your operators received adequate training?

Οι χειριστές σας έχουν εκπαιδευτεί κατάλληλα;

A: Very much/Πάρα πολύ, B: Enough/Αρκετά, C: Little/Λίγο, D: No/Όχι

☐

84. Is there any continues improvement program to train your leaders or operators?

Υπάρχει οτιδήποτε πρόγραμμα συνεχούς μαθήσεως και βελτίωσης για να εκπαιδεύετε τους ηγέτες και τους χειριστές σας;

A: Major/Μεγάλο, B: Minor/Μικρό, C: No/Όχι

☐

85. Has anybody from your staff received any formal training on Quality? If yes give details.

Έχει οιοδήποτε μέλος του ανώτερου προσωπικού σας εκπαιδευτεί σε τυποποιημένο πρόγραμμα μαθήσεως στον τομέα της Ποιότητας;

Y: Yes/Ναι, N: No/Όχι

☐

Details/Λεπτομέρειες:.....

86. Have any of your foremen received any formal training on Quality? If yes give details.

Έχετε οιοδήποτε από τους επόπτες σας που έχει εκπαιδευτεί σε τυποποιημένα προγράμματα μαθήσεως στο τομέα της ποιότητας;

Y: Yes/Ναι, N: No/Όχι

☐

Details/Λεπτομέρειες:.....

87. Are you interested in training and educating members of your staff and supervisors on matters concerning Quality?

Ενδιαφέρεστε να εκπαιδεύσετε και να επιμορφώσετε μέλη του ανώτερου προσωπικού και επόπτες σε θέματα που αφορούν την ποιότητα;

A: Too much/Πάρα πολύ, B: Moderate/Έχειτικά, C: No/Όχι

☐

87.A.How much is the willingness for the training of your staff? Πόση είναι η προθυμία για εκπαίδευση του Αν. Προσωπικού.

B.How much is the willingness for the training of your workers? Πόση είναι η προθυμία για εκπαίδευση των Εργατών.

A 1 2 3 4 5 6 7 ) circle your choice

) σημειώστε την εκλογή σας

B 1 2 3 4 5 6 7 )

poor/πτωχά

Very High/Πολύ μεγάλη

88. Which method of training is most suitable to your company?

Ποιά μέθοδος εκπαίδευσως αρμόζει περισσότερο στην βιομηχανία σας;

Tick one or more

1) Separate course for staff-engineers

Ξεχωριστό τυποποιημένο πρόγραμμα μαθήσεως για Αν.Προσωπικό Μηχανολογίας.

☐

2) Separate course for supervisors

Ξεχωριστό πρόγραμμα για τους επόπτες.

☐

3) One course for everybody

Ένα πρόγραμμα για όλους.

☐

4) A seminar

Σεμινάρια.

☐

5) A short intensive course 2-3 days

Ένα σύντομο πρόγραμμα 2-3 ημέρες.

☐

6) A short course once per week (20-40 hours)

Ένα σύντομο πρόγραμμα μια φορά της εβδομάδα (20 - 40 ώρες).

☐

7) A short course once per week (40-60 hours)

Ένα σύντομο πρόγραμμα μια φορά της εβδομάδα (40 - 60 ώρες).

☐

8) A special course suitable for specific industries only. (e.g. textiles, shoes, clothing)

Ένα εξειδικευμένο πρόγραμμα για ειδικές βιομηχανίες μόνο π.χ. υφαντουργεία, παπούτσια, ρουχισμό κλπ.

☐

- 9) A general course suitable for all industries . . . . . ☐  
Ένα γενικό πρόγραμμα για όλες τις βιομηχανίες.
- 10) A theoretical course with practice . . . . . ☐  
Ένα θεωρητικό πρόγραμμα με πρακτική.
- 11) A course with practice, lab and application . . . . . ☐  
Ένα πρόγραμμα με πρακτική, εργαστήρια και εφαρμογές.
- 12) Special short courses for techniques only (e.g. s.p.c., Optimization methods, failure mode and defect analysis etc.) ☐  
Εξειδικευμένα σύντομα προγράμματα για τεχνικούς μόνο (π.χ. S.P.C, FMEA, Q.F.D, Tachuchi κλπ.)
- 13) Individual visits to interested parties and discussion on individual Quality problems . . . . . ☐  
Επιμέρους επισκεψεις σε ενδιαφερόμενες βιομηχανίες για συζήτηση και επίλυση των επιμέρους προβλημάτων ποιότητας.
- 14) A theoretical course with on the job application . . . . . ☐  
Ένα θεωρητικό πρόγραμμα με εφαρμογές στο τόπο εργασίας επί τόπου.
89. Please recommend any specialized courses you are interested for, which relate to Total Quality and Standard.  
Παρακαλώ εισηγηθείτε οτιδήποτε εξειδικευμένη σειρά τυποποιημένων μαθημάτων που ενδιαφέρεστε και που έχει σχέση με την ολοκληρωτική ποιότητα και πρότυπα.  
.....  
.....  
.....
90. Would you like an expert in Quality management to visit your factory and have a discussion with you about quality?  
Θα θέλατε να σας επισκευθεί ένας ειδικός σε θέματα διεύθυνσης ποιότητας και να συζητήσετε για θέματα ποιότητας;  
A: Very much/Πάρα πολύ, B: Moderate/Μέτρια, C: No/Όχι . . . . . ☐
91. How much time according to your needs he will be spent in your factory?  
Πόσο χρόνο ανάλογα με τις ανάγκες σας θα χρειαστεί στην βιομηχανία σας;  
A: One week/Μία εβδομάδα, B: One day/Μία ημέρα, C: Short visit/Σύντομη επίσκεψη . . . . . ☐
92. Are you willing to share or contribute towards any expenses.  
Είσαστε πρόθυμοι να μοιραστείτε ή να συνεισφέρετε για τυχόν έξοδα;  
Y: Yes/Ναι, N: No/Όχι . . . . . ☐
- 0) E.C. AND CYPRUS/ΕΟΚ ΚΑΙ ΚΥΠΡΟΣ
93. Do you have any plans to start trading with E.C?  
Έχετε οτιδήποτε σχέδια να αρχίσετε εμπόριο με την ΕΟΚ;  
A: We are trading/Εμπορεύμαστε, B: In the near future/Στο εγγύς μέλλον, C: In the future/Στο μέλλον, D: No/Όχι . . . . . ☐
94. What is your opinion for the decision to join E.C?  
Ποιά είναι η άποψη σας για την απόφαση εισδοχής μας στην ΕΟΚ;  
A: Yes/Ναι, O:No/Όχι, C: I haven't decide/ Αναποφάσιτος . . . . . ☐
95. What will be your requirements for joining E.C?  
Ποιές θα είναι οι ανάγκες σας εάν ενταχθούμε στην ΕΟΚ;  
Answer briefly/Απαντίστε σύντομα.....  
.....
96. Do you think that the group of industries your enterprise belongs are ready to join E.C?  
Νομίζετε ότι η ομάδα των βιομηχανιών που η επιχείρησή σας ανήκει είναι έτοιμη για την εισδοχή στην ΕΟΚ;  
A: Ready/Έτοιμες, B: With minor improvement/Με λίγες καλύτερεύσεις, C: Major improvements/Μεγάλες καλύτερεύσεις, D: No/Όχι . . . . . ☐
97. What is the level of Quality of the products of the group of industries your enterprise belongs compared with E.C products?  
Ποιά είναι τα επίπεδα ποιότητας των προϊόντων της ομάδας των βιομηχανιών που η επιχείρησή σας ανήκει συγκρινόμενα με τα Ευρωπαϊκά προϊόντα.  
A: Superior/Ανώτερα, B: Same/Τα ίδια, C: Close but below/Κοντά αλλά κατώτερα, D: Inferior/Κατώτερα, . . . . . ☐  
E: No comparison/καμία σύγκριση

P) QUALITY COSTS/KOETA DOIOETHAE

98. Do you have any figures for the cost of quality % of annual sales or in money?

ἔχετε οἰανδήποτε στοιχεία για το κόστος της ποιότητας ἢ των συνολικῶν πωλήσεων ἢ σε λεφτά;

3 f

- |  |   |   |   |   |   |   |       |       |
|--|---|---|---|---|---|---|-------|-------|
| a) Prevention/Προληπτικά                 | . | . | . | . | . | . | ..... | ..... |
| b) Appraisal/Υπολογισµα κόστα ποιότητας  | . | . | . | . | . | . | ..... | ..... |
| c) Internal failure/Εσωτερικές αποτυχίες | . | . | . | . | . | . | ..... | ..... |
| d) External failure/Εξωτερικές αποτυχίες | . | . | . | . | . | . | ..... | ..... |
| e) Lost opportunity/Απόλεια ευκαιρίας    | . | . | . | . | . | . | ..... | ..... |
| f) Any total cost/Ευνοχικά κόστα         | . | . | . | . | . | . | ..... | ..... |
| g) No figures/Δεν υπάρχουν αριθμοί       | . | . | . | . | . | . | ..... | ..... |

0) GENERAL QUESTIONS/TEKNIKE EPOTHEKE

99. Are you interested in the results and the findings of this Research?

**Ενδιαφέρεστε για τα αποτελέσματα και τα ευρήματα αυτής της έρευνας;**

Y: Yes/NaI, N: No/'OxI

1

100. Would you like the researcher to advise or recommend methods and techniques on Total Quality Management which can be applied to your enterprise for the purpose of this research?

θα θέλατε τον ερευνητή να σας συμβουλευθεί ή να σας εισηγηθεί μεθόδους και τεχνικές στο τομέα της Διεύθυνσης Ολοκληρωτικής Ποιότητας που θα μπορούσαν να εφαρμοστούν στην επιχείρησή σας για τον σκοπό αυτής της έρευνας;

Y: Yes/NaL, N: No/'OxL

1

101. Are in favour of the establishment of the First Quality Assurance Institution Organisation for the benefit of our Manufacturing Industry?

Είσαστε υπέρ της ίδρυσης του πρώτου Ινστιτούτου Οργανισμού Επιθεώρησης Ποιότητας προς όφελος των βιομηχανιών μας;

Y: Yes/NaL, N: No/'OxL

1

If yes please answer the following question or statements. Tick one or more.

Εάν ναι παρακαλώ απαντήστε τις επόμενες ερωτήσεις ή δηλώσεις. Σημειώστε ένα ή περισσότερα

- |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| a) To be semi-government/Να είναι ημικρατικό  | . | . | . | . | . | . |
| b) To be independent/Να είναι ανεξάρτητο  | . | . | . | . | . | . |
| c) To be a government dept/Να είναι κυβερνητικό τμήμα   | . | . | . | . | . | . |
| d) Under CCCO/Κάτω από το ΚΕΒΕ  | . | . | . | . | . | . |
| e) Under OEB/Κάτω από το ΟΕΒ  | . | . | . | . | . | . |
| f) Indeptent with all the above/Ανεξάρτητο με όλους τους πιο πάνω                               | . | . | . | . | . | . |
| g) Belongs to manufactures/Να ανήκει στις βιομηχανίες   | . | . | . | . | . | . |
| h) I am willing to be a member of that organisation/Είμαι πρόθυμος να γίνω μέλος του οργανισμού | . | . | . | . | . | . |
| i) I am willing to be among the first/Θα ήθελα να είμαι από τους πρώτους                        | . | . | . | . | . | . |
| j) Other specifications/Άλλες διευκρινίσεις   | . | . | . | . | . | . |

[illegible]

102. Are you aware of another company who may be interested in participating in this research? If yes please write the name and address of the company.

Είναι σε γνώση σας οιαδήποτε άλλη επιχείρηση που θα ήθελε να λάβει μέρος σε αυτή την έρευνα; Εάν ναι παρακαλώ γράψετε το όνομα και την διεύθυνση της εταιρείας.

Y: Yes/NaL, N: No/'OxL




103. Have you been asked to contribute to such a study before?

Έχετε ερωτηθεί στο παρελθόν να συνεισφέρετε σε παρόμοια μελέτη;

A: Yes/Ναι, B: No/ Όχι, C: Specify/Διευκρινίστε

☐

104. What is the level of willingness of the management in changing and implementing new methods?

Ποιά είναι τα επίπεδα της προθυμίας της Διεύθυνσης για αλλαγές και εφαρμογή νέων μεθόδων

1 2 3 4 5 6 7 circle one/σημειώστε ένα

Low/ Very High/

Χαμηλό Πολύ ψηλό

105. Any comments, suggestions, opinions are welcomed.

Οτιδήποτε παρατηρήσεις, εισηγήσεις, γνώμες είναι ευπρόσδεκτες.

THANK YOU FOR YOUR COOPERATION

ΕΛΕ ΕΥΧΑΡΙΣΤΩ ΓΙΑ ΤΗΝ ΣΥΝΕΡΓΑΣΙΑ

## APPENDIX 5

### FILES INCLUDED ON THE 3 1/2" ATTACHED DISKETTE (D1)

All the files have been written using Data Entry II sub-menu, of SPSS/PC+ V3.0

FORM : The programming of the entire questionnaire without any answers.

DATA 1: Includes the form - layout of Question 1 to Question 59 without any answers.

DATA 1A: Includes the above with all the answers from Q1 to Q59.

DATA 2: Includes the form - layout of questions 60 to 105 without any answers.

DATA 2A: Includes the above with all the answers from Q60 to Q105.

FREQ 1A: Frequency distributions for Q1 to Q59 for the first 25 cases.

FREQ 1B: Frequency distributions for Q1 to Q59 for all cases. (60)

FREQ 2A: Frequency distributions for Q60 to Q105 for the first 25 cases.

FREQ 3B: Frequency distributions for Q60 to Q105 for all cases. (60)

START : This is a batch file which leads you to the main menu of SPSS package.

## APPENDIX 6

### STEPS FOLLOWED IN PROGRAMMING THE COMPUTER

1. Define variable name (8 characters). The first letters were related to each question. The numerical part has exactly the same numbering as the question number which appeared on the questions. The last letter indicates the subdivision of each question if there was one.
2. Define variable label (52 characters). This section describes very briefly each question.
3. Define type of variable (numeric or string). If the acceptable answer is going to be a number (N) or a letter (S).
4. Define variable length.  
How many digits or letters can be accepted as an answer.
5. Define decimal number.  
In case of a numeric variable, the number of decimal points that could be accepted.
6. Define missing cases: (.)  
When there is no answer or a missing value the computer will treat that answer separately. The symbol used for missing case was the point ".".
7. Define variable definitions.  
On the questionnaire the answer is shown either as a letter or a number. That answer was defined at this stage as it was defined in the questionnaire. This

definition appears on every table or analysis.

8. Define Ranges.

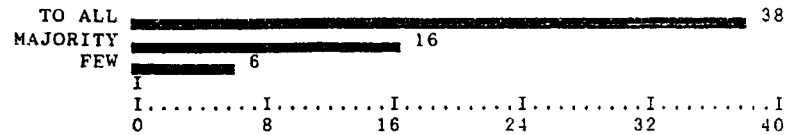
This is to protect the programme from inserting answers which are not included in the questionnaire. The computer was programmed to accept only numbers and letters which were options on the questionnaire. Ranges have been specified for 95% of the questionnaire.

9. Define Rules.

This is a logic command. It was used when there was a relation between two or more questions. It was used to skip or jump one question or allocate a certain value when a specific answer was given on the previous question.

## APPENDIX 7

### SAMPLE PAGE OF THE COMPUTER PRINTOUTS



Valid Cases 60 Missing Cases 0

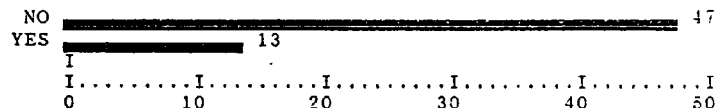
Page 67

SPSS/PC+

12/3/91

DPA21 FAMILIAR WITH DEP. PUR. ANALYSIS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
NO	N	47	78.3	78.3	78.3
YES	Y	13	21.7	21.7	100.0
TOTAL		60	100.0	100.0	



Valid Cases 60 Missing Cases 0

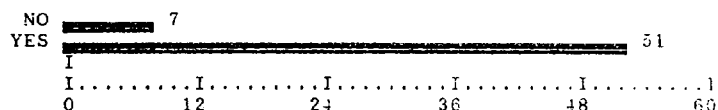
Page 68

SPSS/PC+

12/3/91

APL22 EVALUATE ACTUAL PER. LEVEL

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
NO	N	7	11.7	12.1	12.1
YES	Y	51	85.0	87.9	100.0
	.	2	3.3	MISSING	
TOTAL		60	100.0	100.0	



Valid Cases 58 Missing Cases 2

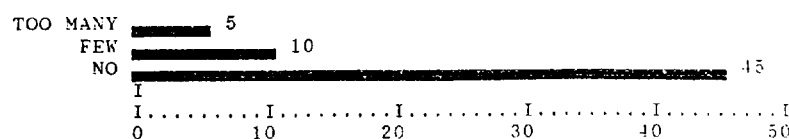
Page 69

SPSS/PC+

12/3/91

VIS23 POSTERS&CHARTS ON WALLS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
TOO MANY	A	5	8.3	8.3	8.3
FEW	B	10	16.7	16.7	25.0
NO	C	45	75.0	75.0	100.0
TOTAL		60	100.0	100.0	



Valid Cases 60 Missing Cases 0

Page 70

SPSS/PC+

12/3/91

REC0R24 KEEP RECORDS FOR:

# APPENDIX 8

## SUMMARISED SURVEY RESULTS

QUESTION	A N S W E R S - C H O I C E S	MISSING
ACTIV 1	C:(13)22% F:(14)23% LF:(13)22% M:(14)23% WF:(6)10%	0
LOCAT 2	A:(39)65% B:(12)20% C:(9)15%	0
FORM 3	COOP:(1)2% PRIV.LTD:(35)58% PUPUBLIC:(2)3% SEMIG.:(1)2% SHARE CO:(20)33%	(1)
EMPL 4	9-19:(6)10% 20-49:(12)20% 50-99:(23)39% 100-199:(15)25% 200-500:(5)9%	0
OUTP\$ 5	MILL.POUNDS UP TO;0.5:(7)12% 1:(10)17% 5:(28)48% 17:(4)7%	(9)15%
CODE NO6	C:(13)22% F:(14)23% LF:(13)22% M:(14)23% WF:(6)10%	0
NAME 7	ANGELI:(35)58% BY HAND:(23)38% STUD.:(2)3%	0
TITLE 8	Q.ENG:(4)7% Q.PERS:(2)3% OWNER:(16)27% DIREC:(15)26% PROD.MAN:(23)39%	0
W.Q.P 9	A:(13)22% B:(14)25% C:(11)19% D:(22)35%	0
OMANU 10	A:(11)19% B:(24)41% C:(10)17% D:(14)24%	0
ST.COM11	Y:(34)57% N:(26)43%	0
OBJ.CO12	A:(27)80% B:(6)18% C:(1)3%	(26)43%
RESP 13	A:(16)27% B:(1)2% C:(8)17% D:0 E:(15)25% F:(1)2% H:(18)30%	(1)2%
Q.SYST14	Y:(18)30% N:(42)70%	
Q.SYST14B	Q.A.STAN:(5)8% UNDER LIC.:(3)5% OTHER:(9)15%	(43)72%
Q.OBJ 15	A:(22)37% B:(37)62% C:(1)2%	0
MAN.CO16	A:(54)90% B:(5)8% C:(1)2%	0
OBJ. 17	A:(37)62% B:(23)38%	0
ILOP 18	Y:(39)65% N:(21)35%	0
ALOP 19	Y:(17)28% N:(43)72%	0
DEP 20	A:(38)63% B:(16)27% C:(6)10%	0
DPA 21	Y:(13)22% N:(47)68%	0
APL 22	Y:(51)88% N:(7)12%	(2)3%
VIS 23	A:(5)8% B:(10)17% C:(45)75%	0
RECOR 24*	A:(42)70% B:(49)82% C:(52)87% D:(31)52% E:(59)98% F:(45)75%	0
SUPP 25	A:(5)8% B:(12)20% C:(14)23% D:(29)48%	0

QUESTION	A N S W E R S - C H O I C E S	MISSING
SUPP 26	LOC.MARKET:24.2% EC:52.4% OTHER:18.1%	(5)8%
CHAN 27	A:(19)32% B:(41)68% C:0	0
STAN 28	0-25:(5)8% 26-50:(5)8% 51-75:(6)10% 76-100:(19)32% NO:(24)41%	(1)2%
CHECK 29	A:(32)53% B:(18)30% C:(4)7% D:(4)7% E:(2)3%	0
STOCK 30	A:(28)47% B:(7)12% C:(22)37% D:(2)3%	(1)2%
STORE 31	Y:(48)86% N:(8)14%	(4)7%
SYST 32	A:(10)17% B:(28)47% C:(21)35%	(1)2%
SYST 32A%	CONTINUS.:(9)15% OFTEN:(4)7% 3-12MONTHS:(4)7%	(43)72%
SYST 32B%	(19)32% GIVE AN ANSWER	(41)68%
ORDER 33*	A:(11)19% B:(8)14% C:(38)64% D:(2)3% E:(11)19% F:(23)39% G:(11)19% H:(39)65% I:(40)67% J:(37)62% K:(15)25%	0
MRP 34	A:(41)71% B:(17)29%	(2)3%
COST 35%	KEEP RECORDS:(30)50%	(30)50%
COST 35*	1986;2.8%:(15)25% 1987;3%:(15)25% 1988;3.7%:(14)24% 1989;3.7%:(16)27% 1990;3.1%:(20)34%	(45)75%
INV 36%	KEEP RECORDS:(22)37%	(38)63%
INV 36*	86:4.2%(18)30% 87:6.1%:(21)35% 88:7.8%:(23)38% 89:6.9%:(25)42% 90:4.8%:(29)48%	(23)38%
PROD 37%	KEEP RECORDS:(11)19%	(49)81%
PROD 37*	86;5%:(7) 87;4%:(7) 88;5%:(8) 89;7%:(10) 90;8%:(11)	(51)88%
FMEA 38	Y:(9)15% N:(50)85%	(1)2%
FAIL 39	A:(13)22% B:(20)34% C:(4)7% D:(8)14% E:(13)22%	(2)3%
COMP 40	USE:(51)86% NO USE:(8)14%	(5)8%
COMP 40*	FMEA:(3)5% SPC:(5)8% INV:(35)58% PUR:(42)70% STOC:(39)65% PAYM:(50)83% DATA:(31)52% MAIN:(8)13% OC:(8)13% CNC:(6)10% DRV:(10)17% DES:(7)12% DWG:(8)13%	(5)8%
EFF 41	A:(20)35% B:(14)25% C:(14)25% D:(9)16%	(3)5%
COUS 42	A:(31)52% B:(24)40% C:(3)5% D:(2)3%	0
COUS 42A	Y:(17)31% N:(38)69%	(5)8%
Q.PR 43	A:(31)52% B:(20)33% C:(6)10% D:(3)5%	0
Q.PR 43A	A:(2)3% B:(4)7% C:(54)90%	0
APP 44	A:(33)57% B:(22)38% C:(3)5%	(2)5%
CAP 45	A:(47)80% B:(6)10% C:(2)3% D&E:0 F:(4)7%	(1)2%
CAP 46	A:(17)28% B:(15)25% C:(27)46%	(1)2%

QUESTION	A N S W E R S - C H O I C E S	MISSING
CAP 47	A:(17)28% B:(25)42% C:(9)15% D:(1)2% E:(8)13%	0
SPEC 48	A:(40)67% B:(20)33% C,D,E,F:0	0
M.DEF 49%	0-.19:(13)22% 0.2-0.49:(3)5% 0.5-0.99:(5)8% 1-4.99:(15)25% 5-10:(6)10%	(18)30%
TACH 50	A:(1)2% B:(20)34% C:(38)63%	(1)2%
OPT 51	A:(29)49% B:(14)24% C:(7)12% D:(6)10% E:(3)5%	(1)2%
OPT 52*	A:(25)42% B:(30)50% C:(9)15% D:(55)92% E:(37)62% F:(2)3% G:(12)20% H:(6)10% I:(4)7%	0
SPC 53	A:(13)22% B:(9)15% C:(7)12% D:(3)5% E:(28)47%	0
SPC 53A	Y:(20)40% N:(30)60%	(10)17%
TSPC 54	A:(12)20% B:(2)3% C:(1)2% D:(45)75%	0
TRAI 55	A:(10)17% B:(5)8% C:(4)7% D:(41)68%	0
LIM 56	Y:(38)69% N:(17)31%	(5)8%
ENT 57	A:(1)3% B:(1)3% C:(12)37% D:(7)21% E:(5)16% F:(1)3% G:(3)9% H:(2)6%	(28)47%
P.C 58	A:(22)37% B:(22)37% C:(6)10% D:(9)15%	(1)2%
ACT 59*	A:(44)73% B:(27)45% C:(12)20% D:(24)40% E:(41)68% K:(15)25%	0
CHAR 60*	A:(8)13% B:(6)10% C:(2)3% D:(2)3% E:(52)87%	(28)47%
X-R 61	A:(11)19% B:(9)16% C:(3)5% D:(1)2% E&F:(33)56%	(3)5%
REC 62	A:(13)26% B:(4)8% C:(7)14% D:(3)6% E:(23)46%	(10)17%
YOKE 63	A:(1)2% B:(16)27% C:(43)72%	0
POKA 64	A:(7)12% B:(10)17% C:(12)21% D:(6)10% E&G:(23)40%	(2)3%
FOOL 65	A:(3)5% B:(10)17% C:(19)33% D:(18)32% E:(7)12%	(3)5%
QFD 66	A:(1)2% B:(18)31% C:(39)67%	(2)3%
PROP 67	A:(17)30% B:(23)40% C:(10)17% D:(2)3% E:(5)9%	(3)5%
Q.LAB 68	A:(9)15% B:(26)27% C:(11)19% D:(19)32% E:(4)7%	(1)2%
STAMP 69	A:(7)12% B:(2)3% C:(4)7% D:(46)78%	(1)2%
DEF 70	A:(45)76% B:(10)17% C:(3)5% D:0 E:(1)2%	(1)2%
FAIL 71%	0-0.19:0 0.2-0.49:0 0.5-0.99:(1)2% 1-4.99:(35)60% 5-30:(9)15%	(15)25%
FAIL 71A%	0-0.19:0 0.2-0.49:0 0.5-0.99:(8)14% 1-4.99:(16)27% 5-30:(3)5%	(32)54%
FAIL 72%	0-0.99:(14)24% 0.2-0.49:(2)3% 0.5-0.99:(2)3% 1.0-4.99:(14)24% 5-7:(4)7%	(21)36%
RECO 73	Y:(22)81% N:(5)18%	(33)55%



QUESTION	A N S W E R S - C H O I C E S	MISSING
USE 74	A:(19)32% B:(14)24% C:(26)44%	(1)2%
CUST 75*	A:3% B:62% C:27% D:19%	(2)3%
CREQ 76*	A:(12)21% B:(8)13% C:(34)57% D:(38)63% E:(3)5% F:(6)10%	(2)3%
COMP 77	A:(20)34% B:(7)12% C:(7)12% D:(24)41%	(2)3%
COMP77NA%	NA:(30)50%	(30)50%
COM 77*	86:(4)7% 87:(4)7% 88:(5)8% 89:(5)9% 90:(9)16%	(53)90%
ACTION78%	GIVE AN ANSWER (40)67%	(20)33%
P.Q 79*	A:(19)38% B:(41)68% C:(11)18% D:(27)45% E:(50)83% F:(21)35% G&H:0	(1)2%
CUST 80*	A:(16)27% B:(38)63% C:(29)48% D:(44)73% E:(19)32% F:0 G:(4)7% H:0	(1)2%
TOM 81	A:(2)3% B:(25)46% C:(28)51%	(1)2%
O.Cs 82	Y:(12)21% N:(45)79%	(3)5%
OPER 83	A:(18)30% B:(37)62% C:(4)7% D:(1)2%	0
PROG 84	A:(15)25% B:(26)43% C:(19)32%	0
TRAIN 85	Y:(27)45% N:(33)55%	0
TRAIN85A	GIVE AN ANSWER (19)31%	(41)69%
TRAIN 86	Y:(19)33% N:(39)65%	(2)3%
TRAIN86A	GIVE AN ANSWER (14)23%	(46)77%
EDUC 87A	1:(1)2% 2:(1)2% 3:(1)2% 4:(4)8% 5:(11)22% 6:(11)22% 7:(21)42%	(10)17%
EDUC 87B	1:(7)14% 2:(9)18% 3:(12)24% 4:(9)18% 5:(3)6% 6:(5)10% 7:(5)10%	(10)17%
TRME 88*	1:(30)50% 2:(41)68% 3:(16)27% 4:(36)60% 5:(21)35% 6:(22)37% 7:(9)15% 8:(46)77% 9:(2)3% 10:(10)17% 11:(31)52% 12:(33)55% 13:(30)50% 14:(23)38%	(1)2%
RECOM 89	(8)11% RECOMMENTATIONS	(52)87%
VIST 90	A:(44)74% B:(5)8% C:(8)14%	(3)5%
VIST 91	A:(15)33% B:(25)56% C:(5)11%	(15)25%
EXP 92	Y:(34)85% N:(6)15%	(20)33%
EC 93	A:(33)58% B:(6)10% C:(12)21% D:(6)10%	(3)5%
JOIN 94	A:(58)100% B&C:0	(2)3%
REQUIR95%	GIVE AN ANSWER (43)82%	(17)28%
READ 96	A:(7)12% B:(20)34% C:(26)45% D:(5)9%	(2)3%
PR.Q 97	A:0 B:(24)41% C:(30)51% D:(4)7% E:(1)2%	(1)2%

QUESTION	A N S W E R S - C H O I C E S	MISSING
COST 98*	A,B,E,F, NO FIGURES C:0-0.19:0 0.2-0.49:0 0.5-0.99:0 1-4.99:(19)80% 5-30:(2)8% D:'0-0.19%:(5)20% '0.2-0.49%:(1)4% 0.5-0.99%:(1)4% 1-4.99%:(15)60% 5-30%:(2)8%	(60)100 (35)58% (36)60%
RES 99	Y:(56)95% N:(3)5%	(1)2%
TOM 100	Y:(52)91% N:(5)9%	(3)5%
QAI 101	Y:(57)97% N:(2)3%	(1)2%
QAI 101*	A:(12)20% B:(10)17% C:(6)10% D:(11)18% E:(6)10% F:(23)38% G:(7)12% H:(42)70% I:(29)48% J:(2)3%	(3)5%
FAM 102	Y:(12)31% N:(27)69%	(21)35%
FAM 102A%	GIVE DETAILS (12)19%	(48)81%
STUD 103	A:0 B:(59)100% C:0	(1)2%
STUD 103A	NO ANSWERS	(60)100
WILL 104	1:0 2:0 3:0 4:(5)11% 5:(6)13% 6:(13)28% 7:(23)49%	(13)22%
COMM 105%	GIVE AN ANSWER (41)70%	(19)30%
DURATION	AVERAGE INTERVIEW TIME:84 MIN	
DATES	FROM 13/3/1991 TO 25/11/1991	

## APPENDIX 9

### PROPOSAL FOR A "QUALITY MANAGEMENT" TRAINING AND IMPLEMENTATION PROJECT

(Proposed by the author to the Mechanical Engineering Department)

#### Aim and Objectives:

To train and improve the performance and competitiveness of Cyprus manufacturing industries. This will be achieved by introducing modern concepts of Total Quality Management together with appropriate statistical methods, using the Action Learning Methodology.

#### Organizers:

Higher Technical Institute, and possibly CPC.

#### Participants:

Quality Assurance Personnel, Production Managers, Chief Executives Officers (CEO) from 4 to 5 Cyprus Manufacturing industries.

#### Duration:

9-12 months, November 1992 to July 1993, 1 day/week on each industry

#### Implementation of the Proposal

- To be discussed at a later stage.
- Instructors/Consultants/Facilitators Counterback  
Personnel mainly from HTI, CYS, CPC, and EC countries

preferably U.K.

**Funding:**

Scheme 1. Enterprises, Scheme 2: Enterprises & ITA  
Scheme 3: Enterprises, ITA, CDB (EC International  
investment partners EC-IIP)

**Cost:**

Very rough estimations: C£15.000 to C£30.000. These  
include expenses for consultation, materials, travel  
expenses etc.

**Supervision:**

Higher Technical Institute, and possibly Cyprus  
Productivity Center, University of Glamorgan, CCCI?

**Personnel requirements:**

One full time consultant/facilitator, 3-5 part time or  
visiting consultants, facilitators.

**General Characteristics:**

This is a joint training and implementation project for  
a group of manufacturing industries (and E.C.  
enterprises under the general supervision and guidance  
of Higher Technical Institute and other institutions.

Using the action learning methodology the project mainly  
will consist of formal training courses and regular  
meetings followed by implementation and consultation at  
the enterprises premises (one day per week for each  
participating company). Suggested courses are attached  
with this proposal.

During the implementation of the project and training, materials and resources will be used, supplied, purchased, suggested, borrowed etc. These will be discussed at a later stage.

### Suggested Courses and Training

Companies coordinators and representatives will be exposed on the following formal courses and training.

1. Project planning and control, project management
2. Total quality management (TQM & Quality Gurus)
3. Seven tools (Pareto, cause and effect C&E, control charts, run chart, scatter diagram, flow charts, histogram)
4. Statistical process control SPC
5. Quality system - ISO 9000
6. Failure Mode and Effects Analysis (FMEA)
7. Quality Function Deployment (QFD)
8. Design of experiments - Taguchi
9. Kamban and Just in time (JIT)
10. Poka yoke
11. Material requirements planning (MRP)
12. Quality Circles (QCs)

Instructors: Local/Foreign

Language : English/Greek

Location : Mainly HTI, Enterprises Premises

Duration : To be discussed on a later stage in accordance with a detailed programme

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