DXN019649

IMPACT OF TOTAL QUALITY MANAGEMENT, WORK TEAMS, AND JUST IN TIME ON THE PERFORMANCE OF THE MEXICAN MANUFACTURING FIRMS

BY

MOHAMMAD REZA AZARANG ESFANDIARI

THESIS SUBMITTED FOR
THE AWARD OF THE DEGREE OF
DOCTOR OF PHILOSOPHY

THE CITY UNIVERSITY
BUSINESS SCHOOL
DEPARTMENT OF MANAGEMENT SYSTEMS
AND INFORMATION
LONDON EC1V 0HB

MARCH 1998

PAGE

NUMBERING

AS ORIGINAL

TABLE OF CONTENTS

LIST OF TABLES

ACKNOWLEDGEMENTS

During the process of conducting this research, I have had the pleasure of dealing with a number of people who were willing to share their knowledge with me and assist me in my endeavour. I would like to thank them.

I would like to express my appreciation to my two supervisors. Dr. Lawrie Reavill spent long hours and great effort in guiding and assisting me during all stages of this research. His valuable comments and advises were always available when I needed them. Dr. Daniel Meade, was of great help throughout the whole process and gave especial help concerning the general structure of the thesis.

I would like to thank other people who assisted me along the way. Dr. Fred Charlwood for his help during the early stages of this thesis. Dr. Graciela Gonzaléz for her efforts to bring me to a competent understanding of the multivariate analysis and for assisting me in mastering the SAS and JMP procedures. Dr. Gonzalo Mitre for his valuable comments in the final preparation of this manuscript.

My gratitude and appreciation to those managers who gave their time and effort to provide the empirical data used in this study.

I would also like to acknowledge the support and financial help provided to me during this research by ITESM campus Monterrey, and department of Industrial Engineering.

I would like to thank my family for their moral support, patience, and encouragement over this time. Without their understanding and help during this important time of life, this task would have been impossible. My special thanks to my wife Sandra, and children Melissa, Maryam, and Rashid. My special gratitude to my late parents who always encouraged me to study a PhD.

Finally, I thank God with giving me the strength to study this PhD.

PAGE
MISSING
IN
ORIGINAL

ABSTRACT

There is no doubt that every corner of the manufacturing world is changing in important ways. Industries that were once dominated by North American and Western European companies are now global, and competition around the world is intense. No manufacturer can afford to be complacent about past successes and expect to survive. The pressures of competition are significant, and they are growing. In Mexico too, companies are becoming concerned by the increasing global competition they are facing. The most immediate threat is posed by the USA and Canada as a consequence of the establishment of the North American Free Trade Agreement (NAFTA). Japanese competition is also increasing, and so too is the competition from the newly industrialised countries of Asia and Europe. Many Mexican companies which relied on cheap labour and had little outside competition are now threatened by technically more advanced companies. Manufacturers find themselves competing more intensely than ever before in international markets. This also means they face more intense competition in their own domestic markets from international producers. Of course, there is no blueprint for survival in the global market. But clear patterns emerge when one carefully examines the practices of those manufacturers regarded as "world class".

A good deal of evidence suggests that the failure of some firms to survive in the global market is due to the mismanagement of people rather than to problems with technical systems per se. In particular, changes in manufacturing often are not accompanied by complementary changes in human resource management. Human resource management considerations such as Work Teams may be as important as other aspects of modern manufacturing, such as Just In Time (JIT) and Total Quality Management (TQM). Recognition of this issue is so widespread that most theorists see Work Teams (WT) as a critical link in the conversion to the modern manufacturing paradigm·

This study investigates the impact of Total Quality Management (TQM), Work Teams (WT), and Just-In-Time (JIT) on the performance of Mexican manufacturing firms. The direction and magnitude of the impact is analysed for large, medium, small and Maquiladora industries. Findings of the study are intended to provide a clearer view of what impacts the performance of the companies.

This overall theme is consistent with a long history of research on the integration of technology and organisation. Little empirical research has, however, investigated the effect of Work Teams, Just In Time manufacturing , and Total Quality Management programs as an integrated concept on the performance of manufacturing firms. Research to date has relied mainly on studying the effect of each factor as a stand-alone system on organisations or case studies, which have frequently presented idiosyncratic practices or conflicting findings.

Based on the model of Malcolm Baldrige Quality Award, and Mexican National Quality Award, a survey questionnaire was developed. It contained variables of the TQM, WT, and JIT practices which were measured on a five-point Likert type scale for all items to ensure higher statistical variability among survey responses· The respondents were asked to choose the grade (from 1 to 5) of implementing these practices in the last three to five years in their firms. The questionnaires were mailed to 230 large, 133 medium, 105 small, and 175 Maquiladora companies. The first section of the questionnaire gathered information on the quality improvement techniques practised by each firm based on a 68 questions on TQM, JIT, and WT, and the second section determined the outcome of the companies measured as the performance based on the perception of plant managers

divided into 7 questions on operational results, customer satisfaction, and organisational climate.

Reliability and validity tests were addressed in survey development and evaluation to provide confidence that the empirical findings accurately reflected the proposed constructs. While the reliability test permitted to the determining of the degree of systematic variance in the questionnaire, the validity test allowed labelling of this systematic variance.

The findings reported here are based on questionnaire data collected covering 122 large, 60 medium, 56 small, and 60 Maquiladora manufacturing companies from different sectors. Given the purpose of the study, a principal component factor analysis with varimax rotation was used to examine the interrelationships among the variables and then explaining these variables in terms of their common underlying dimensions (factors). In order to examine the impact of these variables on the performance of the companies, a canonical correlation analysis was done.

The study showed that no stand-alone improvement technique had an impact on the performance. The only significant impact was found when TQM, JIT, and WT were practised simultaneously.

LIST OF ABBREVIATIONS

CAD	Computer Aided Design
CTM	Mexican Confederation of Workers (Confederacion de Trabajadores de Mexico)
EDI	Electronic Data Interchange
EFQM	European Foundation for Quality Management
EPA	Economically Active Population
EQA	The European Quality Award
GAO	General Accounting Office
HRM	Human Resource Management
JIT	Just In Time
JUSE	Japanese Union of Scientists and Engineers
MFTQ	Mexican Foundation for Total Quality
NAFTA	North American Free Trade Agreement
NIC	Newly Industrialised Countries
PIMS	Profit Impact of Marketing Strategy
PRI	Institutional Revolutionary Party (Partido Revolucionario Institucional)
ROA	Return On Assets
ROI	Return On Investment
SMC	Squared Multiple Correlations
SPC	Statistical Process Control
SQC	Statistical Quality Control
TQM	Total Quality Management
US	United States
WT	Work Teams

GLOSSARY

Canonical correlation: A measure of the strength of the overall relationships between the linear composites of the predictor and criterion sets of variables. It represents the bivariate correlation between the two linear composites.

Canonical functions: The relationship of two linear composites. Each canonical function has two separate linear composites (canonical variates), one for the set of criterion variables and one for the set of predictor variables. The strength of the relationship is given by the canonical correlation.

Canonical loadings: Also known as canonical structure correlation, they measure the simple linear correlation between the independent variables and their respective linear composites, and can be interpreted like factor loadings.

Canonical roots: Squared canonical correlations. They provide an estimate of the amount of shared variance between the respective optimally weighted linear composites of criterion and predictor variables.

Canonical variates: Represent the weighted sum of two or more variables.

Cattell's salient similarity index, s: An index used in deciding whether or not two groups that differ in experience or characteristics share the same latent structure. This index is sensitive to Pattern of loadings.

Common factor Analysis: A factor model in which the factors are based upon a reduced correlation matrix. That is, communalities are inserted in the diagonal of the correlation matrix, and the extracted factors are based only on the common variance, with specific and error variance excluded.

Communality: The amount of variance an original variable shares with all other variables included in the analysis.

Component analysis: A factor model in which the factors are based upon the total variance. With component analysis, unities are used in the diagonal of the correlation matrix, which computationally implies that all of the variance is common or shared.

Correlation matrix: A table showing the intercorrelations among all variables.

Criterion variables: Dependent variables.

Eigenvalues (Canonical Correlation Analysis): See *canonical roots*.

Eigenvalue (Factor Analysis): The column sum of squares for a factor; also referred to as the *latent root*. It represents the amount of variance accounted for by a factor.

Factor: A linear combination of the original variables. Factors also represent the underlying dimensions (constructs) that summarise or account for the original set of observed variables.

Factor loadings: The correlation between the original variables and the factors. *Squared factor loadings* indicate the percentage of the variance in an original variable that is explained by a factor.

Factor matrix: A table displaying the factor loadings of all variables on each factor.

Factor rotation: The process of manipulating or adjusting the factor axes to achieve a simpler and more meaningful factor solution.

Factor score: This measure (score) is a composite of all of the original variables that were important in making the new factor. The composite measure is referred to as a *factor score*.

Linear composites: See *canonical variates*.

Oblique factor solution: A factor solution computed so that the extracted factors are correlated. Rather than arbitrarily constraining the factor solution so the factors are independent of each other, the analysis is conducted to express the relationship between the factors that may or may not be orthogonal.

Orthogonal: Refers to the mathematical independence of factor axes to each other (i.e., at right angles or 90 degrees).

Orthogonal factor solutions: A factor solution in which the factors are extracted so that the factor axes are maintained at 90 degrees. Thus, each factor is independent of or orthogonal from all other factors. The correlation between factors is arbitrarily determined to be zero.

Predictor variables: Independent variables.

Redundancy index: The amount of variance in one set of variables explained by a linear composite of the other set of variables.

CHAPTER 1
INTRODUCTION AND PROBLEM STATEMENT

1.1 A Competitive Global Economy

Internationally, manufacturers are facing increasing competitive pressure resulting from liberalisation of inter-country trading practices and consumer demands. Trade barriers, such as tariffs, are being reduced or have been removed altogether. Additionally, the regional free-trade agreements, such as US-Canada-Mexico Free Trade Agreements, and the European Community (EC), have opened national boundaries to intra-regional trade.

Many managers in Mexico are becoming concerned by the increasing global competition they are facing. The most immediate threat is posed by the USA and Canada as a consequence of the establishment of the North American Free Trade Agreement (NAFTA). Japanese competition is also increasing, and so too is the competition from the newly industrialised countries and from Europe. Many Mexican companies which relied on cheap labour and had little outside competition are now threatened by technically more advanced companies. Manufacturers find themselves competing more intensely than ever before in international markets. This also means they face more intense competition in their own domestic markets from international producers.

In order to remain competitive, manufacturers worldwide must become more efficient and effective (Hayes, Wheelwright and Clark, 1988; Reddy and Berger, 1983; Takeuchi and Quelch, 1983). A parallel development is that of the raised customer expectation with regard to product quality. Feigenbaum (1983), Kaplan (1983), Leonard and Sasser (1982), and Trevor (1986) argue that the ability to meet increased customer demand for quality products at competitive prices has become a key area of competition. Luchs (1986) and Feigenbaum (1986) believe that quality is the sharpest competitive weapon which a firm possesses.

1.2 Role of Integrated Manufacturing

One of the most pressing challenges facing firms in today's business environment is the transformation to a new paradigm for manufacturing where firms are to remain globally competitive (Business Week, 1986; Drucker, 1990; The Economist, 1987). Although the changes in manufacturing originally centred on the implementation of advanced technology, their scope has expanded to other issues, such as strategy (Hayes, Wheelwright, and Clark, 1988), quality assurance (Harrington, 1987), inventory control (Klein, 1991), and job design (Dean, and Snell, 1996). Many theorists have stated that companies need to cross the threshold to this new paradigm to compete in the era of modern manufacturing (Jaikumar, 1986). A good deal of evidence suggests that the failure of some firms to make this transition is due to the mismanagement of people rather than to problems with technical systems per se (Ettlie, 1988; Majchrzak, 1988). In particular, critics have charged that changes in manufacturing often are not accompanied by complementary changes in human resource management (Adler, 1988)' Human resource management considerations such as workteams may be as important as other aspect of modern manufacturing, such as Just In Time (JIT) (Huang et. al., 1983; Klein, 1991) and Total Quality Management (TQM) (Harrington, 1987; Oliver and Davis, 1990). Recognition of this issue is so widespread that most theorists see Work Teams (WT) as a critical link in the conversion to the modern manufacturing paradigm (Hayes et al., 1988; Majchrzak, 1986; Monden, 1983).

1.3 Worldwide Manufacturing Practices

US manufacturing strategy in the 1990s reflects the continuing challenges from the 1980s- the need for continuous improvement in quality, costs, on time delivery, and product development. In 1984, quality improvement was not yet a top-five strategy. By 1986, the top three strategies were all quality related: implementing Statistical Process Control (SPC), introducing zero defects programmes, and involving vendors in quality efforts. Vendor quality and SPC remained the top two manufacturing strategies in 1988, while improving performance quality and vendor quality were the top two strategies in 1990. A 1992 study indicates that the top five most important competitive capabilities of US manufacturers are, in order of importance (Kim and Miller, 1992):

- conformance quality,
- product reliability,
- on-time delivery,
- performance quality, and
- price.

It is noteworthy that three of the top four capabilities reflect quality.

In a study by Pittsburgh-based Development Dimensions International, Quality and Productivity Management Association, and Industry Week magazine of nearly 7,000 people from more than 500 organisations in North America and Europe aimed to answer some of the growing concerns about TQM (Thompson, 1993). The results of this study is shown in Table 1.1.

	Percentage of Respondents	
Strategy	**North American**	**European**
Total Quality Management	17	15
Work Place Training	15	12
Improving Production processes	10	8
Primary/Secondary Educational Systems	10	6
Focus on teams or teamwork	10	11
Speed in delivery and reduced throughput time	9	10
Technology	9	8
Expansion into a global marketplace	5	4
Benchmarking	3	6
Cooperation across Industries	3	3
ISO 9000 Certification	3	5
Wider European Market	-	5
EEC Regulations and Directives	-	3
Other	3	2
Government Trade Regulation	2	1
Assistance from Government	1	1

Table 1.1 : Strategies chosen by executives as most likely to have a long-term effect on productivity and competitiveness.

In general the similarities between answers obtained from North American and European organisations suggests that the firms are beginning to realise the benefits of long-term strategies involving the "Total" organisation. Most respondents selected strategies that require change in organisational culture and processes instead of ones that were more likely to be a quick fix. As can be seen from the Table 1.1, respondents from both North America and Europe ranked strategies that are underlying components of Total Quality Management, Just-In-Time and Work Teams as being the strategies that most likely to have a long-term effect on their productivity and competitiveness.

A study was performed by Swamidass (1994) based on more than 1000 participants in US to measure the performance of technology users in terms of manufacturing lead-time, and rejection and rework rates. This study concludes that Total Quality Management (TQM), Computer Aided Design (CAD) and Just In Time (JIT), in that order, are the most frequently cited technologies in which US manufacturers plan to become extremely skilled users in the next two years. This is understandable, given the frequent use of these technologies and the benefits of these technologies reported by users. JIT was used by nearly 90 percent of plants that consider it to be relevant. Four technologies- JIT, TQM, manufacturing cells, and SQC (Statistical Quality Control)- appeared jointly in manufacturing plants: More than 80 percent of TQM, SQC, and cell users use JIT. More than 80% of JIT, SQC and cell users use TQM. It seems that SQC and cells are used to implement JIT and TQM. Therefore, the use of soft technologies (TQM, JIT, cells, and SQC) occurs in a cluster, which is at the heart of effective and efficient factory operation today.

1.4 Management Techniques

Manufacturing firms that have been confronted with intense foreign competition have developed effective improvement programmes for quality and productivity. Many types of programmes have been developed to improve quality and productivity, but only a few of these have proven to be successful in improving both simultaneously. Many of these programmes originated with, or at least have been refined by, Japanese firms. However, they had to be adapted to different cultural environments It is no coincidence that methods such as Just-In-Time, Total Quality Management, and Work Teams are all used simultaneously by the most successful industrial firms. The critical elements of taking an organisation-wide perspective, stressing process improvements, and involving all employees underline all three improvement programmes.

1.4.1 Just-In-Time (JIT)

JIT is generally thought of as a method to reduce inventory level. But viewed this way one overlooks the significant benefits for productivity and quality that can result. In fact, the quality and productivity benefits are often far more important than the cost savings that result from reducing inventory carrying costs. JIT should really be conceptualised as a complete production scheduling and control system which is the way in which Toyota Motor Co., its originator, conceived of it. Inventory reduction is the "lever" by which improvements are forced throughout the process. The philosophical concept supporting these improvements is that "inventories are the root of all evil in manufacturing."(Mefford, 1991) The reason inventories are so bad is that they can cover up many problems within a production process. No production interruptions occur if inventory levels are kept high enough to discard any defects and keep the process running.

Reduce inventories to the exact number needed at each stage, and poor quality parts and materials become a very visible problem as the process stops. The same thing occurs with poor scheduling, old or poorly-maintained equipment, or worker-related problems if inventory buffers are reduced. Production interruptions continuously occur as the inventory levels are reduced, and the problems that caused these interruptions must be dealt with. The resultant productivity and quality improvement from JIT can be very significant. It will be difficult if not impossible for a firm to implement JIT if quality of both internally-produced and purchased materials are not assured.

1.4.2 Total Quality Management (TQM)

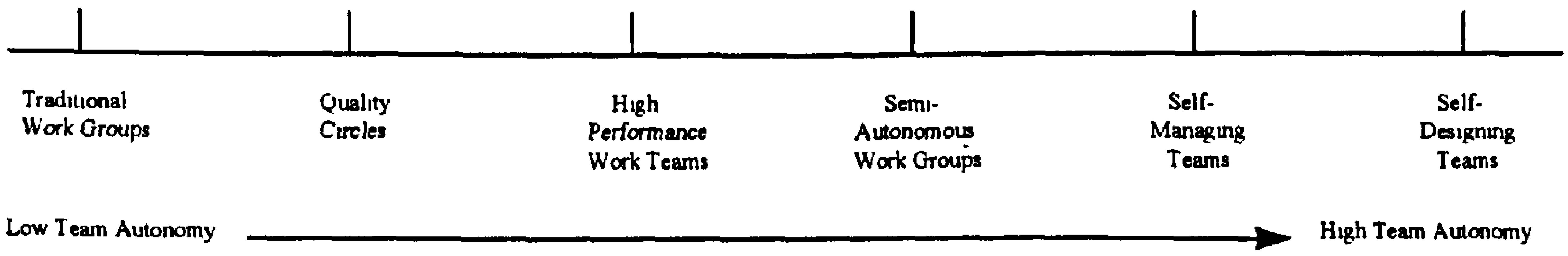
TQM is another method being used to improve both quality and productivity. In a TQM programme the focus is on quality improvement, but to accomplish this goal, a firm is likely to find that the methods employed also lead to significant productivity enhancement. A TQM programme utilises methods such as establishing quality as the primary operational goal, making everyone in the firm feel responsible for quality, a stress on constant improvement, zero defects as a goal, and tracking back defects to their source. These methods are likely to yield productivity improvements as well as quality improvements. In identifying and correcting the quality problems, productivity will almost certainly increase by the direct and indirect mechanisms indicated above. Another potent mechanism of productivity improvement for TQM programmes is the effect on worker attitudes and morale. By stressing every employee's responsibility for quality, a commitment to performing work properly and constantly looking for ways to improve performance is instilled. These moral effects can be very effective in improving quality and productivity, and successful TQM programmes are heavily dependent on such worker involvement. Therefore, it should not come as a surprise that firms using TQM also are demonstrating rapid productivity growth.

1.4.3 Work Teams (WT)

A method to increase employee involvement, and channel their efforts into quality and productivity improvements is the use of work teams. Work teams have been shown to be an effective way to increase worker involvement and commitment by bringing into play group dynamic forces. The concept behind the work team is to involve the worker in design and control of his or her job and to utilise group pressures and rewards to provide motivation. Work teams typically have 5 to 15 employees who work together on one set of tasks and assume responsibility for assigning tasks among themselves, controlling quality, training, and improving efficiency of task performance. Often used on assembly lines, work teams offer a greater variety of tasks to each worker and add planning and control function to these jobs. Work teams increase worker flexibility since they usually rotate jobs, cross-train workers, and develop a broader perspective on the part of the employee as to where his/her job and team fit into the overall production process. This is likely to increase the employee's capabilities as well as motivation since the tasks have become broader and more interesting. The work team also provides a vehicle through which employees can analyse problems and develop solutions. The worker individually and through the team may be more receptive to change, and is better able to contribute to system changes required by the environment.

The popularity of work teams stems from the idea that by identifying and solving work-related problems, teams can contribute to improved performance. With an increasing emphasis on high-quality, fast product innovation and improved customer satisfaction, many companies now use team approaches to realise these goals in an environment characterised by functional and process interdependencies (Boyett and Conn, 1994). Work teams are considered to be "an integral tool aiding continuous improvement in work operations".

A number of different types of work groups and teams are found in manufacturing environments today (Goodman, Devadas, and Hughson, 1988). Teams can be classified on the team autonomy continuum as can be seen from the following figure.



TRADITIONAL WORK GROUPS. Workers perform core production activities, and other groups are responsible for support activities, such as receiving, quality control, and maintenance. Workers have no management responsibility or control. The first line manager controls planning, organising, directing, staffing, and monitoring.

QUALITY CIRCLES. Membership is voluntary. Members are drawn from a particular work group or department. The group has the responsibility for making suggestions but does not have the authority to make decisions. The problem-solving domain is limited to quality- and productivity-related issues and cost reduction. Meetings are held in company time, usually weekly. A staff of specially trained facilitators helps team members with training and with group processes at meetings. No financial rewards are given for group suggestions. Although workers are organised to make suggestions within the defined domain, no changes are made in the day-to-day production hierarchy.

HIGH PERFORMANCE WORK TEAMS. Unlike quality circles, these work teams have some decision-making authority, but not to the extent characteristic of semi-autonomous work groups. Team membership is mandated by the management of the plant and is not voluntary. Compared to quality circles, these teams have an expanded problem-solving domain, and they are provided with information on the plant's budget and competitors' products. Each team is composed of workers from the same production line.

SEMI-AUTONOMOUS WORK GROUPS. Workers manage and execute major production activities. Other groups perform support activities, such as quality control and maintenance, that are related to but outside the scope of major production activities.

SELF-MANAGING TEAMS (OR AUTONOMOUS WORK GROUPS). These are groups of individuals who can self-regulate work on their interdependent tasks. Group members have control over the management and execution of an entire set of tasks- from the acquisition of raw materials through the transformation process to shipping, including all support activities, such as quality control and maintenance, required to produce a definable product. The product could be a definable part of a production process rather than a completed product. The distinction between autonomous and semi-autonomous work groups is that the scope of production tasks managed and executed by the autonomous type is narrower than that of the semi-autonomous type.

SELF-DESIGNING TEAMS. These groups have all the characteristics of self-managing teams. In addition, they have control over the design of the teams themselves and decide such issues as what tasks should be done and who should belong to the teams.

1.5 The Research Environment: Managerial Techniques in Mexico

Ernst and Young's (1990) international study concluded: " Because quality is and will continue to be a key competitive determinant of the 1990s, it is increasingly vital for all business, regardless of industry or location, to understand the impact and strategic potential of quality."

Though there are philosophical differences among the three authorities (Knotis, and Tomlin, 1994) Deming, Juran, and Crosby, there is mutual agreement that: (1) management is responsible for the majority of the problems in most organisations, (2) long-run perspectives are critical for success, (3) human values must be respected at all levels, (4) continuous improvement is necessary, (5) customer service is a major goal, and (6) training is one of the more valuable elements in the process. Others, such as Mondon (1982) and Feigenbaum (1983) described the integration of total quality control throughout the organisation and discussed the critical quality factors such as leadership, buyer quality, supplier quality, process design and control, training, and employee involvement. In research examining global strategies, Morrison (1990) found that quality was the most significant of all strategic determinants.

The perception of Mexico as a country that only offers inexpensive labour is being replaced. Today, many of the world's top corporations, including American Express, Ford Motor Company, Chrysler and General Motors, report that their Mexican work forces offer a higher level of quality and reliability not found in other countries (Mexican Investment Board, 1993).

In today's global economy, customers have more options than before. Mexico must ensure that its products and services are of the highest quality to compete for these customers. The pressure to achieve this goal grows exponentially, as free trade among Mexico, United States, and Canada is now possible through the North American Free Trade Agreement (NAFTA). Suddenly, many businesses that previously had little outside competition are facing more technically advanced North American companies. To succeed, many Mexican businesses will have to compensate for what they lack in advanced technology with greater attention to manufacturing and service quality (Gutierrez, 1994).

Mexico has taken major steps toward opening its economy and forcing the companies to be more competitive. This has been done in three main phases: significant deregulation, followed by privatisation and lastly the pursuit of growth through globalisation. Mexican companies have a unique opportunity to shape a new set of perceptions of themselves and the country. The process of deregulation-privatisation-globalisation is well under way and , coupled with the NAFTA, opens a way for repositioning both at the company and country levels. If Mexican companies are to succeed in the third important phase - globalisation- they must consider taking advantage of structural changes that have occurred in the country's socio-economic climate and craft a contemporary position (Elkins, 1994).

1.5.1 Total Quality Management (TQM) in Mexico

Much of the blame for Mexico's past quality problems can be attributed to a long-closed economy. The lack of competition and the resulting lack of motivation contributed to a decline in quality. Once the economy opened, the country found itself in global competition that forced companies to improve the quality of their products and services. It seems that the message of quality has spread quickly and effectively throughout Mexico. Part of the reason can be found in the Mexican Foundation for Total Quality (MFTQ). The foundation, established in 1988, began with what seemed to be an esoteric goal: to promote a culture and consciousness of quality in Mexico. MFTQ's guiding theory was that it was not enough to introduce quality standards into the workplace; it believed that to sustain quality, adherence to the highest quality standards would have to permeate the nation's consciousness.

In general, Mexicans have historically excelled at individual endeavours, such as painting, writing, designing, and long-distance running, but have not done as well at group undertakings that require teamwork. MFTQ believed that this weakness could be remedied by training a new generation of managers and leaders who could bring people to work toward common goals through systems and methods that instil consistency, continuity, and timeliness into work processes. MFTQ also created incentives to encourage participation in the quality movement. The National Quality Award , inspired by the Malcolm Baldrige National Quality Award in the United States and the Deming Prize in Japan, is now coveted by companies doing business in Mexico.

By adopting a Total Quality programme, American Express Mexico has achieved a 76 percent reduction in response time for billing inquiries. The General Motors Toluca plant has benefited from implementing a Total Quality Programme , winning the National

Quality Award in 1991. Xerox Mexico has also implemented a Total Quality programme, winning the National Quality Award in 1993. Foreign companies are not the only organisations that depend on Mexican quality for success. Mexico's domestic firms continue to report substantial performance improvements in their products and services. Aeromexico has achieved tangible results through its efforts to boost quality in service. The airline reports a 98.6 percent punctuality rate in departures compared to an average of 77.3 percent in the United States. Hylsa- one of the leading steel manufacturers- has benefited from its staff's dedication to quality, increasing productivity by 40 percent in the past few years. On the other hand, many foreign companies have recognised the benefits of establishing Maquiladora assembly facilities in Mexico.

Initially, the reason for establishing manufacturing facilities in Mexico was to gain advantage of the country's low labour costs. Now managers have realised that the competitive factor is no longer cheap labour, but a highly trained and motivated labour supply located at America's back door, offering quality products and short delivery times. One recent study showed that the rates of productivity growth of the Mexican subsidiaries of US and other foreign companies surpass those of the US manufacturing sector as a whole (Sanderson and Hayes, 1990).

A Quality Survey conducted by J.D. Power and Associates in 1989, showed Ford's Hermosillo plant to be in a virtual tie with the best assembly plant in the world, run by Daimler-Benz- 26.1 defects per 100 cars. The same study showed all of Mexico's automobile assembly facilities to be better than the world average. Mexican plants have also proven near the world average for productivity, despite the disadvantage of a lower production volume.

1.5.2 Just In Time (JIT) in Mexico

Ebrahimpour and Schonberger (1984) state that the basic simplicity of JIT makes it attractive for use in developing countries (like Mexico). They argue that JIT helps to solve many of the problems faced by firms in developing countries and suggest only one obstacle to its successful implementation in these countries, employee training. But firms in Mexico (and other developing countries in general) face many other obstacles in their efforts to successfully implement JIT production.

Shaiken (1991) offered the first evidence of JIT operations in a Mexican plant, describing the operation of a automotive assembly plant that utilised many of the components of a JIT production system. While the plant was considered successful, it was unclear how much of this was due to operating JIT. Although the assembly floor operated on a JIT basis, supplier participation was minimal as the majority of parts were obtained through the venture's Japanese partner. Because of long supply lines from Japan, JIT in this plant meant that workers were installing parts that had been manufactured two month earlier in Japan. A shortage of local suppliers for both production and maintenance parts, unreliable rail and truck transportation, and a shortage of qualified workers were identified as the major obstacles this plant faced in its efforts to use JIT.

Lawrence and Lewis (1993) offer a somewhat broader perspective on the use of JIT in Mexico. Drawing from on-site interviews with managers and employees in 18 Mexican manufacturing operations, these researchers identified ten potential obstacles to JIT implementation in Mexico. These obstacles were:

Obstacles to employee participation

1. Low entry-level skills
2. Mexican culture
    - Hierarchical
    - Time orientation
    - Preference for intuition over analysis
3. High rate of turnover

Obstacles to supplier participation

1. Reliance on international suppliers
    - Transportation costs and times
    - More variable transportation times
    - Communication barriers
2. Weak Mexican suppliers

Obstacles to managerial integration

1. Top management commitment to Mexican plant
2. Return On Investment (ROI) justification for labour-replacing investments
3. Strong Mexican Labour unions
4. Separation from design engineers
5. Limited access to JIT information

Shaiken's and Lawrence and Lewis's research clearly indicate that companies face much greater challenges implementing JIT in Mexico than they would in more developed countries like the US. Despite the obstacles, these two studies plus a recent survey of industry practices among Mexican Maquiladoras by Vargas and Johnson (1993) indicate that some manufacturing facilities in Mexico are attempting to use at least some of the components of a JIT production philosophy. None of the papers, though, establish that the use of JIT results in better performance.

1.5.3 Work Teams (WT) in Mexico

Team organisation is slowly entering the manufacturing environment. Henry Ford's moving assembly line, where a worker did the same repetitive task, is being replaced by cell manufacturing. This is a technique in which small teams of workers make a family of products. This technique enables the firm to customise products without having to stop or reset the whole assembly line. Unlike conventional mass production, cell assembly minimises the expenses of carrying large stocks of parts and spares (The Economist, 1994)

Teamwork and cooperation are compelling ideas in the Mexican workplace, but difficult to achieve in reality. Often there are strong allegiances to fellow workers who may be family members, or neighbours. Nevertheless, Mexican workers respond best emotionally to management exhortations to improve group efficiency or group output, rather than to programmes which stress competition with other workers. In practice, Mexican workers often excel when rewarded individually with incentive bonuses.

1.5.4 Human Resource relations in Mexico

The actual job of managing a company in Mexico is a challenge even for the best managers, because not only must the production get out on schedule, but also there is the added complexity of dealing with cultural aspects of the Mexican workers.

Mexican workers tend to be actively oriented rather than problem solvers and appear to assume that companies exist to provide jobs rather than to make a profit. However, the advantages of the Mexican workers are that they are easy to educate and have a good learning skills, they are obedient, and they are considered as cheap but high quality workers. (Forest, 1994).

There are some human resource management challenges that should be taken into account:

1.- Relations with superiors.

Relations between superiors and subordinates in Mexico are dictated by hierarchy. Because of their respect for those in power, Mexican employees tend to be easy to manage. Title and position are usually sufficient to enforce authority in the organisation. Many of the newer management concepts, such as self-supervision and participative management, do not automatically fit with the Mexican culture. Total Quality Management (TQM) concepts can also cause problems. Mexico has a collectivist culture- the family is of utmost importance. Under TQM, the management role is usually translated to facilitator in a multi-functional work team; process improvement is part of everyone's job and the focus is on team not leaders. Teams as the centrepiece of TQM create problems in Mexico. In a conventional Mexican organisation, management directs rather than inspires. Due to a lack of practical education and experience, Mexicans do not develop the problem-solving skills to discover the root causes of many problems and the group skills necessary to handle conflict and improve from mistakes.

2.- Staffing.

Recruiting and retraining good employees is a major challenge. Unskilled Mexican workers, if suitably trained by competent management, can be highly productive while keeping labour costs low. Turnover at the executive level is also higher in Mexico. Moves are more frequent not only because of the past roller coaster economy, but also because trained or skilled people are the target of frequent offers. The importance of family explains why nepotism is a common and accepted practice in recruiting and staffing of almost every organisation in Mexico.

3.- Labour costs.

Mexican compensation packages generally include a number of both optional and mandatory fringe benefits and include several benefits such as: a mandatory Christmas bonus equivalent to a month's salary, 10% of the company's pre-tax profits, contribution to a mandatory government retirement saving plan, eight statutory holidays, double-time after 48 hours a week, a 25% premium for Sunday work, the right to a permanent job once an employee is past the 30-day probationary period, a six-day vacation with two additional days for each year up to a maximum of 24 days, training for workers, 12 weeks of paid maternity leave and the right to return to work, and a 5% of payroll contribution to the Federal Workers' Housing Fund. Mandatory benefits alone add on average 30% to 40% to the basic payroll cost. Fringe benefits amount to about 50% of the nominal hourly wage (O'Grady, 1995).

4.- Unions.

Mexico has some of the strongest labour laws in the world, providing a complex and sophisticated system of protection for the Mexican worker. Mexico's labour code includes guidelines on collective bargaining, dismissal, compensation, maximum working hours, vacations, housing benefits, profit-sharing, the right to strike and social security benefits. Labour law comes exclusively under federal jurisdiction and applies throughout the country and to companies employing Mexican citizens. The Mexican Confederation of Workers (CTM)- the country's largest labour organisation, has over five million members and is a major force in Mexico's political and economic life. However, CTM's structure has been weakening as a result of the death of its long time leader, and lower power in PRI-principal political power in Mexico- in the elections. In Mexico, unions are based regionally, making it necessary for a company to negotiate with different unions throughout the country.

1.5.5 Economic Aspects in Mexico

The country's economically active population (EAP) amounts to nearly 35 million or 39% of the of the total population, having an average age of 19. Mexico's labour force is larger than that of countries such as France, Italy, Spain, Sweden, Austria and Denmark, a mark of the country's high potential as an investment and production site.

The education and skills of the labour force have a fundamental bearing on its productivity. Of the urban force, more than half of the EAP (62.9%) have completed high school or higher level education. Currently, 50.37% of the EAP is in the service sector, 22.70% in the industrial sector and 26.93% in the agricultural sector.

As of 1990, the labour productivity index in Mexico began to increase at a rapid rate and even overtook the US rate. During 1990-1993, the rate of labour productivity index of Mexico's manufacturing industry grew by 20%, compared with 7.5% in the United States.

The structural changes carried out in Mexico since the mid-1980s have enabled Mexico to post substantial gains in productivity. Between 1987 and 1994, the average annual growth rate of productivity levels was twice as high (6.7%) as the United States (3%) or Canada (3.3%). These changes have improved the country's productive technology and its efforts to train better its human resources; they have spurred the modernisation and expansion of productive infrastructure, and increased the use of higher-quality raw materials and inputs.

In labour costs, Mexico has continued to maintain its comparative advantages. In dollar terms, the cost of labour in Mexico is significantly lower than in the Canada and the United States. Moreover, the Mexican labour force has increased its competitiveness in terms of dollar productivity. Mexican exports have increased substantially as a result of trade liberalisation, reaching US$79.3 billion in 1994, mainly due to exports of manufactured goods. Imports also grew at a rapid pace, particularly during that year. Direct foreign investment has also grown; from 1980 to June 1995 it showed an average annual growth of 13.6%, reaching a cumulative total of more than US$56 billion. Sixty percent is from the United States, followed by Germany, the United Kingdom and Japan.

These advantages, together with its geographical position, make Mexico particularly attractive for direct foreign investment. Its export-oriented strategy has been enhanced; for example, Mexico's share of total US manufacturing imports increased every month since January 1993, having attained its highest levels by mid-1994.

1.6 Maquiladoras

The Maquiladora programme was an alternative the Mexican government used to confront the unemployment generated because of the termination, in 1964, of the bilateral agreement of Migratory Workers, known as "Bracero Programme". At that time, there were 185,000 undocumented workers without jobs wanting to live in northern border of the country.

With the Maquiladora programme, the Mexican government was trying to gather the advantages of the custom code changes introduced by US government, which provided taxation only of a product's foreign value-added content, as well as the proximity to the world's largest market, applying diverse changes in the legal dispositions. Such changes include permitting up to 100 percent foreign investment, in plants located within 20 kilometres of the border, and facilities provided for free import of material and equipment, only if dedicated in exporting the products. Subsequent changes in legislation in 1972 permitted Maquiladoras to locate anywhere in the country and sell up to 33 percent of their production in national market.

The initial objective set along with the Maquiladora programme was the following: a) create jobs; b) strengthen the trade balance; c) contribute to major industrial integration and elevate competitiveness of the national industry; d) create training for the workers and the technology transfer to the country (Bonilla, 1992).

As the Maquiladora programme was originally conceived, US companies set up "twin plants" on either side of the border. The plant would manufacture components and ship them across the border, the labour intensive work of assembly would take place in the Mexican facility, and the finished piece would be shipped back across the border for US consumption, with the duty paid only on the value added in Mexico. At that time, the whole reason for establishing manufacturing plant in Mexico was to take advantage of the country's low labour rate (Peak, 1993).

Principal characteristics of Maquiladoras industry in Mexico

1980-1997

Year	Value added (millions of dollars)	Number of establishments	Personnel employed	Participation of national products (%)
1980	772.5	620	119,546	1.7
1981	977.3	605	130,973	1.3
1982	811	588	122,493	1.3
1983	828.2	629	173,128	1.3
1984	1,160	722	202,078	1.3
1985	1,265	789	217,544	0.9
1986	1,294	987	268,388	1.2
1987	1,598	1,259	322,743	1.5
1988	2,337	1,396	369,489	1.7
1989	3,000	1,655	429,725	1.6
1990	3,551	1,938	460,293	1.8
1991	4,133	1,914	467,352	1.8
1992	4,808	2,075	505,053	2.0
1993	5,193	2,173	550,500	2.0
1994	5,655	2,200	608,100	1.8
1995	5,757	N/A	681,251	2.0
1996	5,887	N/A	803,060	2.0
1997*	1,904	N/A	861,143	N/A

* March 1997 (INEGI)

Table 1.2: Statistics of Maquiladora industry in Mexico

As a consequence of Mexican peso devaluation, the number of Maquiladoras began to increase dramatically, given the overall lower labour cost advantages, and, in some regions, the local energy and land cost advantages that Mexico then started to enjoy. As can be seen from Table 1.2, since 1966, the year in which the first Maquiladora plants were installed on the border of Mexico, the number of Maquiladoras firms have increased from 57 to 2,200 until 1994 and the personnel employed have increased from 4,257 to 861,143 until 1997 (INEGI, 1997), giving an annual average rate of 18.5 percent. Almost 80 percent of the Maquiladora plants are located in sites near the US/Mexico border, in order to minimise transportation/logistical costs and potential communication difficulties with the US-based firms (Vargas, and Johnson, 1993)

Most Maquiladoras are operated by US companies, with the majority of Fortune 500 companies now being involved in one or more facilities (Fatemi, 1990; McClintock, 1988). Japanese, European, and Korean companies also have a presence in the Maquiladora programme, with Japanese firms operating some of the largest Maquiladora plants (McClintock, 1988; SECOFI, 1996).

The most significant variable, which is demonstrating the major influence of the Maquiladora industry, is the generation of value added. Since 1984 it has been increasing in a notable rate. The strong dynamism of the Maquiladora sector observed since 1984 could be explained, in part, because of an expansion of the US economy but, also, due to the drop in relative labour cost in Mexico with respect to labour cost in US and to those of the competing countries, like Asia.

Tracking the productivity and wage figures over time shows why Mexico became an attractive venue for manufacturers. Although the productivity in dollar terms fell in 1983, wage rates dropped even quicker. While productivity that year was down to 70 percent of what it had been in 1980, wages were 56.1 percent of their previous level. While US$1.0 paid in wages produced a value-added return of US$1.66 in 1980, the same dollar produced US$2.06 of value in 1983. This represent a 24.1 increase in return on Mexican labour (Cohen, 1994; Gruben, 1990).

It should be recognised that over the 30 years of the life of the Maquiladora industry in Mexico, the qualitative and quantitative advantages have been enormous, but there are some problems which need a rapid solution.

In the first place, the incorporation of national products in the productive processes of the Maquiladoras has been very slow and insufficient, reaching a maximum of 2 percent. The cause of this problem could be the proximity of the foreign suppliers (mainly US) to the border, quality, price and volume offered by the national suppliers. This problem is being reduced since the Maquiladoras could be based anywhere in the country and the better quality of the material being offered by the national suppliers.

The second problem is the high concentration of Maquiladora activity mainly in three economic areas: electronic, automobile and textile. The government is giving additional incentives to those companies with activities different to those mentioned above.

The third problem is the lack of services in various cities where the Maquiladora industry is concentrated. Among these services, the following could be mentioned: electric energy, water, telecommunications, and housing.

Another problem is the high rotation of personnel in the Maquiladora industry, mainly being caused by the low grade of training of the workers. Also, because of high job offers, some companies prefer to employ a new employee rather than train, give responsibility and offer a better position to the old ones. Often the Maquiladora workers quit their jobs in border towns because of housing shortages, insufficient transportation and healthcare, or just plain homesickness (Lazaroff, 1992). The result has been an industry-wide monthly turnover rate of 15 percent (Schiller, 1991).

1.6.1 Managerial Techniques in Maquiladoras

Many Maquiladoras have adopted TQM and JIT programmes to improve quality, reduce costs and to satisfy customer needs. The only obstacle to implement successfully these programmes in many developing countries has been employee training (Ebrahimpour and Schonberger, 1984). But firms in Maquiladoras may face additional obstacles. These obstacles could be classified into three categories: 1) achieving employee participation; 2) achieving supplier participation; and 3) managerial integration .(Lawrence, and Lewis, 1993). Some of these obstacles will be discussed subsequently.

In order to implement TQM and JIT, employees must participate in activities related to problem solving, decision making, and continuous improvement (Schonberger, 1982) Mexican culture is very hierarchical, promoting the creation of well defined lines of responsibility and authority (Kras, 1989). This could be seen as an obstacle to achieving employee participation. Achieving employee participation requires a company's commitment to employee training, but the low entry-level skills of Mexican workers require firms to make even greater commitments to training. Education in Mexico in only compulsory to the sixth grade (age of 12), and is free to the ninth grade (age of 15).

Suppliers play a vital role in implementing JIT and TQM programmes assuring reliable and frequent deliveries of quality parts, ideally from local, single-sourced suppliers (Schonberger, 1982). As discussed earlier, the Maquiladoras obtain almost 98% of their purchases from outside Mexico. The distance between the suppliers and Maquiladoras increases transportation costs and the poor infrastructure within Mexico makes transportation times more variable than in more developed countries. Border crossings and custom paperworks frequently create additional delays. In addition, reliance on international suppliers makes it more difficult to involve them for solving quality problems.

In many Maquiladora firms, top plant managers are not Mexicans and are often assigned to stay in Mexico for a short period of time. A large number of these managers speak very little Spanish, making it difficult to convey commitment.

Low Mexican wages also can present an obstacle because they make labour based material handling, inspection, and reworks, look cheap.

Many companies have been successful in implementing TQM and JIT programmes in Maquiladoras, overcoming a number of obstacles mentioned above. These companies focused their attention on the following issues:

A few companies empowered their production workers and gave them the responsibility for assuring product quality . These companies were selective in choosing their employees who they believed held consistent attitudes towards quality and production philosophy and offered extensive training focused on developing worker's skill and problem- solving abilities (Lawrence, & Lewis, 1993). Most companies found that the biggest barrier to achieve quality goals was the lack of training for production employees (Miller, et. al., 1992). Many companies started training their supervisors who were also responsible for training the workers. Some found that the best way of training was for the quality engineers and auditors to conduct the training themselves, starting with some key workers.

Some companies developed more local suppliers to avoid the problems of customs delays and transportation costs. Others convinced their suppliers to establish a plant nearby to provide the deliveries.

Many companies organised Quality Control Circle teams following the training, a step taken for more workers involvement and for continuous improvements in quality, process, safety, and other key performance issues. One such team not only cut manufacturing steps from 349 down to 96 and production time from 32 days to 2, it had also recommended significant design improvements to the products (Peak, 1993).

1.6.2 NAFTA and Maquiladoras

The most immediate change brought about by NAFTA is the new rules of origin. Currently, under US preferential treatment requirements, up to 35% of local components can be used without penalty when the goods are repatriated to the United States. Under NAFTA, there will be no tariff on North American components, but duty will be applied to components that do not originate in North America. Also it would be easier to move goods through customs (Peak, 1993). This will encourage the development of a domestic supply network for the export originated maquilas which previously used little domestic content .(Cohen, 1994)

Although with NAFTA, the Maquiladoras will be mixed with the rest of the industry, Mexican manufacturing on a whole will benefit from their close ties to the US economy. The flow of advanced technology and capital, lower tariffs, and growing interest in the Mexican domestic market will give Mexico an increased comparative advantage over its competitors in the Far East (Cohen, 1994).

1.6.3 Comparison of Human resource practices between Mexico and US

International Business failures are often the result of poor human resource management and a lack of understanding of the cultural differences between home and foreign countries. The comparison in this study is done between Mexico and US (and Canada), because more than 90 percent of the Maquiladoras are from US and because of the relation among Mexico-US-Canada through the establishment of NAFTA.

A study concerning cross-cultural management style differences was conducted by Hofstede (1980). He surveyed 160,000 employees in 60 countries and found that culture explained more of the differences in work-related values and perspectives than organisational position, age, and gender. He identifies four primary dimensions:

1. Individualism/Collectivism refers to degree of dependency on social framework. Mexico is more collectivist. This indicates a close family relation in exchange for loyalty. US is very individualist which indicates that they control their members by internal pressure or guilt.

2. Power distance gauges how less powerful individuals accept unequal distribution of power. Mexico has a large power distance. This implies that superiors and subordinates consider bypassing the boss to be insubordination. US has a small power distance which means that employee will bypass frequently if necessary to get their work done.

3. Uncertainty avoidance indicates the degree that a group feels threatened by an ambiguous situation and the degree that it establishes structured hierarchies, formal work rules of conduct, etc. to evade these situations. Mexico has a strong uncertainty avoidance. US has a weak uncertainty avoidance.

4. Masculinity/femininity refers to concern for materialism versus concern for people. Masculine societies emphasise assertiveness and acquired possessions; they define gender roles more rigidly than feminine societies. Feminine societies emphasise relationships among people, concern for others, and quality of life. Both Mexico and US are considered to be masculine.

Appendix 5 illustrates the position of Mexico with 40 countries based on their 4 dimensions of work-related values: Individuality, Power distance, Uncertainty avoidance, and Masculinity scales.

The following are some of the differences found between Mexico and US (including Canada):

Hierarchy

Relations between superiors and subordinates in Mexico are dictated by hierarchy. Centralised decision-making is the norm, and Mexican employees are reluctant to take on any responsibility at work. Mexican employees are very loyal to their boss, particularly a Mexican boss, much more than to the company as a whole. Because of their respect for those in power, Mexican employees tend to be easy to manage. Title and position are usually sufficient to enforce authority in the organisation. Many of the newer management concepts being practised in Canada and US, such as self-supervision and participative management, do not automatically fit with the Mexican culture.

Productivity:

Although Mexican labour is cheaper than the US and Canadian labour, Mexican productivity levels are often lower. The lower productivity level was attributed to Mexico having a closed economy for several years; companies and their employees were not required to think or behave in a competitive manner. The key to success in Mexico is in effective training and development. Mexico has nine years of mandatory education, but it is not controlled.

Harmony in the workplace:

Compared to the US, there is a low tolerance for adversarial relations or friction at work. When selecting among job applicants, Mexican employees typically look for a work history that demonstrates ability to work harmoniously with others and cooperatively with authority. Mexican employers tend to seek workers who are agreeable, respectful, and obedient rather than innovative and independent.

United States business embodies such traditional American values as individualism, self-determination, achievement, future orientation, optimism, curiosity, problem solving, and doing more than expected. But traditional Mexican ideals stress employee/employer interdependence, mutual responsibilities and loyalty between boss and worker; age, sex and position ranking orders in the organisation; collectivism and continuity rather than individualism and change; belongingness and cooperation rather than competition; and not exceeding the boundaries of doing what you are told. Mexican employers tend to reject workers prone to criticise, who take their complaints to a higher authority, who exhibit competitiveness- because these traits disturb harmonious relations, and the social fabric.

Authority:

Maquiladora workers tend to regard their loyalty bonds with superiors as the key element in job security, rather than any seniority system. These personal bonds are what really determine whether or not workers come to work every day, are willing to work overtime, or work industriously when they are at work. Supervisors see their role as strictly following orders to the best of their ability, neither questioning nor taking matters into their own hands, and this is exactly how they view the proper role of their subordinates. The Mexican supervisor's style is to supervise closely, and look for willing obedience.

1.7 Research objectives and procedures

The study investigates the impact of Total Quality Management (TQM), Work Teams (WT), and Just-In-Time (JIT) on the performance of the Mexican manufacturing firms. The direction and magnitude of the impact is analysed in detail for large, medium, small and Maquiladora industries.

This research will study the impact of each manufacturing practice on performance individually and as an integrated concept. Findings of the study are intended to provide a more clear view of what impacts the performance of the companies.

This overall theme is consistent with a long history of research on the integration of technology and organisation. Little empirical research has, however, investigated the effect of Work Teams, Just In Time manufacturing, and Total Quality Management programme as an integrated concept on the performance of manufacturing firms. Research to date has relied mainly on studying the effect of each factor as stand-alone system on organisations or case studies, which have frequently presented idiosyncratic practices or conflicting findings (Majchrzak, 1988; Manufacturing Studies Board, 1986).

The study will provide a construct of TQM, WT, and JIT using Principal Component Factor Analysis and will analyse the impact of these constructs on performance using Canonical Correlation Analysis. Additionally Catell's Salient Similarity Index, Pearson Correlation Coefficient will be used for the group comparison purposes.

1.8 Statement of the research questions

The focus of the study was to determine the impact of TQM, WT, and JIT practices on the performance of the Mexican industries addressing the following research questions:

1. What are the TQM, WT, and JIT practices which Mexican large, medium, small, and Maquiladora firms concentrate on ?

2. Are there any differences among large, medium, small, and Maquiladora industries in relation to TQM, WT, and JIT practices?

3. What combination of manufacturing practices impact the performance of large, medium, small, and Maquiladora industries?

    3.1 Do TQM practices individually impact performance measures?

    3.2 Do JIT practices individually impact performance measures?

    3.3 Do WT practices individually impact performance measures?

    3.4 Do TQM and JIT practices together impact performance measures?

    3.5 Do TQM and WT practices together impact performance measures?

    3.6 Do JIT and WT practices together impact performance measures?

    3.7 Do the combination of TQM, WT, and JIT practices together impact performance measures?

These research questions dictate the presentation of the findings of the study.

1.9 Outline of Dissertation

The dissertation is presented in six chapters, which are briefly summarised below.

Chapter 1: Introduction and Problem Statement

Chapter 2: Impact of TQM, JIT, and WT on Performance: A Literature Review

This chapter reviews the existing evidence and the major lines of inquiry in the literature which focus on the impact of TQM, JIT and, WT as an individual or as a group of techniques on the performance of manufacturing firms.

Chapter 3: Performance Enhancement and Quality Awards

This chapter studies the models presented by different Quality Awards such as Malcolm Baldrige, European Quality Award, Deming Prize, Mexican National Quality Award, and Nuevo Leon local Quality Award. Additionally the performance measures will be defined.

Chapter 4: Methodology of the Research

This chapter defines the need for empirical data and a description of the process of obtaining the data. A questionnaire will be developed based on the findings of Chapter 3. Data gathering procedures which were employed are described. The methods for survey design and analysis such as reliability and validation will be discussed. The description of the statistical analysis methods used in this research such as Factor Analysis, Group Comparison, and Canonical Correlation Analysis will be presented in Appendix 1.

Chapter 5: Results and Findings

This chapter describes the results of the statistical analysis, and studies the relationship of the constructs of TQM, WT, and JIT with the performance of the Mexican firms. Each research question will de answered in this section.

Chapter 6: Discussion and Conclusions

The Dissertation concludes with a summary of the research findings. The implication of the findings on the Mexican organisations will be discussed. Contributions, constraints, and limitations of the research are detailed, as are directions for further research.

CHAPTER 2

IMPACT OF TQM, JIT, AND WT ON PERFORMANCE: A LITERATURE REVIEW

The theme of the need for an improvement in manufacturing performance is introduced in Chapter 1. According to the literature, a promising means of reaching this goal is through Total Quality Management (TQM), Just-In-Time (JIT), and Work Teams (WT). In order to explore this premise, Chapter 2 reviews the existing evidence of the relationship between these techniques and the performance of the manufacturing firms.

Theories of the impact of these techniques on performance are frequently supported through an inductive process which shows that the associations are logically supportable. Because of this, much of the literature concerned with measuring the impact on the performance of the firms are supported mainly by anecdotal data and isolated cases, with the evidence for the validity of the theories by no means being conclusive.

This chapter reviews the major lines of inquiry in the literature which focus on the impact of TQM, JIT and, WT as an individual or as a group of techniques on the performance of manufacturing firms

2.1 Improving performance with JIT:

The primary effect of JIT manufacturing methodology is to increase inventory turnover. The reduction in inventory is in agreement with the conventional wisdom on Just-In-Time manufacturing. This system builds a leaner manufacturing facility through tighter information flows and control so that inventories are minimised. Moreover, reduction in inventory would be caused by manufacturing in smaller batch sizes thus reducing effective capacity of the facility and increasing the unit cost of the manufactured product. Thus, JIT would improve performance only if the savings in inventory cost and the increase in revenues outweigh the increased direct manufacturing cost.

The study of Just-In-Time manufacturing has gained widespread appeal over the last decade, not only because it is the most talked about technique in manufacturing, but also because of its simplicity. The origins of JIT are as old as modern manufacturing, and have been traced back to Henry Ford, who believed in keeping inventories to a minimum. Since then, however, the credit. for its popularity must go to Taiichi Ohno, who was the proponent of JIT at Toyota. Following Ohno, other authors wrote about the virtues of

Just-In-Time manufacturing and their own experience with it. (Shingo, 1989; Monden, 1981(a); Monden, 1981(b); Monden, 1981(c); Clutterbuck, 1978; Hayes, 1981). Schonberger is also considered as one of the pioneers of JIT in the US. He studied Japanese manufacturing practices and identified nine tenets to their philosophy (Schonberger, 1982). There is however a void in the vast amount of literature on JIT. There is no conclusive empirical evidence on the success of Just-In-Time manufacturing in the US. Balakrishnan, et. al. (1993) studied the financial benefits from improvements in inventory utilisation realised by JIT firms. They did not find significant gains in return on equity accruing from increases in inventory turnover. The authors did however find that financial ratios improve for JIT adopters who were higher in the supply chain and held some monopolistic power. The sample they studied was fairly small and their methodology, which relies on uni-variate analysis, cannot lead to the isolation of significant partial effects.

2.1.1-Theory and evidence

JIT has a different meaning for different firms. Even though it originated at Toyota and was used in the automobile industry, its basic principles found rapid acceptance in all manufacturing industries. More commonly JIT is taken in the broader sense of "lean production" (Womack, et. al., 1990). This consists of all the tools and techniques used in production that attempt to reduce inventory, lead times, enhance quality and prevent waste. The way this is achieved is, through the use of small batches in production, shorter lead times, more frequent deliveries with smaller orders, and reducing set-up times. Traditional order quantity models reveal that set-up time reduction, drives a facility to order in smaller batches and consequently reduce the average inventory carried in the system. Firms that implement JIT work not only at reducing the batch sizes but also at increasing the frequency and improving the reliability and quality of supplier deliveries. The "leanness" of internal operations necessitates that suppliers deliver smaller quantities more often, otherwise the facility does not get the necessary reduction in inventories, it merely replaces the stocks of raw material with unfinished inventory or work-in-process. Supplier or vendor reliability is also a key concern since poor quality could starve a lean facility as would erratic delivery. Often the implementation of JIT is accompanied by the deployment of Electronic Data Interchange (EDI), vendor qualification programmes, and quality programmes (Sepehri and Walleigh, 1986).

How is set-up reduction achieved? The major driver in the reduction of set-up time is technology. Womack et. al. (1990) narrate how automobile manufacturers reduced the set-up time by investing in general purpose machinery located close to the assembly line so that the assembly worker could do the set-ups on die changes while he was idle. Traditional mass production systems had dedicated machinery, located remotely, that did die changes for stamping operations. Since these machines were dedicated they were only operated for very large batches. The use of jigs and fixtures makes it possible to reduce the time needed for set-ups and is a common feature in a JIT environment.

The involvement of line workers is a key to the success of JIT. Workers have more authority in designing and enriching their jobs and more responsibility in quality control. This causes a reduction in the amount of support and supervisory activity in the plant. Traditionally the quality control or inspection was done at the end of the manufacturing process, but in a JIT facility it is the responsibility of each person performing a task. Material handling too requires less manual effort since all the inventory is deployed near the person using it, and replenished Just-In-Time by the supplier. Thus the labour content in the plant is lower in a JIT environment than in a traditional mass manufacturing environment.

Inventory turnover increases after JIT adoption. This is the most commonly related benefit of JIT. Since JIT attempts to build a lean facility through the elimination of waste, the first target is reduction of inventories through set-up reductions and the contraction of lead times. Inventories are often considered to hide problems on the shop floor, such as quality and obsolescence. They also increase the lead time for manufacturing a product. We expect significant increases in inventory turnover as a result of JIT adoption.

The great improvement in manufacturing performance as a result of JIT implementation has become an increasingly important subject of study throughout the Western World during the last 15 years. One study found that Japanese companies were able to reduce their inventory by 16-45% and increase their labour productivity by 50-80% by implementing the JIT system (Manoochehri, 1985). The apparent benefits of JIT were obviously attractive to western manufacturers, especially given the increasing labour and materials costs since the late 1970s. However, JIT implementation in western industry requires quite different methods from those used by Japanese firms, even though the goals may be the same. There are numerous cultural, geographical, and philosophical differences between the two countries.

At the beginning of the JIT implementation era, reduction of costs and inventory, high quality, and productivity were reported as the major benefits of JIT. The perceived benefits of JIT include flexibility, as well as productivity and high quality (Burnham, 1984; Celley, et. al., 1986; Bartezzaghi and Turco, 1989; Im and Lee, 1989; Manoochehri, 1984; Voss and Robinson, 1987).

Performance of the production system as a whole is influenced by operating conditions, such as lead time, lot size, set-up time, capacity utilisation, percentage of defects, and manpower utilisation. Organisational performance may be regarded as a hierarchy of objectives, with operating conditions taking the role of intervening variables and representing the lower level. According to Bartezzaghi and Turco (1989), two groups of total production systems performance criteria can be identified: the first is the capacity to satisfy customers' needs which represent quality, flexibility, and service, while the second is various measures of productivity.

Productivity is the most important objective of management. Productivity is generally defined as the ratio of outputs to inputs, a measure of the relationship between the quantity of resources used and the quantity of outputs, with separate approaches for total and partial measurement. The use of total productivity is obviously desirable. However, it is clearly impossible to identify all of the necessary input variables. In addition, total productivity is not useful for management control purposes without breaking it down into each of its components, such as output per unit of labour, of capacity, and of materials (Greenberg, 1973).

Bartezzaghi and Turco (1989) classified quality into four dimensions: quality of design, quality of conformance, reliability and maintainability, and technical assistance. According to them, JIT partially influences the quality of conformance. Conformance indicators can be gathered in the plant (% of defects or incidence of rework) or in the field (defects occurring after the sale but within the warranty period, or proportion of warranty replacements).

Flexibility has recently become an important issue in business because of the necessity to respond to rapidly changing customer requirement (Macbeth, 1987). They enumerated flexibility concepts as follows:

1) Readiness, which concerns the length of lead time, reliability of delivery time, and the ability to respond to customer requests;

2) Product flexibility, which concerns the number of different models of finished products, time and costs of new product introduction, and the number of product codes producible in a given time period;

3) Volume flexibility, which concerns ability to vary output quantities in the short and medium term, as well as expansion flexibility.

JIT influences product flexibility and readiness because it can be used to control mixed- model multi-level production systems (Miltengurg and Sinnamon, 1989), while requiring short set-up times, short lead times, and frequent deliveries.

2.1.2 Important factors for implementing JIT

Billesbach (1991) surveyed 68 US manufacturing organisations, focusing on why an organisation chose to implement JIT and what factors managers believed to be important for successful implementation. In terms of reasons an organisation had implemented JIT, Billesbach offered his respondents four alternatives: (1) JIT meshed with business strategy, (2) customer(s) required it, (3) competition was presently engaged in JIT, and (4) it was endorsed as a corporate policy. These reasons for implementation, however, were not exhaustive. The percentage of respondents who believed each factor to be necessary are as follows: meshed with business strategy (77%), customer(s) required it (47%), competition engaged in JIT (49%), and JIT endorsed as corporate policy (43%). Billesbach does not discuss whether these reasons have any impact on the success of the implementation process. There is also no indication of the most desirable first step to take in successful JIT implementation.

2.1.3 Reasons for implementing JIT

A study was conducted by Markham and McCart (1995) to answer questions which were not addressed previously:

1. What is the main reason behind JIT implementation, and does the reason for incorporating JIT within an organisation contribute to the level of success in its implementation?
2. Does the first step an organisation take in implementing JIT affect its level of success?

The importance of the reason behind implementing JIT varies among firms experiencing low, medium, and high levels of success. This study indicates that all firms rank reducing lead time, work in process, and raw materials among the top five reasons for implementing JIT. In addition to that, the firms with medium and high levels of success rank increasing inventory turnover as an important reason for implementing JIT. The firms with high levels of success also include improving quality among the top five reasons. Customers requiring JIT was ranked as the number two reason by most of the firms that experienced low success in implementing. This reason was reported by Billesbach to be important to 47% of the respondents in this survey. Thus the results of this study appear to be consistent with those of Billesbach. However, Billesbach did not consider the level of success achieved by this respondents. He was interested in the percentage of respondents who thought each of the four reasons for JIT implementation (meshed with business strategy, customers required it, competition used it, and JIT endorsed as corporate policy) important. This study finds that firms that considered their own internal needs for implementing JIT were more successful at it than firms that were responding to external factors. It seems that to have at least medium success in JIT implementation, a firm should be inward driven, i.e. motivated to examine how JIT can improve the organisation itself, rather than implementing JIT merely to satisfy those who are external to the organisation.

Since the late 1970s, when the competitive economic race with Japanese companies began, many US companies have rushed to incorporate JIT concepts into their manufacturing facilities. They believed that using the methods of Japanese companies would result in similar success. Unfortunately, emulating the Japanese methods per se did not guarantee success. Some excuses given for failure were the strong Japanese corporate loyalty, the work ethic in Japan, and the Japanese national character. An examination of the growing number of success stories for American firms makes it apparent that those excuses are, for the most part, invalid.

2.1.4 Measuring the impact of JIT on organisational performance

A study by Chang and Lee (1995) utilised concrete financial/accounting data concerning measures of organisational performance, as reported in Standard & Poors Compusat, to examine the impact of Just-In-Time production on organisational performance. Matching groups of JIT implementing and non-implementing firms were formed from a cross sectional survey, and a comparative analysis was made from the two groups.

In this study, the following research questions were tested: (1) Did JIT impact the organisation's performance in terms of partial productivity ratio? (2) Did JIT impact the organisation's performance in terms of quality and flexibility? The following three hypotheses were developed.

H1: Companies implementing JIT will achieve better organisational performance in terms of sales in dollars per employee, the operating profit margin before depreciation, and return on investment in accounting data than companies not implementing JIT.

H2: Companies implementing JIT will achieve better organisational performance in terms of finished goods inventory turnover, raw material inventory turnover, and work-in-progress inventory in accounting data than companies not implementing JIT.

H3: Companies implementing JIT will achieve better organisational performance in terms of quality and flexibility than companies not implementing JIT.

The results of this study were: 1) JIT has no impact on any of the partial productivity ratios of sales in \$/employee, the operating profit margin, and Return on Investment. It seems that the impact of JIT is not noticeable until a substantial period of time has elapsed: JIT should be applied as one part of a long term plan and integrated manufacturing strategy with the commitment of all persons within the organisation instead of an *ad hoc* basis. 2) Companies implementing JIT had worse performance in terms of finished goods inventory turnover, raw material inventory turnover, and work-in-progress inventory in accounting data than companies not implementing JIT. But after implementing JIT, firms had better performance than those non-JIT firms. Thus, H2 was accepted. Paek (1989) found that high inventory was the most frequently cited problem which induced managers to implement JIT, thereby initiating streamlining of materials flows, set-up reductions, and reduction of lot sizes. Thus, JIT-implementing manufacturers generally emphasised reducing inventory at the start of their involvement with JIT because they had larger inventories than non-JIT manufacturers before implementing JIT. It is apparent that JIT affects the inventory system in a short period. 3) JIT companies achieved better organisational performance improvement in terms of quality and flexibility during JIT implementation period than non-JIT firms. Thus H3 was accepted. Paek ascertained that low quality and low flexibility were important problems which induced manufacturers to implement JIT. These two facts encourage JIT firms to improve quality and flexibility utilising JIT.

2.1.5 Impact of JIT on accounting measures

A work by Huson and Nanda (1995) attempts to measure the impact of JIT on accounting measures of performance. This empirical methodology, simultaneous equation estimation, isolates the partial effects of JIT on various accounting measures such as unit costs, inventory turnover and labour usage, and translates it to improvement in accounting measures of performance thus gauging the true impact of this method on firm performance. The results show that after JIT adoption, firms reduced the labour content in facilities, increased inventory turnover and enhanced earnings. Even though the firms studied experienced a downturn in their performance, the empirical methodology could identify positive benefits resulting from JIT adoption.

Authors have noted that lean production is necessitated by an increase in competitive pressure, a demand for product variety and a need for flexible production systems. In such an environment one would expect to see competition reduce contribution margins and increase consumer surplus. At the same time firms would need to reduce waste in manufacturing to survive. The automobile industry is a case in point. When threatened by lower priced and fuel efficient Japanese imports, the big three automobile companies tried to emulate the production systems of their competitors. This was the optimal response and the reason for their subsequent survival. The industry as a whole is characterised by declining margins and increased variety. To judge the impact of changes in production technology one cannot make a before and after comparison since the impact of technology would then always be negative in such an environment. The use of simultaneous equation estimation allows us to isolate the true impact of technology on the firm performance measure of interest.

2.1.6 JIT in small businesses

The Just-In-Time management philosophy has traditionally been considered applicable only to large manufacturing firms. An examination of over 100 manufacturing firms, large and small, reveals that JIT is just as applicable to small firms as to large. Small manufacturing firms actually managed greater percentage lot-size reduction from suppliers, greater reductions in inventory, and increased inventory turns.

Businesses that have adopted JIT are primarily those with large-scale operations (Finch, 1986). However, small businesses are often very dependent on their key major customers. If a major customer declares that JIT is the way of the future, its smaller vendors face some fascinating challenges and decisions (Williams and Tice, 1984). Finch states that the small manufacturers may not give its suppliers enough business to motivate them to change delivery pattern or quality standards. In addition, the small manufacturer may have limited resources to invest in implementing JIT, and managers of small manufacturing businesses may not know for sure which aspects of the JIT system can work in their companies (Finch, 1986; Williams and Tice, 1984)·

Inman and Mehra (1990) obtained 144 usable responses form manufacturing firms. 52 of these firms were identified as small businesses and the remaining as large businesses. The results show that small manufacturers can indeed implement the critical elements of JIT implementation. In fact, for a few of the elements, small manufacturing firms tend to have greater success.

Almost half of the responding small manufacturing firms included quality circles as part of their JIT implementation process. While more larger firms used quality circles, the difference in small and large manufacturers was not significant. No significant difference between large and small manufacturing firms was found in the use of preventive maintenance programmes as a part of their JIT implementation process. Both large and small manufacturing firms achieved admirable decreases in the amount of set-up time required. Finch (1986) reported that cross-training of employees has been common in small manufacturing operations in order to compensate for absenteeism and employee turnover. Also, in job shop environment, small manufacturers may have to cross-train workers to provide flexibility for changes in demand. Therefore, it is not surprising that the survey revealed no significant differences between the percentages of workers cross-trained in small and large manufacturing firms.

It is apparent that small manufacturers cannot provide their vendors with as much revenue as can larger manufacturers. Therefore, they may not have enough leverage to insist that their vendors improve quality and delivery. The literature suggests that purchasing all of a certain product (or family of products) from one source can provide incentive to a vendor who knows that as long as he performs, the firm's business belongs to him. This assurance can encourage vendors to spend time and money to improve quality, reduce lead times, and decrease lot sizes. The survey results show no significant difference in the percentage of suppliers who are sole sources for small and for large firms.

Small firm's ability to implement critical elements of JIT does not necessarily mean that implementation benefits them. Thirty nine small firms indicated that they had reduced downtime by implementing JIT concepts. The mean percentage reduction was significantly better for small firms than for large. All except five of the 114 firms responding reported measurable reductions in inventory.

The survey showed that the benefits small businesses achieved were at least as good as those of large businesses. Implementing JIT in the small firms actually produced greater improvements in downtime and reduced inventory, and increased inventory turn ratio.

2.1.7 Comparison of manufacturing management in JIT and non-JIT firms

Many US industries have suffered tremendous market share losses in the past two or three decades. While stiff competition comes from several fronts, Japanese companies have proven to be the most prolific. Empirical evidence of the extent to which Japanese companies have encroached upon US companies' international and domestic market shares abounds (Cohen, et. al., 1984). The accepted explanation for the success of the Japanese in US and international markets is their production of high quality products at competitive prices (Garvin, 1987). Quality is argued to be the single, most important management issue that will ultimately determine a company's ability to survive in international markets (Hahn and Boardman, 1985). The widening gap between US and Japanese product quality has not risen because US manufacturers do not care about quality. The gap has developed because of a major philosophical difference in how quality is viewed and, consequently, managed in these two countries. Wheelwright (1985) studied the problem of US competitiveness and argued that the "explanation of the world-wide decline in US manufacturing competitiveness is management's view of the manufacturing function, its role, and how that ought to be carried out. Thus, restoring that competitive edge requires a basic change in philosophy, perspective, and approach." The issue of product quality is inextricably tied to this manufacturing philosophy.

Wheelwright identified two manufacturing philosophies. The first, "static optimisation," describes the traditional US philosophy about manufacturing: emphasis is on management of the workforce (dating from Taylor's scientific management), functional autonomy, cost minimisation, and maintaining stability. As a result, there is little potential to use manufacturing to influence competitiveness. The second manufacturing philosophy is described by "dynamic evolution," an approach that views manufacturing as a dynamic process that has no final solution or form. The underlying concept to this philosophy is continual improvement which can only arise from highly developed problem solving skills, cooperation, communication, and commitment at all levels of the organisation. The dynamic evolution approach is characterised by top management involvement in decisions relating to all aspects of the manufacturing operations. The result is a long term perspective that encourages new ideas and improvements, not the least of which are better quality and reduced costs. This manufacturing philosophy is consistent with Japanese manufacturing management.

The key components of the dynamic evolution approach, as defined by Wheelwright (1985), are: a philosophy of continuing improvement of the manufacturing process, a problem identifying/ problem solving orientation, a team approach to problem solving, and an orientation toward the entire system (product, process, people, and technology). The dynamic evolution approach incorporates all of the facets generally understood to represent Japanese management (e.g., Kaizen, quality circles, shared goals, continuous improvement of processes, ongoing training, worker rotation, immediate correction of defects, and a system approach), which is characterised by the Just-In-Time (JIT) and Total Quality Management (TQM) philosophies (Schonberger, 1982).

Ebrahimpour and Withers (1993) proposed the following Hypotheses:

1.- Top management's commitment to quality. Studies on Japanese management or the dynamic evolution approach to management indicate a requirement for top management's commitment to quality improvement (Schonberger, 1982; Garvin, 1983) and a recognition of the strategic importance of quality. Evidence indicates that firms in which top management paid only lip-service to the quality effort failed to achieve the degree of quality improvement sought (Ebrahimpour and Schonberger, 1984; Crawford and Cox, 1991; Johnson, 1992) Instead, successful quality improvement programmes require that top management's commitment to the quality effort manifest itself in actions that reflect this commitment.

2.- Factors critical for achieving product quality. The literature identifies numerous factors which can affect product quality. However, a number of factors (product and process design, training, equipment maintenance, material quality, and workmanship) are inherent in Japanese management and are considered critical to any successful total quality improvement effort (Garvin, 1986).

3.- Factors affecting production operations. Certain quality-related factors are characteristic of JIT implementation and the JIT philosophy. Divergent attitudes about the relevant importance of these quality-related factors that are key to improving production operations (low inventories, continuous improvements, training, reduced set-up times, meeting schedules) would be evidence of differences in management philosophies about quality management (Mefford, 1989; Schonberger, 1982).

The application of JIT requires some major changes in the manufacturing practices, and results in significant benefits such as reduction of work-in-process inventory, decrease in lead time, improvement of quality and productivity, and increase in flexibility and adaptability to changes in market.

The adoption of JIT could lead to many benefits that result in higher productivity. The JIT is not just an inventory system as it might seem. It is an overall operation system. Application of JIT affects many aspects of manufacturing. Hence, its potential benefits are many, and for the same reason its application is much more involved and complicated. Thus, the JIT should not be considered as a quick fix to increase productivity. Rather its implementation means a major overhaul of the operation system and requires much time, effort and commitment. Some major JIT benefits could be divided into three groups of related factors: less inventory, higher quality, and higher workers' contribution.

Less Inventory. When the parts are produced to be used just in time and suppliers deliver daily or even several times a day, the inventory drops significantly. Less inventory means, of course, less capital tied up in inventory. Some other benefits of lower inventory will be: 1)lower storeroom costs such as facilities, equipment, and labour; 2)less need for a highly sophisticated inventory control system and paper work to track the inventory; 3)less need for inventory control staff; and 4)lower tax, pilferage, risk of obsolescence, etc. By decreasing inventory it creates the motive to discover and solve the production problems. In other words, find the reasons for inventory and eliminate them. Producing in small lots accompanied by short set-up time results in short lead time or throughput time. As a result of short throughput time and small inventory, the manufacturer has much more flexibility in adapting to changes in the market or other factors. This flexibility is an important advantage when operating in a dynamic environment.

Higher Quality. As in JIT system there is no safety stock and lot size is small, quality is crucial. Every defective unit could disrupt the production process. There is no large pile of parts to cover the defective ones. Any defective part is detected promptly and a fast feedback is given to the producing process, which could identify the problem and correct it. With the line-stop principle, management clearly communicates to the workers that the top priority is quality and not quantity. Higher quality is closely associated with higher productivity. One expert estimates that a two percent reduction in defects is usually accompanied by a ten percent increase in productivity (Hayes, Wheelwright, and Clark, 1988). Fewer defects mean higher quality of finished goods, less labour and materials waste, fewer rework labour hours, higher capacity, lower unit cost, less warranty costs, higher workers' pride, and obviously higher productivity.

Higher Workers' Contribution. The JIT system requires cooperative workers. The management-worker relationship should be based on trust, loyalty and concern. As the safety stock is not available and the production lot is small, to be responsive to manufacturing disruptions the system has to rely on worker's high performance, dedication, overtime production hours and multifunction skills. The JIT system requires extended training of workers in all functions of the production process. In summary, the JIT system is designed to enhance the workers capabilities, motivation, and involvement, and rely on their contribution. Obviously, a more knowledgeable and motivated work force is a significant factor influencing quality, cost and productivity.

Adopting JIT. By decreasing inventory, improving quality and increasing the workers' contribution, the JIT system improves productivity. Because of economic, cultural and geographical differences with Japan, the JIT system can not be copied, however, there are many transferable concepts and techniques of JIT that could be applied effectively in any environment. JIT is not so much "cultural-dependent" as it is "management-dependent." (Manoochehri, 1985).

2.2 Improving performance with TQM

In the 1980s, the Japanese successfully produced high quality products at relatively low cost, thus capturing a large share of the global market in critical industries such as automotive and electronics. This led to a change in the way western manufacturing firms managed their operations. Analysis of the quality of Japanese firms revealed that a holistic approach to quality such as Total Quality Management (TQM) was instrumental in yielding high quality at a low cost (Ebrahimpour, 1985; Garvin, 1984). The early success achieved by major US companies such as Ford and Motorola with TQM implementation and the inception of the Malcolm Baldrige National Quality Award led to a formal recognition of the TQM philosophy. As a result, over the past few years the number of both large and small firms embarking upon formal TQM implementation has grown significantly (Durity, 1991). However, many firms launching TQM are failing in their efforts (Fuchsberg, 1992; Senge, 1993). Many of the disappointments are attributed to the failure to recognise that success with TQM depends on organisational context, including the firm's size, the nature of its products, and industry characteristics (Cole, 1993). Hence, empirical investigations of the effectiveness of TQM in various environments are urgently needed .

2.2.1. International quality study

The International Quality Study (IQS) was conducted by Ernst & Young (1992) to examine the effect such practices actually have on businesses. The survey was sent to more than 500 companies in Germany, Japan, Canada, and the US. The participating companies were divided into three general groups: higher-, medium-, and lower- performing companies. Performance was measured by three factors: profitability, productivity, and quality. For profitability, return on assets (ROA) was the yardstick. Lower performers had an ROA of less than 2%; medium performers 2 to 6.9%; and higher performers 7% or greater. For productivity, value-added-per employee was used. The dividing point between lower and medium performers was $47,000, and the dividing line between medium and higher performers was $74,000. For quality, an index was calculated based on participants' reports of overall quality as perceived by the end users of their products or services.

Lower performers

One essential step for lower performers is to construct a workable human resource infrastructure. Organising teams into effective work units is one way of doing it. Less than 5% of their work force participated in teams, compared to more than 25% for higher performers. Lower performers benefit from heavily investing in training for all levels of employees. Training should focus on how to interact effectively with customers. Empowerment, or pushing decision making down to the lowest levels, is not advised. Practices such as self-managed work teams, highly autonomous quality improvement teams, and making workers responsible for checking the quality of their own work have no effect on improving company performance. Making assessment and compensation policies for senior managers dependent on quality improvement is not advised. On the other hand, placing importance on quality in evaluating non-management personnel will improve performance. The study shows that while an overall strategy of "designing in" quality aids lower performers, the results are not immediate. They should continue "inspecting it in".

Middle performers

The study indicates that a focus on processes and measurement provides the best leverage to improve middle-performing companies. The study points out that many management practices are correlated with improving performance for the lower- and higher-performing groups, only a handful of practices appear to make a difference in the performance of the middle group. Teamwork benefits these companies, with the most leverage gained from concentrating team efforts at the department level. Less than 25% of the workforce engages in departmental teams. Among higher performers, however, that number approaches 50%. Improvements come also from more training on quality topics for non-managerial personnel. Widespread participation by senior managers in meetings on quality issues is another method to increase performance. Medium performers gain a competitive advantage by making better use of their relationships with suppliers. The study shows that medium performers should concentrate on four basic inputs: mission or vision statements, data on current performance, audits of market share, and an assessment of product quality.

High performers

1. High performers concentrate on some of the most popular quality practices- benchmarking, employee empowerment, externally oriented planning tools- which appear to work only for top performing companies. High performers also gain a broad advantage by emphasising numerous forms of employee interaction. This survey shows that widespread employee participation in meetings regarding quality boosts performance, particularly when participation is by non-managerial personnel. Most companies say that nearly 50% of all non-management employees participate in such meetings. Among ones with the highest productivity, that figure is closer to 100%. The best companies attribute major importance to the following practices:

- Use customer satisfaction and competitor comparison measures in strategic planning.
- Measure reduced cycle time for process improvements.
- Emphasise reliability, responsiveness, and safety as key elements to the company's overall reputation.
- Emphasise product adaptability and accessibility of ancillary services.
- Achieve quality by designing it into products and services.

2.2.2 Alternative quality improvement practices and organisation performance

This study conducted by Adam (1994) relates alternative quality improvement approaches to actual operating and financial performance. Productivity improvement approaches are also investigated and related to performance to define better the relationship between quality and productivity. In this study, multiple quality and productivity approaches are correlated to eight quality, three operating, and three financial performance measures for 187 US business firms.

1. The research questions proposed in this work were: What combination of quality improvement and productivity improvement techniques lead to the highest organisation performance? How is performance defined? In this study, the interest is in identifying a quality/productivity technique profile that can predict quality, operational, and financial performance. Here quality is distinguished from operating performance. Quality includes actual quality data expressed as error rates, cost of quality components, and customer satisfaction. Operating performance is employee turnover, employee satisfaction, and productivity expressed as net profit as a percent of sales. Financial

performance includes return-on-assets (ROA) and annual sales growth. The following hypotheses are addressed in this study:

1. A company's approach to quality and productivity improvement correlates to product and service quality, operating performance, and financial performance.
2. A company's approach to quality improvement correlates to product and service quality.
3. A company's approach to quality improvement correlates to operating and financial performance.
4. A company's approach to productivity improvement correlates to operating and financial performance

Hypothesis 1 reflected an interest in examining interactions between quality improvement approach, productivity improvement approach, and performance. The quality and productivity approaches studies here seem to have a greater impact on quality than on operating and financial performance. It was concluded also that a wide array of improvement approaches (items, factors) impact quality rather than one or two items.

Hypothesis 2 suggested that a company's approach to quality could correlate to actual quality. The approaches to quality improvement used by companies favoured employee involvement, management involvement and responsibility for quality, and quality improvement projects to guide improvement. Statistical Process Control (SPC) was not a strongly favoured quality improvement technique, although it was reported as helpful by participants. It was no surprise, based on experience, but a continued disappointment based on the research literature, that reward-focused pay for quality performance techniques was not widely used as a technique to improve quality.

Hypothesis 3 asked if the quality improvement approaches correlates to operating and financial performance. There were no significant relationships between sales growth and quality improvement approach. Overall, these operating and financial results support Sluti's (1992) findings and are new to the quality improvement literature. TQM and other commonly promoted practices have little practical influence on the performance variables reported in this study.

Hypothesis 4 asked whether a company's approach to productivity actually related to productivity and financial performance. Findings were: 1) no productivity improvement techniques (factors) explained the total cost of quality, although some quality cost components and percent of the items defective could be explained by productivity factors; 2) turnover, net profit, and employee satisfaction all regressed strongly to productivity improvement factors; and 3) financial performance as expressed by ROA and sales growth was not significantly explained by the approach to productivity. These results are consistent with the American Quality Foundation and Ernst & Young (1992) study in which productivity improvement practices strongly related to performance.

In conclusion, this study identifies factors that capture approach to quality improvement and to productivity improvement. A profile emerges for the organisations as to what improvement techniques might be most useful if the objective is to improve quality, operating and/or financial performance.

2.2.3 An empirical investigation between quality and productivity

The primary objectives of this study by McCracken and Kaynak (1996) are (1) to test the relationship between quality and productivity to determine which of these theories is supported by the research; (2) to investigate the relation between total productivity and partial productivity measurements; and (3) to examine the cost structure of companies in relation to productivity and quality improvements.

Skinner (1986) argues that most of the productivity programmes in companies focus on the wrong issues, such as direct labour efficiency and the efficiency of factory workers. According to Skinner, when quality is the goal, low cost follows; but when low cost is the goal, quality is lost.

Edosomwan (1988) states that productivity and quality are connected, interrelated, and inseparable. According to Edosomwan, productivity and quality management are "an integrated process involving both management and employees with the ultimate goal of managing the design, development, production, transfer, and use of the various types of products and services in both the work environment and marketplace".

Leonard and Sasser (1982) also emphasise the relationship between productivity and quality. They suggest that an increase in quality always results in increased productivity or vice versa.

The following empirical studies indicate that quality improvements result in increases in productivity.

Hayes and Clark (1986) studied differences among factories. They reported results that support the importance of improved quality, lower work-in-process inventory, and reduced confusion to productivity gains.

Garvin (1983) studied the quality of air conditioner manufacturers in the United States and Japan. He measured quality as the rate of occurrence of internal and external failures. Garvin found that total quality costs incurred by Japanese producers were less than one-half the failure costs incurred by the best US companies. In addition, Garvin noted that the highest quality producers also achieved the highest output per labour-hour. This observation suggests a positive relationship between quality and labour productivity.

Shetty (1986) surveyed the presidents of 171 companies to assess the perceived importance on nine factors believed to increase productivity. Of the factors assessed, the company presidents ranked quality improvements sixth in order of importance for its potential to improve productivity.

Krafcik (1988) studied auto manufacturing systems in Japan, North America, and Europe. He found that plants operating with a "lean" production policy can manufacture a wide range of models and can maintain high levels of quality and productivity. Productivity tends to increase with improved quality because of reduced efforts, more attention to process control, and less required inspection. Krafcik suggested that lean plants are more capable of simultaneously achieving high levels of productivity, quality, and mix complexity.

The results indicate that as defects, scrap, and rework (negative quality) decrease, productivity increases. Thus, as quality increases, productivity increases. The characteristics observed in the most successful companies indicated the importance of employee involvement and in-depth analysis of production variations in enhancing quality and productivity.

2.2.4 Total Quality Management programmes in Singapore

Based on an interview questionnaire with 289 companies in Singapore by Cunnigham and Ho (1996), this article provides an assessment of the overall impact of such programmes. A key finding is that progress on quality improvement is more clearly linked to reducing absenteeism and turnover than to increase profits; and profits are negatively correlated with absenteeism.

Certain approaches, such as Just-In-Time, statistical quality control, automated technology, product design, control over suppliers, and internal quality inspection can easily be quite mechanistic if they are applied within assumptions that workers need to be controlled and closely monitored. Such programmes might be used as a checklist to judge an organisation's interest in quality. There is, however, a fine line between using these approaches in an organic or mechanistic fashion, as quality circle and Just-In-Time management can be applied in either mechanistic or organismic terms.

Three employee relations items stand out as major inhibitors of quality in these business organisations in Singapore. They are lack of knowledge of the cost of poor quality in the company; employee's resistance to change; and low training/educational level of the workforce. Other management-related items that respondents suggested inhibited quality include high employee turnover, inadequate measures of success (evaluation of performance), and an inability to work toward common quality. These items, when combined into one factor, were identified as significantly more serious for those companies that had introduced participative methods (group-related activities, suggestion schemes, housekeeping programmes, education, and training) and quality system (Just-In-Time, statistical quality control, automated technology, control over suppliers, and internal quality inspection). Although there is a significant difference in the importance that these companies perceived in the factors inhibiting quality, it is interesting to note that these items were rated lower on average (less than 2 on a 4-point scale).

2.2.5 TQM with *Fortune* 500 corporations

A questionnaire was developed by Lacktriz (1997) to survey FORTUNE 500 companies concerning the implementation of TQM tools and techniques within their organisation. The survey was designed to address issues such as an organisation's commitment to training and the commitment and understanding of middle and upper management. It also contained items focusing on training issues, use of quality teams, compensation, SPC tools and techniques. ISO 9000 certification, and the Malcolm Baldrige National Quality Award. The results were compiled from 95 surveys that were returned. The conclusions were:

1. A formal quality plan is not a prerequisite to attaining FORTUNE 500 status. In spite of all the attention that TQM has received, several corporations appear to be doing well financially without a formal quality plan in place.

2. Even with quality plans in place for years, many firms believe that their quality journey is still incomplete and admit to falling short of total success in their quality implementation. Furthermore, the corporations as a group tend to lag even further behind in their implementation of SPC tools and techniques.

3. Top management in many firms is still not knowledgeable in quality management philosophy, concepts, and tools, and an even higher percentage of top management is not up to speed in SPC techniques. Only about half of the companies have more than 40% of their work force knowledgeable in quality management philosophy, concepts, and tools. Again, the percentage is even lower for understanding and implementing SPC concepts.

4. Almost all of the responding firms use quality teams; yet surprisingly, some FORTUNE 500 members still do not implement this basic quality tool. A majority of firms allow their teams to address problems within the normal work day and consider the results within the context of performance evaluation. Some take it further on compensation issues.

2.3 Improving performance with WT

The popularity of work teams stems from the idea that by identifying and solving work-related problems, teams can contribute to improved performance. With an increasing emphasis on high-quality, fast product innovation and improved customer satisfaction, many companies now use team approaches to realise these goals in an environment characterised by functional and process interdependencies (Boyett, and Conn, 1994). Work teams are considered to be "an integral tool aiding continuous improvement in work operations".

Team organisation is slowly entering the manufacturing environment. Henry Ford's moving assembly line, where a worker did the same repetitive task, is being replaced by cell manufacturing (Smolowitz, 1995). This technique enables the firm to customise products without having to stop the whole assembly line. Unlike conventional mass production, cell assembly minimises the expenses of carrying large stocks of parts and spares (The Economist, 1994).

Sony has discovered that experimental teams of four people assembling a camcorder (from soldering to testing) have 10% higher output than the conventional conveyor belt assembly process. Under the latter process, output is limited to the speed of the conveyor belt. In addition, the team approach "reduces handling time, the seconds consumed as goods under production are passed from worker to worker. And if something goes wrong, only a small section of plant is affected" (Williams, 1994).

Given the benefits of team organisation, what are the concerns about teams? The concerns are as follows (The Economist, 1995):

1. Management, when establishing teams, may fail to set clear objectives for the team.
2. Management may introduce the team concept, but may not concurrently change "the firm's pattern of appraisal and reward from an individual to a collective system. This can send the work force fatally mixed signals: employees are expected, on the one hand to pull together, on the other hand, to compete for individual rewards."
3. Teamwork drives up corporate costs in the areas of funds for training, requisite courses in stress management, and meeting time as "empowered workers break off from the tedium of making things and chat endlessly about process improvement or product imperfections."
4. "The chief problem with team is political. Almost invariably, their creation undermines some existing distribution of power in a firm. Middle managers often see shop floor

teams as threat to their authority and perhaps to their livelihoods: many workers see teams as a source of division and road to overwork."

2.3.1 WT and manufacturing performance

In the quality management literature, experts advocate the use of teams as a means of improving quality. For example, Juran and Gryna (1980) suggested the use of "breakthrough" teams, and Deming (1986) emphasised the importance of workers input and, management-worker cooperation for improving quality. It is also evident from the literature review that some theoreticians have tried to explain why participation in work teams is associated with performance improvement. For example, Mohrman and Novelli (1985) discussed two models that relate participation in quality circles to improved productivity. The first model predicts that participation in quality circles, leads to idea generation, which leads to idea implementation, which in turn leads to improved productivity. It is the implementation of the ideas themselves and the degree to which these ideas relate to productivity that contribute to productivity improvement. In the second model, participation in quality circles leads to favourable individual outcomes that improve job satisfaction, motivation, and task performance, leading to productivity improvement.

Katz, Kochan, and Keefe (1987) surveyed plants of a major US automobile manufacturer in 1979 and 1986 and found that work teams had a negative impact on plant productivity. Explaining their results, they noted that "the negative impact of work teams on plant productivity in the company.... resulted from problems associated with introducing the system........teams may yet help to improve productivity" (1987: 709). Two more studies, Ichniowski, Shaw, and Prennishi (1994) and MacDuffie (1995), document the positive impact of a bundle of innovative human resource management practices on manufacturing performance. In both studies, work teams figured prominently in the bundle of innovative human resource management practices that positively impacted manufacturing performance. According to Osterman (1994), more than half of all US firms are now exploring some form of team-based work system.

The purpose of this study done by Banker, et. al. (1996) was to examine empirically the impact of work teams on manufacturing performance. Using a longitudinal research design, and controlling for other variables that have the potential to affect manufacturing performance, the results indicates that quality and labour productivity improved over time after the introduction of work teams. The authors supplemented these quantitative results with qualitative insights into the functioning of work teams and their evolution over time, leading to workplace transformation. The results provide evidence of the positive impact of work teams on manufacturing performance.

2.3.2 Human resource and manufacturing performance

Using a unique international data set from a 1989-90 survey of 62 automotive assembly plants, MacDuffie (1995) tests two hypotheses: that innovative human resource (HR) practices affect performance not individually but as interrelated elements in an internally consistent HR "bundle" or system; and that these HR bundles contribute most to assembly plant productivity and quality when they are integrated with manufacturing policies under the "organisational logic" of a flexible production system. Analysis of the survey data, which tests three indices representing distinct bundles of human resources and manufacturing practices, supports both hypotheses. Flexible production plants with team-based work systems, "high-commitment" HR practices (such as contingent compensation and extensive training), and low inventory, and repair buffers consistently outperformed mass production plants. Variables capturing two-way and three-way interactions among the bundles of practices are even better predictors of performance, supporting the integration hypothesis.

2.4 Need for further Research

As interest in quality improvement techniques and its effects on competitive performance has grown, there has been a corresponding proliferation of empirical research. The case examples and empirical studies presented in this chapter support the emerging view of the beneficial impact of Total Quality Management, Just In Time, and Work Teams as a stand alone system upon some aspects of performance as cycle time, productivity, customer satisfaction, flexibility, etc.

In the process of reviewing the existing empirical evidence, a number of gaps were identified. Empirical evidence for a simultaneous impact of Total Quality Management, Just In Time, and Work Teams on the performance of manufacturing plants is lacking in the literature. None of the studies give evidence of which combination of improvement techniques influence performance on the companies. Most of the studies lack the concept of the size of the company. Many studies investigate the impact of the improvement techniques on individual performance measures, but not on a series of dependent variables having an interaction among them. The majority of empirical work on quality improvement techniques can be characterised by a narrow focus and a lack of rigor, particularly with regards to reliability and validity issues. Research must initially specify the important dimensions of quality improvement techniques, determine that they are measured reliably and validly, and subsequently determine their effect on plant or firm performance (Flynn, et.al., 1994)

In view of the existing empirical evidence and the remaining gap in the literature, it was determined that the investigation of the impact of Total Quality Management, Just In Time, and Work Teams on the performance of the manufacturing plants promised to be a fruitful area of study.

CHAPTER 3
THEORETICAL FRAMEWORK

Development of a theoretical model is necessary to investigate the impact of improvement techniques- Total Quality Management (TQM), Just-In-Time (JIT), and Work Teams (WT)-on performance of the manufacturing firms. The first step in developing a measurement instrument is to articulate the theory and concepts that underlie it, providing a foundation for content validity, or the extent to which an instrument measures relevant concepts. This chapter describes and develops a model of the relationship among Total Quality Management, Just-In-Time, and Work Teams and their impact on performance. Additionally, different quality award models will be presented and compared in order to serve as a basis for designing a survey questionnaire for this research. This chapter also reviews different studies covering the relationship between the quality award winning and the firm's performance. Finally, the performance measures used in this research will be discussed.

3.1 Model of relationship among TQM, JIT, and WT and their impact on Performance

The experience of firms experimenting with new methods of achieving improvement is demonstrating that there is a positive relationship between quality and productivity. In other words, by simultaneously trying to achieve higher levels of quality and productivity, firms are finding that there are synergistic effects. There are three main reasons for this relation between quality and productivity: direct and indirect linkages and morale effects (Mefford, 1991). Figure 3.1 illustrates this relationship.

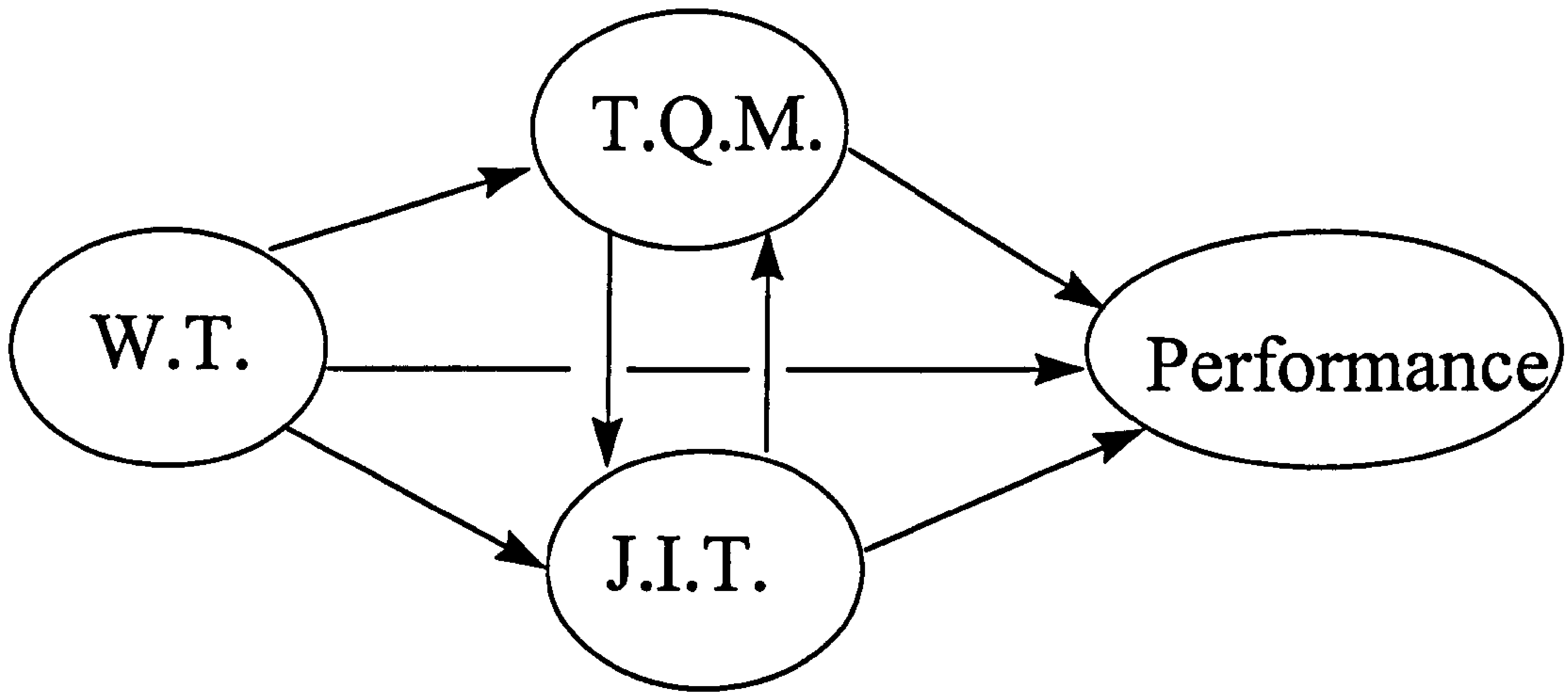


Fig. 3.1: Model of relationship among TQM, JIT, and WT and their impact on performance

A direct linkage between quality and productivity is the enhancement of output per worker that results from reducing the waste represented by defective products or services. The labour and material inputs that go into inadequate products and services may be completely wasted or at least additional resources will have to be expended to rectify the problem.

Another way is through the complementary nature of improvement programmes. In industry it has been found that a process improvement method such as JIT cannot be effective without emphasising quality improvements. This occurs because the very lean, tightly coordinated process that results from JIT leaves room for neither defective parts nor inefficient tasks. Necessarily a firm implementing JIT finds that it must focus on quality as well as inventory and inefficiency reduction. Another method widely used in manufacturing that specifically focuses on quality improvement, TQM, has been shown to also yield substantial productivity improvements. This should not really be surprising since effective improvement programmes focus on the process, not the products or specific problems as isolated instances. Both JIT and TQM are based on the premise that, if the overall efficiency and effectiveness of the process is improved, simultaneous improvement of both quality and productivity will be achieved.

The impact of TQM on JIT can be understood by examining the functional elements of aggregate inventory. When machines stop frequently for quality problems, high amounts of safety stock inventory are required to compensate for the absence of a constant work flow. The optimal level of safety stock is proportional to the square root of the standard deviation of the lead time (Fogarty, et. al.,1991); in other words, as cycle time varies more because of manufacturing process problems, more safety stock is required to assure meeting customer needs without a "stockout." Thus, TQM practices lead to a less variable (better-controlled) manufacturing process that, in turn, reduces the need for safety stock buffers. TQM practices such as design for manufacturability, facilitate set-up time reduction, allowing the use of smaller lots, which reduces cycle stock.

Also as TQM practices reduce the number of items requiring rework, cycle times are shortened by the time savings (Mefford, 1989), allowing improved schedule attainment and correspondingly faster response to market demands. The use of certified suppliers and long term supplier relationships based on quality criteria can reduce or eliminate preprocessing cycle time delays for incoming inspection. In the processing and postprocessing phases, quality at the source, feedback, statistical process control, and effective product designs reduce or eliminate time delays for rework and process inspection of in-process and finished goods, respectively, and transportation times. Thus, there is a reduction in total cycle time, improving customer service by providing flexibility in meeting customer demands.

As JIT practices reduce waste, the need for inventory buffers is reduced, leading to improved quality performance in several respects. Reduced inventory levels have an impact on quality performance through their exposure of problems (Arnold and Bernard , 1989; Dean and Snell, 1991; Wilkinson and Oliver, 1989). TQM uses many approaches for identifying and prioritising process problems, including inspection at the source, communication with customers, quality circles, and many graphic tools. Low inventory levels provide another means for identifying process problems, as well as an incentive for action. When inventory is removed as JIT is implemented, the following operations are starved of parts, and the workforce on the starved machines is mobilised to determine the cause (Davy, et. al., 1992). Thus, controlled levels of inventory reduction induce parts starvation, exposing problems and forcing attention to underlying problems (Schonberger, 1984).

Lot size effects TQM as well. When there are large lots, a process malfunction will likely operate, unchecked, through the processing of the entire lot. In practice, inspection is often delayed until later stages of the production process, increasing the likelihood that the process settings will have been destroyed. Thus the length of the feedback delay is directly proportional to the size of the lot. In contrast, as lot size are reduced, the feedback delay is shortened, process problems are detected in matter of minutes (Hay , 1988), and their causes are more likely to be clear and obvious to the operator. A primary vehicle for reducing lot size is the set-up time reduction. JIT encourages the reduction and simplification of set-up procedures through a variety of practices. As set-up procedure is simplified, it is more likely to be performed by a machine's operator rather than by a separate set-up crew. Every set-up provide the operator with a feedback check; as set-ups become more frequent, the feedback loop is shortened, leading to improved quality.

The JIT and TQM systems require cooperative workers. The management-worker relationship should be based on trust, loyalty and concern. As the safety stock is not available and production lot is small, to be responsive to manufacturing disruptions the system has to rely on worker's high performance, dedication, multifunction skills, and problem solving capabilities. These systems are designed to enhance the workers capabilities, motivation, and involvement, and rely on their contribution. Obviously, a more knowledgeable and motivated work force is significant factor influencing the firms performance (Manoochehri, 1985).

Also contributing to this linkage is the morale component of both. Motivated employees, if provided the opportunity and encouragement, are likely to think of many ways to improve operations. This satisfaction that comes from having made an improvement for the organisation, if properly recognised and rewarded by the firm, may reinforce the motivating effects of employee participation and encourage further efforts. Additionally there may well be a positive motivational effect on employees working for a company that is viewed by all its clients- customers, employees, suppliers, and the community- as a quality-producing organisation. There is certain amount of pride and satisfaction of having one's identity linked to such a firm. This may further increase employee motivation and willingness to commit to organisational improvement programmes.

3.2 Quality Awards

Increasing global competition has resulted in renewed interest in quality and improvement techniques and has led firms to seek guidance in implementing their quality programmes in order to eliminate product defects, enhance customer satisfaction, boost productivity, cut costs, and increase employee morale. Meanwhile, several national and regional quality awards have been established to promote quality and serve as models of Total Quality Management (TQM).

The Malcolm Baldrige National Quality Award, Deming Prize, European Quality Award, Mexican National Quality Award, and Nuevo Leon State Quality Award will be presented and compared in terms of their application categories, criteria and areas of examination, and the underlying values and concepts embodied in their respective frameworks.

3.2.1 Malcolm Baldrige National Quality Award

The Malcolm Baldrige National Quality Award was officially signed by Ronald Regan in 1987 as an act to recognise US companies which excel in quality achievement and quality management.

The award promotes:

- awareness of quality as an increasingly important element in competitiveness,
- understanding of the requirements for quality excellence, and
- sharing of information on successful quality strategies and on the benefits derived from implementation of these strategies.

Public Law 100-107 establishes the three eligibility categories of the Award: Manufacturing, Service, and Small Business.

The Award is divided in seven Categories: (Malcolm Baldrige National Quality Award, 1994) as shown in Figure 3.2:

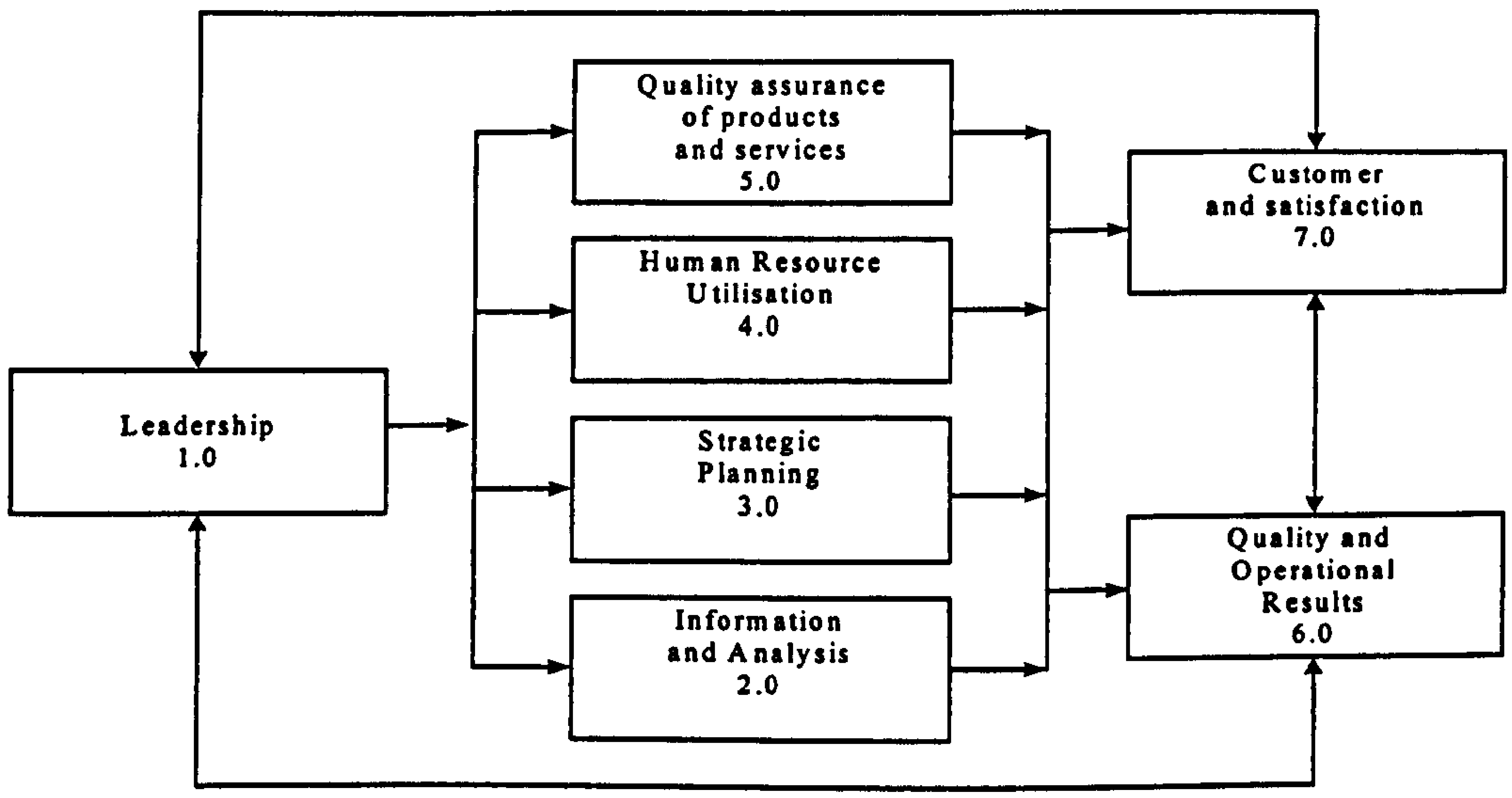


Figure 3.2: Malcolm Baldrige Quality Award model of TQM

Leadership

This Category examines the senior executives' leadership in creating quality values, building the values into the way the company does business, and how the executives and the company project the quality values outside the company. Participation in activities such as those national and international organisations and other activities given in this Category depends upon the type and resources of the business, and its overall competitive and regulatory environments.

Information and Analysis

This Category examines the scope, validity, and use of data to determine the adequacy of the data system to support total quality management. The scope, management, and analysis of data depend upon the type of business, its resources, number and geographical distribution of units, and other factors. Evaluations are based upon the appropriateness and effectiveness of methods for management of data, information and analysis in relation to these business factors.

Strategic Quality Planning

This Category examines the company's approach to planning to determine its adequacy to achieve or sustain quality leadership. While the planning processes and priority development do not depend appreciably upon the size and type of business, the scope and type of benchmark and competitive data may depend upon such business factors. Competitive and benchmark data are essential for planning quality leadership because they make possible clear and objective quality comparisons. The principal considerations in assessing the effectiveness of competitive and benchmark data are in relation to the competitive environment and resources of the company. Evaluations of planning are based upon the thoroughness and effectiveness of processes including the information used.

Human Resource Utilisation

This Category examines the company's efforts to develop and involve the entire work force in total quality. The organisation of efforts to develop and involve employees depend upon the number of employees, resources of the company, the geographical distribution of business units and other factors. Evaluations depend upon the appropriateness and effectiveness approaches to human resource development .

Quality Assurance of Products and Services

This Category has a very strong process and systems orientation throughout. Processes may be carried out entirely by employees, largely by means of technology, or through a combination of the two. The degree of formality in systems and processes depends upon a number of factors such as size of the business, type of products and services, customer and government requirements, regulatory requirements, and number of business locations. Evaluation takes into account consistency of execution of quality operations that incorporate a sound prevention basis accompanied by continuous quality improvement activities. Consistency of execution is taken to mean the existence of defined, suitably-recorded processes with clear delineation of responsibilities.

Quality and Operational Results

This Category examines the company's quality improvement and quality levels by themselves and in relation to those of competitors. Included are quality of products and services, internal operations, and suppliers. The number and type of measures depend upon factors such as the company's size, type of products and services, and competitive environment.

Customer Focus and Satisfaction

This Category examines the company's knowledge of customer requirements, service and responsiveness, and satisfaction results measured through a variety of indicators. The scope and organisation of activities to gather information, to serve and to respond to customers depend upon many factors such as company resources, type of products and services, and geographical distribution of business units and customers. Evaluations are based upon the appropriateness and effectiveness of efforts in relation to these business factors. They also take into account whether or not a company utilises all instruments at its disposal or within its resources to meet the key requirements of an excellent customer service system.

3.2.2 The Deming Application Prize

The Deming Prize was established in Japan by the Japanese Union of Scientists and Engineers (JUSE) in 1951. This award is named in honour of W. Edwards Deming who is recognised as father of worldwide quality movement. The prize has three award categories: the Deming Prize for the individual person, the Deming Application Prizes, and the Quality Control Award for organisations (Japanese Union of Scientists and Engineers, 1990).

The Deming Application Prizes are awarded to private or public organisations and are subdivided into small enterprises, divisions of large corporations, and overseas companies.

The Deming Prize was established to ensure that good results are achieved through successful implementation of companywide quality control activities (Ishikawa, 1989). The Deming Prize evaluates the operations of a firm against 10 criteria, all having equal scoring weights (Sprow, 1992):

Policy and planning

Management's total plan for quality control from setting objectives to implementation and integration into long-range relationships.

Organisation

Defining responsibilities, delegating power, use of staff, and feedback from performance auditing.

Education

Education plan, scope (including training vendors), implementation, and response to employee suggestions.

Information

Assembly, dissemination, analysis, and use of all forms of information on quality.

Analysis

Problem selection, analysis, and use of results

Standardisation

How standards are established, revised, and used.

Control

Control systems and control points for quality and feedback from quality circles.

Quality assurance

The basic quality assurance system, quality audits, and evaluations expanded to cover everything from new products development to process capabilities to safety and product-liability prevention.

Effects

Measuring visible and invisible effects, such as quality, serviceability, delivery, cost, profit, safety, and environmental effects.

Future planning

Relationship of total quality promotion in long- range plans.

3.2.3 The European Quality Award (EQA)

In 1988, responding to the quick success of Baldrige Award, 14 large European multinational corporations formed the European Foundation for Quality Management (EFQM) to promote TQM principles in Western European countries. In 1991, EFQM, with the support of European Organisation for quality and the European Commission, established two types of quality awards for firms: the European Quality Prize, given to firms that meet the award criteria, and the EQA, presented to the most accomplished applicant (The European Quality Award, 1993). In 1992, four European Quality prizes and an EQA were granted for the first time.

There are 9 criteria to be evaluated in this Award:

Leadership

Policy and Strategy

People management

Resources

Processes

Customer Satisfaction

People Satisfaction

Impact on Society

Business Results

The rationale for the European model is that customer satisfaction, people (or employee) satisfaction, and impact on society- the results- are achieved through leadership driving policy and strategy, people management, resources, and processes- the enablers- leading ultimately to excellence in business results.

Some of the criteria are similar to those in the Baldrige Award- Leadership, policy and strategy, people management, resources, processes, and customer satisfaction- three EQA criteria- people satisfaction, impact on society, and business results introduce new elements.

People satisfaction refers to how the employees feel about their organisation, and some of the aspects addressed in this category include the working environment, perception of management style, career planning and development, and job security.

The EQA's impact-on-society criterion focuses on the perceptions of the company by the community at large and the company's approach to the quality of life, the environment, and the preservation of global resources.

The business-results criterion addresses the financial performance of the firm and its market competitiveness and the firm's ability to satisfy shareholder's expectations. Additionally, a host of nonfinancial areas of performance, such as order-processing time, new-product design lead time and time to break even, are also considered in the evaluation.

3.2.4 Mexican National Quality Award

This Award was established in 1986 with the objective of promoting implementation of quality systems and obtaining results as a consequence of the implementation. In this Award all types of industries such as large, medium, small and government institutions could participate.

There are eight categories in this Award (Premio Nacional de Calidad, 1996) as seen in Figure 3.3:

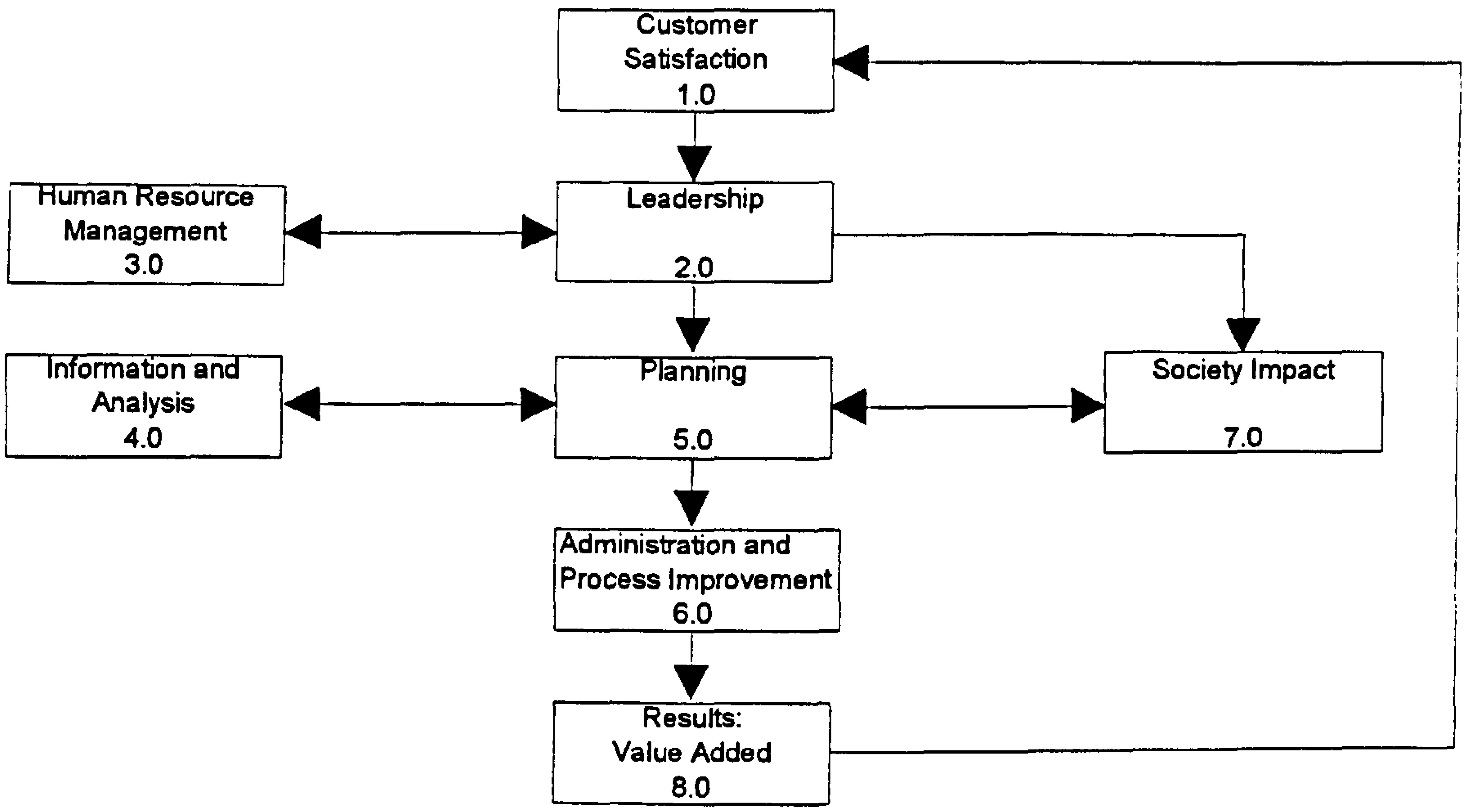


Figure 3.3: Mexican National Quality Award model of TQM

Customer Satisfaction

This point relates to the final customers, the importance given by the administration to this issue, and the mechanisms used to know, satisfy and exceed customer needs.

Leadership

The grade of top management involvement towards the quality efforts, analysis of the vision and mission of the company and the way the management diffuse them to the whole company.

Human Resource Management

Involves the way in which the organisations train and educate the personnel with respect to quality subjects. Additionally measures the grade of involvement of the personnel in the company, and the way this stimulates the creativity and participation of all employees. This category also includes incentive and recognition systems.

Planning

Includes strategic planning as well as operative planning of the firms. This category examines the process for achieving, maintaining or increasing the leadership of the organisation in quality.

Administration and Improvement of Processes

Includes all the key processes of the organisation in a manner to assure that the customers receive consistently a higher value for their products. This point includes all processes from the design, control and planning, until improvement and standardisation of processes.

Impact on Society

The way in which the organisation focuses its systems to avoid pollution and favours the ecology system, and the methods being used by firms to achieve a positive impact on society.

Results: Value Added

This refers to the numeric results of the organisation including financial, quality improvement, performance and key operations, as well as the quality of its suppliers.

3.2.5 Nuevo Leon Local Quality Award

This Award was established in 1989 by the government of Nuevo Leon for the public and private organisations in which there has been an implementation of a planned process of quality and the evidence of focus being used, and results being obtained.

In this Award all types of industries such as large, medium, small as well as educational organisations could participate.

The category of the Award (Premio Nuevo Leon a la Calidad, 1996) is divided into 8 categories as seen in Figure 3.4:

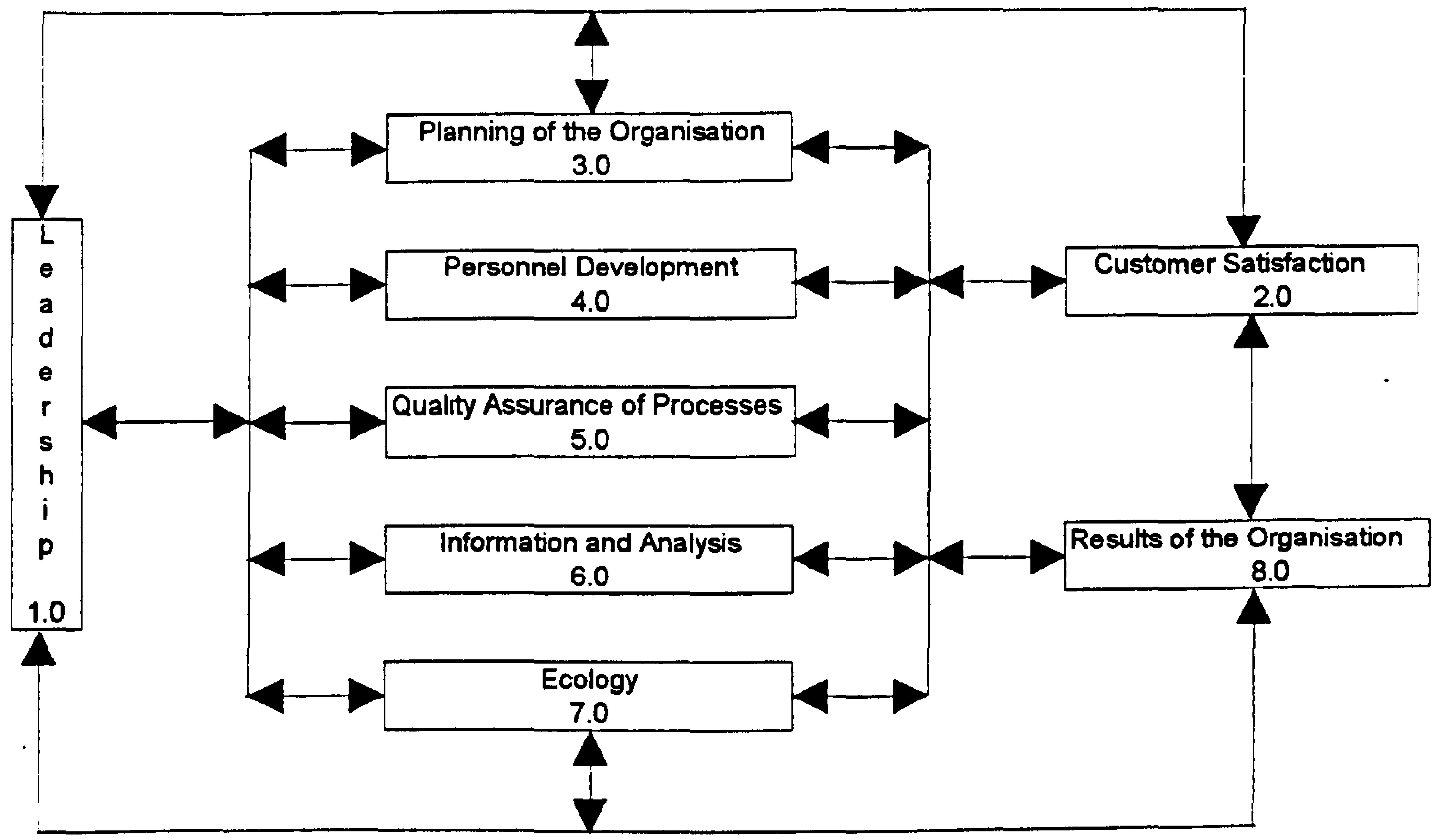


Figure 3.4: Nuevo Leon Quality Award model of TQM

Leadership

This section includes the deployment of the vision and the mission of the firm by the top management and the extent of sharing and communication of the quality concepts in the whole company. This category also examines the grade of involvement of top management with the quality process.

Customer or User satisfaction

It is about the methods and systems being used in the firm to know the needs of the customers and translating them in the process of improvement for the company.

Planning of the Organisation

Includes the processes of strategic planning and the way the company deploys them towards all the units of the organisation.

Personnel Development

It refers to continuous training and education of the personnel. This category includes also the methods of recognition and personnel performance measurement.

Quality Assurance of the Processes

Includes the systems and procedures which a company uses when trying to present , modify and or improve a product or service. This point also measures the techniques being used for controlling the quality of the processes in the organisation.

Information and Analysis

This category is about the information handling in the organisation, the way it is being obtained and used, and the reliability of the data. This also includes the way this information is communicated in the organisation.

Ecology

This point measures the way in which the organisation creates a consciousness of ecology among its employees and way it avoids pollution. Also considers the aspects which a company uses to create consciousness in the community in relation to ecology.

Results of the Organisation

Includes all the results of the effectiveness of the operation, financial results, customer satisfaction index and its tendencies.

3.2.6 Comparison of the Awards

The framework of the Deming Prize is centred on the implementation of a set of principles and techniques, such as process analysis, statistical methods, and quality circles. The Deming Prize evaluates the operations of a firm against 10 criteria but, unlike the Baldrige Award and EQA, all criteria have equal scoring weights. The Deming Prize introduced examinations characteristics such as visiting teams and scoring methods, the award ceremony, and the obligation of the winners disseminate the quality techniques they have developed. These features inspired similar characteristics in the Baldrige Award and EQA. (Nakhai and Neves, 1994)

The most important difference is in the purpose of the Deming Prize: "To award prizes to those companies that are recognised as having successfully applied companywide quality control based on statistical quality control and are likely to keep up with it in the future."(Japanese Union of Scientists and Engineers, 1990). Therefore, most Deming Prize criteria are confined to the application of statistical techniques. Even criteria such as company policy and planning, results, or future plans, which are considered in a broader context in the Baldrige Award and EQA, are primarily concerned with quality assurance activities and quality results, especially the elimination of defects. Both the Mexican Awards- national and local- are based on the Malcolm Baldrige Award in their focus, application and definition.

The awards seem to place different focus on the definition of quality: the Deming Prize views quality as defined by the producers. The Baldrige Award indicates that quality is defined by the customer. For the EQA, the customer as well as the employee and the community at large all contribute to the definition of quality. Mexican National and local quality Award are similar to the Baldrige Award and indicate that quality is defined by customers and users.

All the awards make major contributions to the definition and practice of TQM. The Deming Prize serves as a symbol for companywide quality efforts, the pursuit of continuous improvement, and the extension of quality management to the suppliers of the firm. The Baldrige Award focuses firms on competitive comparisons and benchmarking. The EQA brings a host of new ideas- impact on the community, employee satisfaction, and financial and nonfinancial results. Mexican Local Quality Award includes ecology and the category of educational organisations which is not addressed directly by other Awards.

3.2.7 Past Quality Award winners

Table 3.1 lists some of the winners of the Awards analysed before. The list does not include all the winners, and only a sample of them are chosen.

Table 3.1: Some of the past winners of the Quality Awards

Year	Malcolm Baldrige Quality Award	Deming Prize	European Quality Award	Mexican National Quality Award	Nuevo Leon State Quality Award
1996	ADAC Laboratories Dana Commercial Credit Trident Precision	Fuji Photo Optical	Brisa	Industrias Negromex POLICYD	ITESM Campus Mty
1995	Armstrong World Corning Telecommunications	Ishikawajima-Harima Mtex Matsumara Kikuchi Metal stamping Toyoseiki Co	Texas Instruments Europe	Fab y Rep Industriales Vitro Fibras Velon	Fábricas Monterrey Vidriera Monterrey
1994	GTE Directories AT&T Consumer Wainwright Industries	AT&T Power System Maeda Seisakusho AW Industries NT Techno Corp	Design to Distribution Ltd	Engranes Cónicos Cementos de Yaqui Automovilística Andrade The Ritz-Carlton CanCún	Nylon de México Hotel Rio UDEM (Preparatoria)
1993	Eastman Chemical Ames Rubber	NTT Data Corp	Milliken Europe Division	Pinturas Osel Altec Elect. de Chihuahua Surgikos	Galvak IMMSA Acumuladores Mexicanos Hotel Ancira Radisson Urbanizadora U-Calli Pro-Famili
1992	AT&T Network Sustems Texas Instruments The Ritz-Calton Hotel Granite Rock	Aisan Industry Co. JATCO Corporation	Rank Xerox Ltd	IBM de México G M. Ramos Arizpe	Nemak Pinturas Osel Acertek Tortillas "Mama Raquel" Bancomer Carl's Jr Valle Automotries
1991	Selectron Corporation Zytec Corporation Marlow Industries	NEC Kansai, Co Nachi-Fujikoshi Corp Hokushin Industries Sinei Industries, Co. Niigata Toppan Printing Philips Taiwan	N/A	G M Planta Motores CRYSEL	John Derre Masterpak Tecniquimia Carnes BIF Hotel Ambassador Club Cima Servi-Data
1990	Cadillac Motor Car Federal Express IBM Rochester	Aisin Hoyo Co Amada Wasino, Co NEC Shizuoka, Ltd	N/A	Hylsa Xerox de México American Express Co.	Metalsa Buenos Alimentos Fundición MAC Fraga Organización Benavides OXXO

3.2.8.- Link between quality winning and performance

There have been very few studies to investigate the link between winning a Quality Award and the performance of the company. The only studies so far that have been publicly available are for the analysis of the effect of the Baldrige Award on US organisations. Because of the similarity of the Malcolm Baldrige Quality Award and the two national and local Mexican Quality Awards, these studies have been of interest for this thesis.

The first survey was realised in 1991 by General Accounting Office (GAO) of twenty US companies with quality programmes that scored well on their Malcolm Baldrige

National Quality Award applications from 1988 and 1989 (United States General Accounting Office, 1991). The survey noted measurable improvements in employee attendance, job satisfaction, turnover, safety and health, volume of suggestions, and productivity. Customer satisfaction and retention were also up. In fact, customer complaints dropped an average of 12 percent. and there was a 5 percent to 10 percent improvement in defect and error rates, order processing, on-time delivery, and product reliability (Hitchner, 1993).

The study looked at 52 performance measures in four categories.

* Financial measures.
* Operational measures.
* Customer-satisfaction measures.
* Employee-relations measures.

Almost without exceptions, the data show that companies which adhere to criteria have improved performance in all four areas. Market share, revenues, delivery times, turnover, and just about every other measure improved after the companies began using the Baldrige criteria to improve their organisations (Brown, 1991).

David Garvin (1991), a quality expert, conducted a second study in response to criticism about the award. He interviewed Baldrige Award judges, senior examiners, and examiners to obtain their views on the award, the evaluation process, and how companies can best use the criteria. Garvin concludes that the Baldrige Award is "the most important catalyst for transforming American business". In his analysis, Garvin goes to demonstrate that the Baldrige criteria are an ideal road map guiding companies in their efforts to develop a system of integrated competencies that together lead to high performance.

A third survey was conducted between fall 1991 and winter 1992 to determine what US business community really thought of the Baldrige Award. The companies were selected from the *Fortune* 500 industrial corporations. Over 69 percent of the respondents believed that the criteria are useful as an internal assessment tool and, can provide quantificable success factors. The study also concluded that the Baldrige Award provides the best framework for a total quality management system. This study indicates that the Baldrige Award has altered the nation's conscience regarding the benefits and processes necessary to achieve quality. The award's success demonstrates that such efforts can indeed foster excellence, and improve productivity (Knotts et al., 1993).

All these studies indicated that quality improves a firm's competitiveness. As Shetty (1993) concluded "Quality confers cost advantages and fosters customer loyalty. Low cost and high quality are essential for a firm that seeks to increase market share and profitability.

Not all the Baldrige winners have been completely successful and some have faced performance problems. For instance Wallace Company customers rebelled at paying higher prices to fund the costs of the company's quality programme. The company lost money, laid off employees, and was forced to operate in Chapter 11. Federal Express's decision to cut its operation in Europe also was a major setback for the firm. And the larger corporate parents of both IBM Rochester and Cadillac have suffered reverses in their respective industries. In these latter cases, however, the learnings earned from the Baldrige competition may provide a partial basis for the larger organisation's recovery. Each of these companies argue, and with some justification, that things would have been much worse much sooner without their TQM efforts (Hill, 1993). To date, not one of these firms has blamed their Baldrige application efforts for their performance problems. To the contrary, IBM is pushing its Market Driven Quality programme throughout the company and using the Baldrige framework for assessment of this effort (Panchak, 1992).

The Baldrige winners suggest that the effort to win the award was worth it. Most of the companies intend to continue the same type of quality self- assessment programme in the future, using the Baldrige application as a framework. Westinghouse has developed its own in-house quality competition culminating in presentation of two George Westinghouse Total Quality Award, one for the best division and one for the most improved division in the corporation with regard to TQM performance (Main, 1990).

Motorola has gone to its suppliers and asked them if they would be willing to apply for the award within five years. Motorola furnished some of its quality training to the suppliers that accept this challenge, and those who do not consider the Baldrige challenge are dropped as suppliers.(Smith, 1993) Motorola, IBM, and Xerox, via the Quality Forum, have become major contributors to efforts directed as increasing the level of TQM- related instruction in the U.S. business and engineering schools (Blackburn and Rosen, 1993).

The Baldrige process in many cases has shown a direct correlation with financial performance (Hart, 1993). Armonk, NY- based IBM, for example, administers an internal competition using the Baldrige judging methodology. In 1991, the company compared the performance of its top-scoring and low-scoring divisions on several measures. The top divisions performed significantly better in such areas as customer satisfaction, market share, revenue growth, and profitability.

Based of these studies, it can be concluded that the Baldrige Award provides the best guideline for a Total Quality Management system and that the criteria can be useful as an assessment tool to provide quantifiable success factors.

3.2.9 Lessons from Malcolm Baldrige Quality Award winners

By analysing the strategy used by the Baldrige Award winners, a common pattern can be established to serve as an assessment tool to provide quantifiable success factors. The strategy followed by the successful companies shows a road map that, if followed, leads to world class quality (Juran, 1996). All of these companies have achieved stunning results with respect to quality such as: time reduction to provide customer service, reduction in defect levels, increase in productivity through quality improvement, and cost reduction through quality improvement.

The other feature of the companies' achievements was that the improvements took place throughout the entire spectrum of company activities: customer satisfaction; field performance of products quality of the manufacturing processes; suppliers' quality; customer service; and quality of the business processes;

These companies made extensive gains beyond the measurable results. For example, as a by-product of making their improvements, their personnel became experienced at and got into the habit of making improvements. In addition, most of these improvements were made by teams. This required teamwork, which then carried over into the traditional responsibilities as well. The results obtained by the Baldrige winners was through establishing "stretch goals". One way to achieve these goals was the use the concept of "benchmarking" as championed by Xerox.

Benchmarking involves setting goals based on results already achieved by world leaders in similar activities. The fact that someone else has achieved those results proves that it is possible. Similarly, the Baldrige winners and other leading companies have already met stretch goals thus proving that stretch goals are possible.

To meet stretch goals, the major form of "what to do differently" consists of going into quality improvement at revolutionary pace. The Baldrige winners did just that. Milliken, a Baldrige winner, reported that over 200,000 opportunities for improvements were implemented during the year they won the award. They also reported thousands of projects completed by action teams. Xerox, another winner, reported that 75 percent of their employees served on manufacturing teams.

To make improvements by the thousands requires an organised effort- namely, an infrastructure. A high level quality council is needed to direct and coordinate the effort. A process is needed for choosing which improvement projects should be tackled. Teams must be organised and assigned to carry out the projects.

The leading companies also provided extensive training in how to manage for quality, in how to make improvements, and in necessary tools and techniques. Xerox described its training strategy and associated training curricula as a strategy that started at the top and then cascaded down. Such training required resources. In its approach to training, Milliken gave a figure of $1,900 applied per employee for the Baldrige Award year. Other Baldrige award winners note similar commitments. At Cadillac Motor Car, skilled hourly personnel receive a minimum of eighty hours of formal instruction. At Wallace Company, each of their 300-plus suppliers are offered training in continuous quality improvement- a first in the industry. IBM Rochester invests heavily in education and training, the equivalent of 5 percent of its payroll.

All of the Baldrige winners used employee involvement. The major change was to provide employees with the opportunity to participate in quality planning and quality improvement. Use of teams was widespread. There were many types of teams at all levels of the organisations. Some teams, such as Cadillac, included executives, plant managers, and union leaders. Teams worked on projects that extended across the entire spectrum of company activities.

All the companies stressed the use of motivation as a means of changing the culture and securing employee involvement. A major form of that motivation has been recognition- public acknowledgement of the contributions made by individuals and teams. Milliken reported an extraordinary rate of such recognition, reaching five out of six production employees.

At Federal Express, executive bonuses rest upon the quality performance of the overall organisation. In the annual employee surveys, if management leadership is not rated as high at least as it was in the previous year, no executive receives a year-end bonus.

In all leading companies, the upper management personally and actively supplied the leadership for the revolution in quality. At Wallace Company, each of the organisation's five top executives underwent more than 200 hours of intensive training on the methods and philosophy of quality improvement.

To provide leadership, executives at all of the leading companies accepted personal responsibility for certain decisions and actions that are critical to attaining world class quality. In this way, the upper managers virtually took charge of quality. These critical decisions and actions consisted of: serving on the quality council; establishing the major quality goals for the business plan; setting up the essential infrastructure; proving training and other resources; reviewing progress; providing recognition; and revising the reward system

We can learn from the demonstration case examples that a significant number of companies- Baldrige Award winners and others- have demonstrated that meeting the quality challenge is possible. This proves that it is possible elsewhere. Generalising form their successes, we can develop a winning approach leading to world class quality.

3.3 Performance measurement

For several years, senior executives in a broad range of industries have been rethinking how to measure the performance of their businesses. They have recognised that new strategies and competitive realities demand new measurement systems. Now they are deeply engaged in defining and developing those systems for their companies. Leading manufacturers and service providers have come to see quality as a strategic weapon in their competitive battles. As a result they have committed substantial resources to developing measures such as defect rates, response time, delivery commitments, and the like, to evaluate the performance of their products, services, and operations. In addition to pressure from global competitors, a major impetus for these efforts has been the growth of the Total Quality Movement and related programmes such as the Malcolm Baldrige National Quality Award. As competition continues to stiffen, strategies that focus on quality will evolve naturally into strategies based on customer satisfaction.. Attention to customer satisfaction, which measures the quality of customer service , is a logical next step in the development of quality measures (Eccles, 1991).

Revising performance measures is a prerequisite to improving productivity, competitiveness, and profitability. It is undoubtedly the most important decision a company can make. In fact, performance measures are the key element in determining whether or not an improvement effort will succeed. The reason is simple: the actions of individuals in manufacturing are driven by the measures used to evaluate performance. Everywhere, managers and workers, strive to increase efficiencies. They do this primarily because performance measures encourage and reward the attainment of efficiencies.

Commentators on manufacturing performance have strongly advocated the use of non- financial measures in managing production activities. Words such as customer service, productivity, quality, flexibility, delivery time, competitive position, and production process time permeate the literature on manufacturing performance measures. One problem is that financial measures are not sufficiently meaningful for the control of a production or distribution plant. Factory operators do not by nature think in terms of the financial aspects of their work. Their concern is directed toward production rates, yield quantities, reject rates, schedule changes, stockouts and on- time deliveries. Indeed, it has been noted that '...day- to- day control of the manufacturing and distribution operations are better handled with non- financial measures (Maskell, 1989).

Several authors have noted the importance of using multiple measures of the dimensions of performance (Kaplan, 1983; Gupta, 1987; Steers, 1975; Venkatraman and Ramanujam, 1986; Randolph, et. al., 1991). Specific performance dimensions will vary among organisations, depending upon the critical success factors established. An in- depth look at seven performance dimensions measured in three general categories of performance measurements that are found frequently in a world- class manufacturing environment follows:

1.- Operational Results

- **Productivity**

Estimating and monitoring productivity are among the most critical information outputs that management can use to judge performance. Productivity can be defined as the physical output of an activity divided by the cost of resources consumed, thus expressed as a cost per unit of output. The most common measure of the productivity is labour productivity which is defined as value added by workers in the company. Therefore, productivity improves when cost per unit of output declines. This productivity calculation links the physical output of an activity to its cost.

- **Quality**

Quality has many meanings for many people. In judging quality performance of an activity, it simply means conformance to specification. Quality pertains to both the adequacy of processing within an organisation and the characteristics of what is delivered outside the organisation (Riggs and Felix, 1983). Within the organisation, typical measures of quality are scrap, recycle, and other forms of waste that with intended performance, would not have occurred. Quality as a performance measurement is one of the most useful information outputs for management to achieve its goal of providing the lowest product cost while at the same time meeting customers needs.

- **Cycle (Lead) Time**

Cycle time is measurement of how long is taken to complete an activity or a business process. The total cycle time to make a product and deliver it to the customer is the summation of the "non- overlapped" cycle time for each of the activities necessary to produce and deliver a product to customers. Like the other performance measurements, reduced cycle time is predicted on improved productivity, increased quality, and customer satisfaction.

2.- Customer Satisfaction

- **Customer Satisfaction**

Customer satisfaction (quality delivered outside the organisation) deals with whether the service rendered is what the outside customer expected, wanted or specified. Some of the measures of customer satisfaction are quite subjective. They appear as postaudit reviews, complaints, or satisfaction surveys (Thor, 1988).

Since firms stay in business and prosper only if they achieve customer satisfaction, improved productivity, increased quality, and reduced cycle time are meaningless if customers are dissatisfied. As a key performance measurement, customer satisfaction should be qualified and expressed at its source- by the customer (Miller, 1992).

3.- Organisational Climate

Throughout the organisation in all functions at all levels people make it happen. How people work, and learn, and grow, and produce will determine company success. The structure of work and the motivation and development of people as a key performance area is measured in three dimensions:

- **Turnover**
- **Absenteeism**
- **Morale**

An overall performance cannot be viewed unless the level of motivation, satisfaction and involvement of employees are measured in the organisation. Without satisfied employees not all of the performance measures can be achieved.

It is important to note that each of these elements of activity performance has limited value when viewed independently. In isolation, none of them can fully measure performance or fully describe how well the organisation is doing. For example, high levels of productivity would not be meaningful if cycle times were increasing or customer service levels were dropping. Each of the primary performance measurement must be considered in tandem when judging total activity performance.

The performance measures used in this research is shown in Figure 3.5:

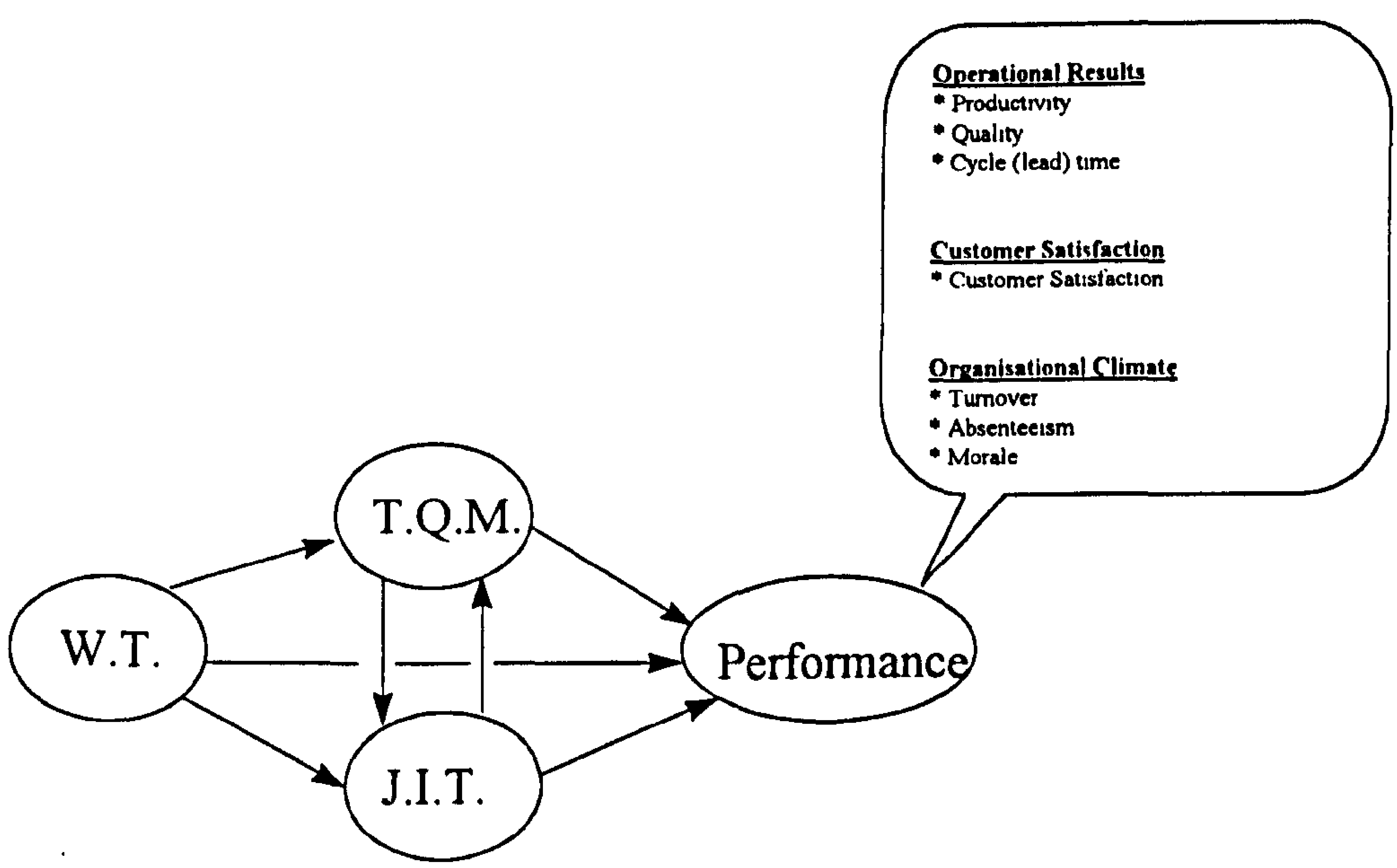


Figure 3.5: Model of the dimensions of performance measures

3.4 Summary

Using quality award criteria are not the only means to evaluate the status of quality and improvement techniques used in an organisation. Studies on the relationship between quality award winners and the performance of the firms confirm that the quality award criteria actually enhance higher productivity, greater customer satisfaction, improved employee relations, and increased profitability. These conclusions gives us confidence that quality award criteria are one the best ways of assessing an organisation's efforts on using and implementing improvement techniques and their impact on the performance.

CHAPTER 4
RESEARCH METHODOLOGY

This chapter describes the process employed in the gathering and testing of the empirical data used in this study.

There are several means to carry out this study, i.e., computer simulation, case studies, surveys, etc. The decision of the appropriate approach is influenced by the research task; the environmental characteristics of the study; the data source; and the method by which data is gathered.

The research task in this study is to evaluate the impact of TQM, WT, and JIT on the performance. The environment within which the study is carried out is the Mexican manufacturing organisations. There is no data base available in Mexico concerning the information relevant to the manufacturing practices carried out by Mexican companies, and PIMS (Profit Impact of Marketing Strategy) which is a data base of the information of the firms in US is not suitable for this study.

4.1 Data requirement

The following considerations were taken for gathering of data after taking into account the proposed research task in the context of the Mexican manufacturing environment :1) Data being gathered from a relatively large sample of manufacturing firms in order to enable a representative sample of data of the manufacturing industry to be obtained, and to facilitate the use of statistical analysis of the data.; and 2) Data from different types and sizes according to classification of Mexican industries (INEGI, 1997): Large firms (having 500 or more employees), Medium firms (having between 100 and 500 employees), Small firms (having less than 100 employees), and Maquiladoras, mainly being medium size companies. This classification may differ from other studies and according to different countries.

According to US Small Business Administration (SBA), size standards (1990) small manufacturers generally have fewer than 500 employees. However, the SBA uses different employee sizes for programmes such as small business loans and government procurement (Longenecker and Moore, 1987). Also, researchers use different thresholds for defining a small business. For example, McEvoy (1984) used a cut-off of 250 to study personnel practices in small firms, while Amba-Rao and Pendse (1985) used a cut-off of 300 employees to study compensation practices. While examining human management practices, Hornsby and Kuratko (1990) defined firms with fewer than 150 employees as small firms. Thus, there is no one threshold which defines a small firm based on employee size. It ranges typically between 100 to 500 employees. For our study, the medium firms in Mexico will be equivalent to small firms in the US according to the differences in the classification of the industries based on the number of employees.

4.2 Sample and survey design

Based on the model of Malcolm Baldrige Quality Award, and Mexican National Quality Award, a survey questionnaire was developed. It contained variables of the TQM, WT, and JIT practices which were measured on a five-point Likert type scale for all items to ensure higher statistical variability among survey responses (Saraph and Benson, 1989; Roth and Miller, 1992; Schonberger, 1983).

The respondents were asked to choose the grade (from 1 to 5) of implementing these practices in the last three to five years in their firms. This seemed to be a reasonable time for the implementation of the practices and sufficient time for the firms to evaluate the results. The questionnaires were sent to the key members of the companies such as plant managers, quality managers and human resource managers. Sufficient care was taken in operationalising the study's research variables and casting them into the questionnaire instrument through appropriate wording and random ordering.

To ensure relevance of the research sample and obtain reliable responses, a multi-stage process was undertaken:

1. An initial list of the manufacturing companies was chosen from *Expansion* 500 magazine from large, medium, and small companies; and the Maquiladora companies from the *Maquiladora Directory.*

2. Each company was contacted by telephone to update the names and addresses of the top management members who would be responding to the survey.

3. Prior to the main survey, the questionnaire was pre-tested with experts in the academic community from Mexico and UK and revised as often as necessary to establish the initial face validity.

4. The questionnaire was also pilot tested with several manufacturing executives from five different companies. In-depth interviews concerning the choices, clarity and phrasing of the questionnaire enabled further refinement

4.3 Test for Generalisability

In the manufacturing sector, a plant constitutes the strategic business unit for TQM implementation and has been used in several empirical studies (Griffin, 1988; Ebrahimpour and Withers, 1992; Schroeder, et. al., 1992). Hence, plants were used as the unit of analysis in this study. Plant managers play a critical role in linking corporate policy formation with short- and medium-term operations. Since plant managers are involved in both the operations and the strategic initiatives of a firm, they are familiar with quality management implementation in their plants and are in a unique position to evaluate the quality and manufacturing efforts in their firms. Hence, following similar studies (Ebrahimpour and Withers, 1992; Schroeder, et. al., 1992; Roth and Miller, 1992), plant managers were used as the key respondents and quality managers as the alternate respondents in this study. The respondents were chosen to have a high degree of work experience in their firms. This provides an assurance and confidence that the respondents were adequately knowledgeable to provide reliable answers to the questions asked and that their responses could be treated as representative of their firms' responses.

Note, however, that despite the care taken to select appropriate respondents for the study, the results presented here are based on the subjective perceptions of these respondents about their firm's quality and manufacturing efforts and resulting plant performance. Thus, they cannot substitute for a direct objective measurement of TQM, WT, JIT, and performance elements in the firms, and responses on subjective questions may be biased. However, collecting objective numerical data is not free of problems either. Data enquiries may increase the number of questions asked, may require respondents to divulge information which they perceive to be confidential, and may need careful normalisation. Even the numerical responses may not be accurate, because the respondents may provide false information either by intent or through error, or may alter numerical responses to create a socially desirable image of their organisation (Feldman and Lynch, 1988). Also, since numerical data are not always readily available, a respondent may provide wrong responses to such queries. As can be readily seen, the subjective assessment relies on the respondent's judgement and allows him/her to respond without giving specific numerical information. The assumption here is that to answer the subjective question, the respondent will proceed through a logical string similar to that explicitly represented by the objective queries. Thus, respondents will be more willing to respond to subjective questions than to queries about numerical data. Weighing the relative costs (increased questionnaire size, decreased response rate) and benefits (reduced bias) of objective data versus subjective perceptual measures, we opted for the use of the key respondent's perceptions.

4.4 Operationalisation of the survey

The questionnaire was divided into two sections: 1) Independent variables, which are the practices the companies should follow, based on the model of Quality Awards, and 2) Dependent variables, which are the results and outcome of the company measured as performance. All these variables were measured on a 1 to 5 Likert type scale (1= very little and 5= a great deal).

4.4.1 Independent Variables

These variables were designed to represent three main factors to be measured: Total Quality Management (TQM), Just In Time (JIT), and Work Teams (WT). A copy of the blank questionnaire in English and Spanish is included in Appendix 2.

Variables 1 to 47 were designed to measure the practices of TQM. These items assessed leadership of the top management, creation of quality culture, communication, empowerment, quality measurement, systematic data analysis, benchmarking, planning, customer satisfaction, employee satisfaction, etc. Variables 48 to 62 were designed to measure the practices of WT. These items assessed personnel involvement, working in teams, employee performance, communication, training, recognition, etc. Variables 63 to 68 were set to measure the practices of JIT assessing items such as number of suppliers, length of production runs, length of set-ups, inventories, etc.

1. Have all of the executives of your organisation received training in quality concepts and tools?

2. Are all the executives visibly involved in creation of an effective quality culture?

3. Do all executives practice the principles of quality promoted by the organisation?

4. Is there any written quality policy, as well as quality goals in long terms? (If the answer is no, go to the question 7)

5. Has this policy been communicated to all levels of employees in the organisation?

6. Does this policy emphasise the necessity of continuous improvement and involvement of all the functions of the organisation?

7. Has the responsibility of the quality management and improvement been clearly defined and communicated to all the levels of the organisation?

8. Are all employees trained personally to take control and make decisions for problem solving and customer satisfaction (Empowerment) ?

9. Does your company diffuse its leadership in quality to external community, through integration of responsibilities for health, security and environment protection?

10. How much resource (financial, time, people, and equipment) do your executives dedicate to quality improvement process?

11. Does the organisation obtain quantifiable data of all the dimensions of the quality of its products and services?

12. Does the organisation obtain and report quality data on all functions and departments (including accounting, marketing, etc.)?

13.Does the company employ periodic methods for obtaining and analysing data of clients point of view on quality of its products and services?

14.Does the company report all factors in relation with quality costs such as internal failure, external failure, prevention and appraisal costs?

15. Is your organisation involved in systematic analysis of quality data, in order to identify the causes of the problems?

16.Is your organisation involved in systematic analysis of quality data, in order to create strategies of quality improvement?

17.Does your company obtain key data on clients, competitors, suppliers, etc. to be used in the quality planning process?

18.Does your company demonstrate its priority towards quality in the process of decision making?

19.Does your company utilise world class standards (benchmarking)?

20.Does your company obtain data with relation to the quality of its competitors?

21.Does your company have operational (1-2 years) and strategic (3-5 years) plans describing global quality goals and strategies to achieve these goals?

22.Do your employees, clients and suppliers participate in the quality planning process?

23.How achievable are your short and long term goals, taking into account the environment and other restrictions?

24.Does your company have specific plans for quality improvements and methods for monitoring the progress?

25.Do the plans for quality improvement include all functions of the organisation?

26.Does your company have plans for assuring that its suppliers are capable of achieving their quality requirements?

27.Does your organisation use a systematic process like Quality Function Deployment (QFD) to define the requirements and expectations of the clients?

28.Does your organisation use a systematic and effective process to translate the requirements of the clients to the planning process in order to improve products and services?

29.Are the staff responsible for creating new products and services kept informed on quality objectives and clients requirements?

30.Is there any evidence of the use of analytical techniques such as Pareto, Taguchi methods, Failure analysis mode, etc. for creating new products and services?

31.Does your organisation employ physical/chemical and destructive tests to measure all the important quality characteristics of products and services?

32.Does your company use measurement instruments and technology which are "State of the Art" in order to achieve an excellent performance in quality?

33.Is there an auditing process being used to evaluate periodically the effectiveness of your quality management system?

34.Does your organisation employ adequate methods of evaluation to determine how much do your suppliers and external distributors of goods and services achieve your quality requirements?

35.Does your company work in collaboration with their suppliers in order to improve quality?

36.Does your company apply quality assurance techniques in supporting departments such as, Research and Development, Accounting, Human Resources , Marketing , etc.?

37.Has your organisation a system in place to document the information concerning products and services and to maintain these documents?

38.Are these documents up to date and are they easy to use?

39.Is there any system to evaluate the performance of the products and services before their use?

40.Is there any system to evaluate the performance of the products and services after their use?

41.Has there been a correlation of the wastes and rework data against the quality requirements to identify appropriate corrective actions?

42.Do your customers believe that your products and services satisfy their specifications, and they are getting value for money?

43.Are the customer satisfaction measures exact, objective, complete and reliable?

44.Are the customer satisfaction measures related to their requirements and expectations?

45.Do your clients believe that your company has an effective and efficient system to handle their problems and complaints?

46.Does your company have any policy or procedure whereby your customers could contact easily the employees in order to solve their complaints?

47. Does your organisation employ a unique or innovative system to reach customer satisfaction?

48. Is there a corporate plan to involve everyone in relation to the quality improvement process?

49. Are there any quality criteria connected to the process of personnel selection?

50. Are there any quality criteria in measuring the performance of each employee in the organisation?

51. Does your company utilise effective methods for communicating the quality goals and progress to all employees?

52. Is there any effective system for communicating quality related ideas and suggestions to the management, and allowing the management to give feedback on these ideas?

53. Is there any defined system for involving all employees in the quality improvement process?

54. Do all levels of employees (including management) dedicate sufficient time to learn the principles and techniques of quality improvement? (how many hours per year)

55. Are the employees capable of applying the knowledge and skills learned in training to their work?

56. Does the organisation have an incentive or recognition programme to reward the effort of employees toward quality improvement?

57. How many times per month do the members of the work unit participate in problem solving sessions?

58.How often is performance discussed with employees?

59.How closely is pay tied to team performance?

60.How closely is pay tied to problem solving and suggestions on improvements?

61.What percentage of people receive training during a typical year?

62.How many different kinds of training programmes are available for members of your work unit to attend?

How much has each of the following changed in the last 3-5 years?

63.Number of your suppliers

64.Size of their deliveries

65.Length of product runs

66.Length of set-ups

67.Number of total parts

68.Amount of buffer stock

4.4.2 Dependent Variables

The difficulty in establishing a direct link between the system's performance and the firm's economic performance has been a topic of much debate and research. This is due to the intangible nature of many variables at departmental/divisional, firm, industry or economic level that could confound its influences. In view of these difficulties, the outcome of the company has been measured by three factors: 1) Operational results, 2) Customer satisfaction, and 3) Organisational Climate.

1.- Operational Results

Productivity (measured as value added per employee),

Quality (measured as reduction of wastes and defects), and

Cycle (lead) time.

2.- Customer Satisfaction

Customer satisfaction

3.- Organisational Climate

Turnover,

Absenteeism, and

Morale

Because many of these indicators are seldom available at plant level where these results can be found (Parthasarathy and Sethi, 1993) and because the managers do not wish to provide this information, researchers have been forced to rely increasingly on measuring the perceptions of responsible senior executives as indicators of performance (Delone and McLean, 1992)

The indicators used in dependent variables are comparative (measured in a Likert type scale from 1= has decreased to 5= has increased), measuring the relative results before and after practising TQM, JIT and WT. Due to the difficulty in obtaining numerical results and even so if available would lack reliability, in this research, the perceptions of responsible senior executives as indicators of performance were used.

4.5 Reliability and Validity tests

When using questionnaires to measure constructs, reliability and validity must be addressed in survey development and evaluation. A thorough measurement analysis on instruments used in empirical research is essential for several reasons. First, it provides confidence that the empirical findings accurately reflect the proposed constructs. Second, empirically validated scales can be used directly in other studies in the field for different populations. They also yield valid tools to practitioners for assessment, benchmarking and longitudinal evaluation of their programmes (Flynn, et. al., 1994). A scale for a construct is useful for application by different researchers in different studies if it is statistically reliable and valid. Reliability allows the survey designer to determine the degree of systematic variance in the questionnaire, while validity allows the designer to, in a sense, label this systematic variance. A scale has construct validity if it is measuring the concept that it was intended to measure (Bagozzi and Phillips, 1982).

4.5.1 Unidimensionality analysis

Unidimensionality is a necessary condition for reliability analysis and construct validation (Anderson and Gerbing, 1991). Items in a unidimensional scale estimate one single construct. In the absence of unidimensionality, a single number cannot be used to represent the value of a scale (Venkatraman, 1989). A researcher can reduce the problems associated with unidimensionality by carefully selecting the items for scales. This may warrant removing those items from the scales that reduce the extent of unidimensionality. It is possible to identify groups of items (from correlations among them) on a multidimensional scale that represent different constructs, but have been forced into one single construct due to error or lack of conceptual clarity on the researcher's part. After the groups of items are split into distinct constructs, these new constructs are considered for subsequent analysis instead of the original one. Factor analysis can be used to assess the unidimensionality of a scale (Ahire, et. al., 1996).

4.5.2 Reliability analysis

Once the unidimensionality of the scales is established, an assessment of the statistical reliability is necessary before any further validation analysis can be performed. Reliability is the degree to which measurements are free from random errors. Reliability can be thought of as the relationship between the true underlying score and the observable score. Random error decreases the measurement's reliability, that is, as random error is introduced into measurement, the observed score is not a good reflection of the true underlying score. For one to feel confident that a questionnaire's scores accurately reflect the underlying dimension, the questionnaire must have a high reliability. Although many types of reliability exist, internal consistency reliability is vital to surveys.(Anastasi, 1988). There are several statistical indexes used to estimate the degree of internal consistency. One index is

Cronbach's coefficient Alpha. (Cronbach, 1951). Basically, this Alpha coefficient indicates the degree to which items are related to each other. This index can range from 0 to 1. Generally, a value of 0.6 or greater is an acceptable level of reliability (Nunnally, 1978). The other method and the most straightforward way is to calculate the correlation between two parts of a test by splitting the total number into two halves of equal length (Muller, 1996).

4.5.3 Validity analysis

Validity refers to the degree to which evidence supports the inferences made from scores derived from measurements, or the degree to which the scale measures what it is designed to measure. The methods for gathering evidence of validity can be grouped into 2 categories: Content validity and construct validity.

Content validity is concerned with the degree to which the items in the questionnaire are representative of a "defined universe" or "domain of content." The domain of content typically refers to all possible items that could have been used in the questionnaire. The goal of content validity is to have a set of items that best represents the defined universe. As suggested in the literature, the in-depth analysis of various referent disciplines to derive the list of items to measure the variables, the detailed evaluation/pretest by academic experts and real-world managers enabled us to establish content validity requirements (Churchill, 1979; Nunnally, 1978).

Construct validity is concerned with the questionnaire as a measurement of an underlying construct. A high degree of correlation between the questionnaire and other scales that measure the same constructs provides evidence of construct validity. This validity can also be evaluated by a low correlation between the questionnaire and other scales that measure a different construct. Construct validity could be established by assessing *convergent* and *discriminant validities.* Convergent validity is evaluated by using principal component factor analysis (PCA) on each predefined variable (Churchill, 1979) and discriminant validity is verified through a joint domain PCA (Kerlinger, 1978). In both cases, the three decision rules commonly employed for factor identification are: 1) minimum eigenvalue of 1, a minimum cumulative variance explained of 70 percent and scree test, 2) minimum factor loading of 0.4 for each indicator item, and 3) simplicity of factor structure (Nunnally, 1978).

4.6 Data collection

Because the focus of the study is on performance measurement at the plant level, empirical data for individual plants was necessary. The target population to be surveyed was made up of large, medium, and small companies from the list of *Expansion 500*, and medium Maquiladoras.

Identification of the target population required a comprehensive list of manufacturing plants in Mexico. A directory of the manufacturing plants based on their size was found which provided the firm name, address, telephone and fax number, number of employees, and the name of the top management. A similar directory was found for the Maquiladora industry. Based on the random test it was found that the directories did not contain reliable information concerning the names of the managers of the firms. There was a need to update the information in the directories. Each company was phoned and the list was updated. The non-trading and duplicated firms were excluded from the list.

4.6.1 Pre-test and pilot test of the Questionnaire

Prior to sending the main survey, a pretest of the questionnaire was conducted with experts in the academic community from both Mexico and UK to assure that the questionnaire would measure what it was suppose to measure and to achieve an acceptable mixture of number of questions and the length of the each question asked. The questionnaire was revised as often as necessary to establish the initial face validity.

After the initial face validity through the protesting of the questionnaire, it was pilot tested. The feedback was solicited with regard to the choices, clarity and phrasing of the questionnaire and the cover letter. The questionnaire was delivered personally to plant manager and quality managers of five selected companies. Minor changes were made to the wording of some of the questions. Other than those modifications, the respondents found the questionnaire suitable.

4.6.2 Distribution of the Questionnaires

The questionnaires with answering sheets in fax-mode type, and cover letters were sent by post to all the participants. Several questionnaires of the firms in the region of Nuevo Leon were delivered personally. Four weeks after the initial mailing, a reminder was faxed to non-respondents, and four weeks after the reminder faxes, a phone call was made to assure the reception of the questionnaires and to remind them of the responses.

4.7 Data Processing and Analysis

The empirical data used to evaluate the evidence for the impact of TQM, JIT, and WT on the performance is drawn from the experiences of a representative sample of large, medium, small, and Maquiladoras firms in Mexico. To test the overall fit, significance, direction and strength of these relationships requires an appropriate analysis methodology.

One characteristic which helps identify potentially useful methodologies is the use of observed measures acting as indicators of unobserved constructs. Constructs are latent variables, which means they cannot be measured directly (Ahire, Golhar, and Waller, 1996). For example, top management commitment to quality is a construct that cannot be measured directly. However, when top management is committed to quality, adequate resources will be allocated to quality improvement efforts. Thus, allocation of adequate resources to quality improvement efforts can be one of the manifestations of Top Management Commitment to quality. For a field study, each manifestation is measured with an item in a scale. The constructs in this study are elements which represent the respondents' perception of practices of Total Quality Management, Just-In-Time, Work Teams, and the degree of changes in performance of the organisations.

Hughes, et. al. (1986, p.128) state that: "One major shortcoming of research procedures arises from the fact that the bulk of research in management has addressed relationships between and among theoretical constructs that are not directly observable (e.g. labour productivity, employee satisfaction, management style, and motivation factors). As a consequence, if a test theory is desired, variables that can be observed must be found which are used as proxies for the unobservable constructs."

One way of selecting proxies for unobserved constructs is to use factor analysis, since factor analysis recommends variables most suitable as measuring devices for a construct (Nie, et. al., 1975). However, once the factor analysis is completed the analysis methodology still must be determined.

One possible methodology considered was multiple regression. Multiple regression depends on observed variables to evaluate associations between one dependent (criterion) variable and a set of multiple independent (predictor) variables (Draper and Smith, 1981). Since this study investigates the impact of a set of predictor variables on performance (criterion variables) which is being measured as a whole- a series of seven different variables, not as a single response- multiple regression methods were not suitable for this research. The method suitable for this type of studies is Canonical Correlation analysis which is a multivariate statistical model that facilitates the study of interrelationships among sets of multiple criterion (dependent) variables and multiple predictor (independent) variables. That is, whereas multiple regression predicts a single dependent variable from a set of multiple independent variables, canonical correlation predicts multiple dependent variables from multiple independent variables (Hair, et. al., 1986).

4.8 Summary

This chapter explains the data requirements of the study and describes how they are addressed. It also contains the research design, questionnaire design, reliability and validity tests, and data collection analysis.

CHAPTER 5

RESULTS AND FINDINGS

This chapter describes the results of the statistical analysis, and reviews the relationship of the constructs of TQM, WT, and JIT with the performance of the Mexican firms. Each research question will be answered in this section. The statistical methods used for this purpose such as reliability and validity analysis, Factor Analysis, Cattell's Salient group analysis, and Canonical Correlation analysis are described in Appendix 1.

5.1 Questionnaires

1.- Large companies:

The large companies were selected as having 500 or more employees. In total 230 questionnaires were sent to different manufacturing sectors of large companies in Mexico, from which 122 usable responses were gathered, giving a response rate of 53 percent.

The demographic characteristics of the participants can be found in Tables 5.1, 5.2, and 5.3:

Table 5.1: Industry description of the large companies

Industry Description	No. of Responses	% of responses
Electrodomestic products	8	6.56
Beverage	23	18.85
Steel	5	4.10
Fabricated metal products	9	7.38
Electrical and mechanical equipment	7	5.74
Auto parts	8	6.56
Mining and Cements	10	8.20
Synthetic fibres	7	5.74
Auto glass manufacturers	5	4.10
Miscellaneous manufacturing industries	40	32.79
Total	122	100.00

Table 5.2: Geography of the respondents for large companies

Geography of Respondents	No. of Responses	% of responses
Baja California (BC)	5	4.10
Coahuila (Coah)	4	3.28
D F and Estado de Mexico	14	11.48
Hidalgo (Hgo)	1	0.82
Jalisco (Jal)	6	4.92
Nuevo Leon (NL)	86	70.49
Puebla (Pue)	1	0.82
Queretaro (Quer)	1	0.82
San Luis Potosi (SLP)	2	1.64
Veracruz (Ver)	2	1.64
Total	122	100.00

Table 5.3: Position titles of the respondents for large companies

Respondents	No. of Responses	% of responses
Presidents	2	1.64
Plant Manager	47	38.53
Quality Manager	33	27.05
Others	40	32.79
Total	122	100.00

2.- Medium companies:

Medium companies were selected of having between 100 and 500 employees. In total 133 questionnaires were sent to different sectors of manufacturing industries of Mexico , from which 60 usable responses were gathered, giving a response rate of 45 percent.

The demographic characteristics of the participants can be found in Tables 5.4, 5.5, and 5.6:

Table 5.4: Industry description for medium companies

Industry Description	No. of Responses	% of responses
Electrodomestic products	2	3.33
Beverage	5	8.33
Fabricated metal products	6	10.00
Electrical and mechanical equipment	5	8.33
Auto parts	3	5.00
Mining and Cements	5	8.33
Auto glass manufacturers	3	5.00
Miscellaneous manufacturing industries	31	51.67
Total	60	100.00

Table 5.5: Geography of the respondents for medium companies

Geography of respondents	No. of Responses	% of responses
Baja California (BC)	4	6.67
Coahuila (Coah)	1	1.67
D.F.and Estado deMexico	7	11.67
Durango (Dgo)	2	3.33
Hidalgo (Hgo)	6	10.00
Jalisco (Jal)	2	3.33
Michoacan (Mich)	1	1.67
Nayarit (Nay)	2	3.33
Nuevo Leon (NL)	27	45.00
Oaxaca (Oax)	1	1.67
Puebla (Pue)	1	1.67
Sinaloa (Sin)	1	1.67
Tabasco (Tab)	1	1.67
Tamaulipas (Tamps)	2	3.33
Tlaxcala (Tlax)	2	3.33
Total	60	100.00

Table 5.6: Position titles of the respondents for medium companies

Respondents	No. of Responses	% of responses
Plant Manager	27	45.00
Quality Manager	21	35.00
Others	12	20.00
Total	60	100.00

3.- Small companies:

Small companies were selected of having less than 100 employees. In total 105 questionnaires were sent to different sectors of manufacturing industries of Mexico, from which 56 usable responses were gathered, giving a response rate of 53 percent.

The demographic characteristics of the participants can be found in Tables 5.7, 5.8, and 5.9:

Table 5.7: Industry description for small companies

Industry Description	No. of Responses	% of responses
Electrodomestic products	3	5.36
Fabricated metal products	9	16.07
Auto parts	6	10.71
Ceramics and Cements	6	10.71
Miscellaneous manufacturing industries	32	57.14
Total	56	100.00

Table 5.8: Geography of the respondents for small companies

Geography of respondents	No. of Responses	% of responses
Coahuila (Coah)	2	3.57
Chihuahua (Chih)	1	1.79
D.F and Estado de Mexico	3	5.36
Guanajuato (Gto)	2	3.57
Nayarit (Nay)	1	1.79
Nuevo Leon (NL)	42	75.00
Oaxaca (Oax)	1	1.79
Queretaro (Quer)	2	3.57
Sinaloa (Sin)	1	1.79
Veracruz (Ver)	1	1.79
Total	56	100.00

Table 5.9: Position titles of the respondents for small companies

Respondents	No. of Responses	% of responses
Plant Manager	35	62.50
Quality Manager	7	12.50
Others	14	25.00
Total	56	100.00

4.- Maquiladoras

The Maquiladoras were selected mostly from medium size manufacturing companies in Mexico. In total 175 questionnaires were sent to different sectors of Maquiladoras such as Electronic, Auto parts, and plastic products and 60 usable responses were gathered, giving a response rate of 34 percent.

The demographic characteristics of the participants can be found in Tables 5.10, and 5.11:

Table 5.10: Geography of the respondents for Maquiladoras

Geography of respondents	No. of Responses	% of responses
Baja California (BC)	5	8.33
Coahuila (Coah)	1	1.67
Nuevo Leon (NL)	38	63.33
Tamaulipas (Tamps)	16	26.67
Total	60	100.00

Table 5.11: Position titles of the respondents for Maquiladoras

Respondents	No. of Responses	% of responses
Plant Manager	18	30.00
Quality Manager	21	35.00
Others	21	35.00
Total	60	100.00

Responses to questions were entered onto a spreadsheet file using Microsoft Excel. The data contained in the file was in detailed form with the response to each questions for each plant separated by size, type, and respondent's name and position title. The data were 100% checked for completeness and reliability. This database is found in Appendix 3.

5.2 Reliability and Validity Results

Measurement analysis begins with assessing the instrument's reliability, or the ability of its scales to consistently yield the same response. Once a scale has been determined to be reliable, its validity can be assessed. Validity is a scale's ability to measure what it sets out to measure.

In this study, Factor Analysis was used to assess the unidimensionality of a scale (Ahire, Golhar, and Waller, 1996), and no problem with unidimensionality was found

In order to initially review the instrument's reliability, Coefficient Alpha was calculated for each scale which assesses the internal consistency of the scales (Cronbach, 1951). Although an Alpha value of 0.70 is often considered the criterion for internally consistent established scales , Nunnally (1978) states that permissible Alpha values can be lower for new scales, suggesting the use of a minimum Alpha value of 0.60. Because in this study we are concerned with new scales, we used a criterion Alpha value of 0.60.

SAS calculations provided the correlation matrix of responses which was used for calculation of Coefficient Alpha. The results of the Cronbach Coefficient Alpha the TQM, WT, and JIT constructs of the firms studied can be found in the Table 5.12.

Table 5.12: Cronbach Coefficient Alpha results for the constructs

	Large	Medium	Small	Maquiladora
TQM	0.9699	0.9627	0.9436	0.9665
WT	0.9157	0.8796	0.9162	0.9193
JIT	0.7524	0.6739	0.7664	0.7091

All of the scales were internally consistent, according to the criterion, meaning that data for measures are related to the same construct (Churchill, 1979). Alpha values ranged from a minimum of 0.67 (JIT for medium firms) to a maximum of 0.97 (TQM for large firms).

The questionnaire was pretested with experts in the academic community from both Mexico and UK and was revised several times to establish the initial face validity.

Additionally, the questionnaire was pilot tested with plant and quality managers of five selected companies and minor changes were made to the wording of some of the questions. This study, as a whole, demonstrates the content validity of the instruments used

Construct validity was established by the three decision rules commonly employed (Nunnally, 1978) for factor identification through principal component factor analysis, which are 1) minimum eigenvalue of 1, or a minimum cumulative variance explained of 70 percent, 2) minimum factor loading of 0.4 for each indicator item, and 3) simplicity of factor structure.

5.3 Factor Analysis Results

Factor Analysis was performed to find the solution that best fitted the correlation between observed variables (Kim, and Mueller, 1978). This characteristics enabled the number of variables for further research to be minimised while maximising the amount of information in the analysis. A reduced set of variables could then be used as operational representatives of the constructs underlying the complete set of variables (Gorsuch, 1974).

The Factor Analysis was conducted individually on each set of the three main groups of independent variables- Total Quality Management (TQM), Work Team (WT), and Just-In-Time (JIT)- to create an independent construct for each group. This procedure created an entirely new set of a smaller number of variables (factors) to replace the original set of variables for inclusion in subsequent Canonical Correlation Analysis. The SAS system was used to perform the Factor Analysis using Principal Component procedure including an Orthogonal Transformation with a Varimax Rotation.

The results of factor analysis will be presented next in the following sections for each company size and type, i.e., large, medium, small, and Maquiladora. Within each company size, the results are detailed for each of the three main groups of independent variables, i.e., TQM, WT, and JIT.

5.3.1 Large Companies

Total Quality Management (TQM)

The 47 TQM context measurement items were factor analysed using SAS. As shown in Table 5.13, nine distinct Varimax rotated factors were identified from the original 47 items. These 9 factors accounted for 70.99 percent of the total variance of the original items. All these 9 factors had an eigenvalue of 1.0 or higher. Eight items formed the first and the most significant factor (accounting for 43.75 percent of the variance of the original items, with an eigenvalue of 20.56); seven items formed the second significant factor (accounting for 5.34 percent of the variance of the original items, with an eigenvalue of 2.98); five items generated the third significant factor (accounting for 3.97 percent of the variance of the original items, with an eigenvalue of 1.86); five items formed the fourth significant factor (accounting for 3.62 percent of the variance of the original items, with an eigenvalue of 1.70); four items generated the fifth significant factor (accounting for 2.98 percent of the variance of the original items, with an eigenvalue of 1.40); four items formed the sixth significant factor (accounting for 2.84 percent of the variance of the original items, with an eigenvalue of 1.33); five items generated the seventh significant factor (accounting for 2.57 percent of the variance of the original items, with an eigenvalue of 1.21); three items formed the eighth significant factor (accounting for 2.53 percent of the variance of the original items, with an eigenvalue of 1.19); and four items generated the ninth significant factor (accounting for 2.39 percent of the variance of the original items, with an eigenvalue of 1.12). Two variables- 22, and 25- did not load on any single factor and were then not included for subsequent analysis.

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9699, showing a high degree of internal consistency.

Table 5.13: Factor Matrix for the TQM items of large companies

	Factor 1 Customer focus	Factor 2 Supplier relation and evaluation	Factor 3 Top manag. involv.	Factor 4 Quality policies	Factor 5 Problem solving	Factor 6 Benchmarking	Factor 7 Product evaluation	Factor 8 SPC	Factor 9 Strategic planning
Eigenvalue	20.56	2.98	1.86	1.70	1.40	1.33	1.21	1.19	1.12
Percent	43.75	6.34	3.97	3.62	2.98	2.84	2.57	2.53	2.39
Cum.Percent	43.75	50.09	54.06	57.68	60.66	63.50	66.07	68.60	70.99
Eigenvectors									
8	0.41								
18	0.42								
42	0.51								
43	0.67								
44	0.72								
45	0.66								
46	0.60								
47	0.73								
26		0.64							
33		0.44							
34		0.73							
35		0.71							
36		0.53							
37		0.66							
38		0.68							
1			0.80						
2			0.73						
3			0.70						
7			0.56						
10			0.53						
4				0.81					
5				0.76					
6				0.80					
31				0.55					
32				0.50					
11					0.57				
15					0.75				
16					0.64				
41					0.59				
17						0.51			
19						0.67			
20						0.70			
30						0.45			
27							0.64		
28							0.49		
29							0.44		
39							0.67		
40							0.60		
12								0.68	
13								0.59	
14								0.54	
9									0.40
21									0.45
23									0.68
24									0.40

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. A thorough search was made into the variables included in each factor, looking for common practices, and taking into account the sign and the size of each factor loading. These names are found in Table 5.14. These names constitute the description of the constructs of the TQM practices.

Table 5.14: TQM constructs for large companies

Factor	Description
1	Customer focus
2	Supplier relation and evaluation
3	Top management involvement
4	Quality policies
5	Problem solving and analysis
6	Benchmarking
7	Product evaluation
8	Statistical Process Control
9	Strategic planning

Work Teams (WT)

The fifteen WT context measurement items were factor analysed using SAS. As shown in Table 5.15, four distinct Varimax rotated factors were identified from the original 15 items. These 4 factors accounted for 70.86 percent of the total variance of the original items. Six items formed the first and the most significant factor (accounting for 48.00 percent of the variance of the original items, with an eigenvalue of 7.20); five variables generated the second significant factor (accounting for 10.11 percent of the variance of the original items, with an eigenvalue of 1.52); two variables formed the third significant factor (accounting for 5.46 percent of the variance of the original items, with an eigenvalue of 0.97); and two variables formed the fourth significant factor (accounting for 5.29 percent of the variance of the original items, with an eigenvalue of 0.68).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9157, showing a high degree of internal consistency.

Table 5.15: Factor Matrix for WT items of large companies

	Factor 1 Employee involvement	Factor 2 Training	Factor 3 Performance pay. in team.	Factor 4 Problem solv. in team
Eigen Value	7.20	1.52	0.97	0.68
Percent	48.00	10.11	6.46	6.29
Cum.Percent	48.00	58.11	64.57	70.86
Eigenvectors				
48	0.71			
49	0.74			
50	0.77			
51	0.78			
52	0.74			
53	0.60			
54		0.82		
55		0.66		
56		0.48		
61		0.77		
62		0.66		
59			0.89	
60			0.84	
57				0.92
58				0.43

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.16. These names constitute the description of the constructs of the WT practices.

Table 5.16: WT constructs for large companies

Factor	Description
1	Employee involvement
2	Training
3	Performance payment in teamwork
4	Problem solving in team

Just-In-Time (JIT)

The six JIT context measurement items were factor analysed using SAS. As shown in Table 5.17, three distinct Varimax rotated factors were identified from the original 6 items. These 3 factors accounted for 75.19 percent of the total variance of the original items. The third factor although did not have a eigenvalue of 1.0 or higher, was included in the analysis in order to reach a cumulative variance explained of higher than 70 percent of the original items. Two items formed the first and the most significant factor (accounting for 44.95 percent of the variance of the original items, with an eigenvalue of 2.70); Two items generated the second significant factor (accounting for 17.18 percent of the variance of the original items, with an eigenvalue of 1.03); and two variables formed the third significant factor (accounting for 13.06 percent of the variance of the original items, with an eigenvalue of 0.78).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.7524, showing a good degree of internal consistency.

Table 5.17: Factor Matrix for JIT items of large companies

	Factor 1 Lot size reduction	Factor 2 Setup time reduction	Factor 3 Inventory reduction
Eigen Value	2.70	1.03	0.78
Percent	44.95	17.18	13.06
Cum.Percent	44.95	62.13	75.19
Eigenvectors			
63	0.90		
64	0.77		
65		0.76	
66		0.88	
67			0.89
68			0.66

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.18. These names constitute the description of the constructs of the JIT practices.

Table 5.18: JIT constructs for large companies

Factor	Description
1	Lot size reduction
2	Setup time reduction
3	Inventory reduction

5.3.2 Medium Companies

Total Quality Management (TQM)

The 47 TQM context measurement items were factor analysed using SAS. As shown in Table 5.19, twelve distinct Varimax rotated factors were identified from the original 47 items.

Table 5.19: Factor Matrix for TQM items of medium companies

	Factor 1 SPC	Factor 2 Customer focus	Factor 3 Quality policies	Factor 4 Quality goals	Factor 5 Product evaluation	Factor 6 Top manag involv	Factor 7 Supplier relation	Factor 8 Problem solving	Factor 9 Benchmarking	Factor 10 Empower-ment	Factor 11 Quality costs	Factor 12 Feedback from clients
Eigen Value	18.47	3.52	2.61	2.12	1.72	1.61	1.47	1.39	1.31	1.15	1.09	1.03
Percent	39.30	7.48	5.56	4.51	3.67	3.43	3.13	2.96	2.78	2.44	2.31	2.19
Cum Percent	39.30	46.78	52.34	56.85	60.52	63.95	67.08	70.04	72.82	75.26	77.57	79.76
Eigenvectors												
1	0.64											
11	0.74											
12	0.67											
15	0.60											
16	0.62											
30	0.62											
32	0.64											
33	0.48											
34	0.48											
36	0.54											
37	0.44											
38	0.56											
43		0.62										
44		0.88										
45		0.88										
46		0.59										
47		0.75										
4			0.76									
5			0.91									
6			0.89									
22				0.40								
23				0.72								
24				0.42								
39				0.49								
41				0.63								
42				0.84								
27					0.49							
28					0.48							
29					0.66							
40					0.82							
2						0.61						
3						0.81						
25						0.67						
21							0.53					
26							0.62					
31							0.77					
35							0.53					
10								0.48				
18								0.68				
19								0.52				
9									0.62			
17									0.60			
20									0.88			
7										0.41		
8										0.87		
14											0.55	
13												-0.41

These 12 factors accounted for 79.76 percent of the total variance of the original items. All these 12 factors had an eigenvalue of 1.0 or higher. Eleven items formed the first and the most significant factor (accounting for 39.30 percent of the variance of the original items, with an eigenvalue of 18.47); five variables formed the second significant factor (accounting for 7.48 percent of the variance of the original items, with an eigenvalue of 3.52); three items generated the third significant factor (accounting for 5.56 percent of the variance of the original items, with an eigenvalue of 2.61); six items formed the fourth significant factor (accounting for 4.51 percent of the variance of the original items, with an eigenvalue of 2.12); four variables generated the fifth significant factor (accounting for 3.67 percent of the variance of the original items, with an eigenvalue of 1.72); three items formed the sixth significant factor (accounting for 3.43 percent of the variance of the original items, with an eigenvalue of 1.61); four variables generated the seventh significant factor (accounting for 3.13 percent of the variance of the original items, with an eigenvalue of 1.47); three items formed the eighth significant factor (accounting for 2.96 percent of the variance of the original items, with an eigenvalue of 1.39); three items generated the ninth significant factor (accounting for 2.78 percent of the variance of the original items, with an eigenvalue of 1.31); two variables formed the tenth significant factor (accounting for 2.44 percent of the variance of the original items, with an eigenvalue of 1.15); one variable generated the eleventh significant factor (accounting for 2.31 percent of the variance of the original items, with an eigenvalue of 1.09); and one item generated the twelfth significant factor (accounting for 2.19 percent of the variance of the original items, with an eigenvalue of 1.03).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9627, showing a high degree of internal consistency.

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. A thorough search was made into the variables included in each factor, looking for common practices, and taking into account the sign and the size of each factor loading. These names are found in Table 5.20. These names constitute the description of the constructs of the TQM practices.

Table 5.20: TQM constructs for medium companies

Factor	Description
1	Statistical Process Control
2	Customer focus
3	Quality policies
4	Quality goals based on customer's requirements
5	Product evaluation
6	Top management involvement
7	Supplier relation and evaluation
8	Problem solving and analysis
9	Benchmarking
10	Empowerment
11	Quality costs
12	Feedback from clients

Work Teams (WT)

The fifteen WT context measurement items were factor analysed using SAS. As shown in Table 5.21, five distinct Varimax rotated factors were identified from the original 15 items. These 5 factors accounted for 75.67 percent of the total variance of the original items. Five items formed the first and the most significant factor (accounting for 40.47 percent of the variance of the original items, with an eigenvalue of 5.07); two variables generated the second significant factor (accounting for 12.97 percent of the variance of the original items, with an eigenvalue of 1.95); two variables formed the third significant factor (accounting for 8.09 percent of the variance of the original items, with an eigenvalue of 1.21); three items generated the fourth significant factor (accounting for 7.26 percent of the variance of the original items, with an eigenvalue of 1.09); and three variables generated the fifth significant factor (accounting for 6.88 percent of the variance of the original items, with an eigenvalue of 1.03).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.8796, showing a high degree of internal consistency.

Table 5.21: Factor Matrix for WT items of medium companies

	Factor 1 Employee involvement	Factor 2 Performance payment	Factor 3 Problem solving	Factor 4 Training	Factor 5 Communication
Eigen Value	6.07	1.95	1.21	1.09	1.03
Percent	40.47	12.97	8.09	7.26	6.88
Cum.Percent	40.47	53.44	61.53	68.79	75.67
Eigenvectors					
48	0.73				
49	0.86				
50	0.81				
51	0.68				
52	0.47				
53	0.67				
54	0.41				
56		0.40			
59		0.89			
60		0.83			
53			0.53		
54			0.47		
57			0.83		
61			0.65		
51				0.40	
54				0.60	
55				0.83	
62				0.68	
52					0.63
56					0.46
58					0.82

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.22. These names constitute the description of the constructs of the WT practices.

Table 5.22: WT constructs for medium companies

Factor	Description
1	Employee involvement
2	Performance payment in teamwork
3	Problem solving in team
4	Training
5	Communication between Top management and employees

Just-In-Time (JIT)

The six JIT context measurement items were factor analysed using SAS. As shown in Table 5.23, three distinct Varimax rotated factors were identified from the original 6 items. These 3 factors accounted for 75.56 percent of the total variance of the original items. The third factor had a eigenvalue of 0.98 which was close enough to 1.00 and was accepted. Three items formed the first and the most significant factor (accounting for 40.19 percent of the variance of the original items, with an eigenvalue of 2.41); Two items generated the second significant factor (accounting for 19.07 percent of the variance of the original items, with an eigenvalue of 1.14); and one variable formed the third significant factor (accounting for 16.30 percent of the variance of the original items, with an eigenvalue of 0.98).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.6739, showing a minimum acceptable degree of internal consistency.

Table 5.23: Factor Matrix for JIT items of medium companies

	Factor 1 Lot size reduction	Factor 2 Inventory reduction	Factor 3 Setup time reduction
Eigen Value	2.41	1.14	0.98
Percent	40.19	19.07	16.3
Cum.Percent	40.19	59.26	75.56
Eigenvectors			
63	0.70		
64	0.84		
65	0.85		
63		0.41	
67		0.70	
68		0.84	
66			0.88
67			0.52

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.24. These names constitute the description of the constructs of the JIT practices.

Table 5.24: JIT constructs for medium companies

Factor	Description
1	Lot size reduction
2	Inventory reduction
3	Setup time reduction

5.3.3 Small Companies

Total Quality Management (TQM)

The 47 TQM context measurement items were factor analysed using SAS. As shown in Table 5.25, twelve distinct Varimax rotated factors were identified from the original 47 items. These 12 factors accounted for 79.70 percent of the total variance of the original items. All these 12 factors had an eigenvalue of 1.0 or higher. Six items formed the first and the most significant factor (accounting for 30.98 percent of the variance of the original items, with an eigenvalue of 14.56); six variables formed the second significant factor (accounting for 9.06 percent of the variance of the original items, with an eigenvalue of 4.26); three items generated the third significant factor (accounting for 6.60 percent of the variance of the original items, with an eigenvalue of 3.10); four variables generated the fourth significant factor (accounting for 5.43 percent of the variance of the original items, with an eigenvalue of 2.55); two items formed the fifth significant factor (accounting for 5.15 percent of the variance of the original items, with an eigenvalue of 2.42); four items generated the sixth significant factor (accounting for 4.29 percent of the variance of the original items, with an eigenvalue of 2.02); four variables formed the seventh significant factor (accounting for 4.06 percent of the variance of the original items, with an eigenvalue of 1.91); two items generated the eighth significant factor (accounting for 3.73 percent of the variance of the original items, with an eigenvalue of 1.75); four items formed the ninth significant factor (accounting for 2.92 percent of the variance of the original items, with an eigenvalue of 1.37); three variables generated the tenth significant factor (accounting for 2.76 percent of the variance of the original items, with an eigenvalue of 1.30); five variables formed the eleventh significant factor (accounting for 2.47 percent of the variance of the original items, with an eigenvalue of 1.16); and three items formed the twelfth significant factor (accounting for 2.25 percent of the variance of the original items, with an eigenvalue of 1.06). Variable 33 did not load on any single factor and was then not included for subsequent analysis.

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9436, showing a high degree of internal consistency.

Table 5.25: Factor Matrix for TQM items of small companies

	Factor 1 Top manag involvement	Factor 2 Customer focus	Factor 3 Quality policies	Factor 4 Quality eval & inspect.	Factor 5 Problem solving	Factor 6 Quality assurance	Factor 7 Quality planning	Factor 8 Quality document	Factor 9 Supplier relation	Factor 10 SPC	Factor 11 Benchmarking	Factor 12 Product evaluation
Eigen Value	14 56	4.26	3 10	2 55	2.42	2.02	1.91	1.75	1.37	1.30	1 16	1 06
Percent	30 98	9 06	6 60	5 43	5.15	4.29	4 06	3.73	2.92	2 76	2 47	2 25
Cum Percent	30 98	40 04	46 64	52 07	57.22	61 51	65 57	69.30	72 22	74.98	77 45	79 70
Eigenvectors												
1	0 61											
2	0 81											
3	0.70											
18	0.54											
21	0 60											
24	0 55											
34		0 49										
42		0.81										
43		0 65										
44		0.82										
45		0 69										
47		0 45										
4			0 91									
5			0 96									
6			0 95									
30				0 66								
31				0 81								
39				0.84								
41				0 60								
15					0.84							
16					0 74							
7						0.65						
23						0.55						
25						0.70						
36						0 73						
13							0.50					
22							0 72					
27							0.57					
28							0 76					
37								0.80				
38								0 81				
8									0 71			
14									0.66			
26									0.75			
35									0 51			
10										0 49		
11										0 84		
12										0 80		
9											0 57	
19											0 72	
20											0 41	
32											0 50	
46											0 56	
17												0 53
29												0 58
40												0 72

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. A thorough search was made into the variables included in each factor, looking for common practices, and taking into account the sign and the size of each factor loading. These names are found in Table 5.26. These names constitute the description of the constructs of the TQM practices.

Table 5.26: TQM constructs for small companies

Factor	Description
1	Top management involvement
2	Customer focus
3	Quality policies
4	Quality evaluation and inspection
5	Problem Solving and Analysis
6	Quality assurance and improvement
7	Quality planning
8	Quality documentation
9	Supplier relation and evaluation
10	Statistical Process Control
11	Benchmarking
12	Product evaluation

<u>Work Teams (WT)</u>

The fifteen WT context measurement items were factor analysed using SAS. As shown in Table 5.27, four distinct Varimax rotated factors were identified from the original 15 items. These 4 factors accounted for 71.07 percent of the total variance of the original items. Seven items formed the first and the most significant factor (accounting for 47.06 percent of the variance of the original items, with an eigenvalue of 7.06); three variables generated the second significant factor (accounting for 10.03 percent of the variance of the original items, with an eigenvalue of 1.50); three items formed the third significant factor (accounting for 7.15 percent of the variance of the original items, with an eigenvalue of 1.07); and two items generated the fourth significant factor (accounting for 6.83 percent of the variance of the original items, with an eigenvalue of 1.02).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9162, showing a high degree of internal consistency.

Table 5.27: Factor Matrix for WT items of small companies

	Factor 1 Employee involvement	Factor 2 Training	Factor 3 Problem solving	Factor 4 Performance payment
Eigen Value	7.06	1.50	1.07	1.02
Percent	47.06	10.03	7.15	6.83
Cum.Percent	47.06	57.09	64.24	71.07
Eigenvectors				
48	0.64			
49	0.49			
50	0.70			
51	0.73			
52	0.79			
53	0.81			
56	0.64			
54		0.78		
61		0.71		
62		0.77		
55			0.76	
57			0.73	
58			0.52	
59				0.85
60				0.90

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.28. These names constitute the description of the constructs of the WT practices.

Table 5.28: WT constructs for small companies

Factor	Description
1	Employee involvement
2	Training
3	Problem solving in team
4	Performance payment in teamwork

Just-In-Time (JIT)

The six JIT context measurement items were factor analysed using SAS. As shown in Table 5.29, three distinct Varimax rotated factors were identified from the original 6 items. The second and third factors although did not have eigenvalues of 1.0 or higher, were included in the analysis in order to reach a cumulative variance explained of higher than 70 percent of the original items. These 3 factors accounted for 77.10 percent of the total variance of the original items. Three items formed the first and the most significant factor (accounting for 47.68 percent of the variance of the original items, with an eigenvalue of 2.86); Two items generated the second significant factor (accounting for 16.44 percent of the variance of the original items, with an eigenvalue of 0.99); and one variable formed the third significant factor (accounting for 12.98 percent of the variance of the original items, with an eigenvalue of 0.78).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.7664, showing a good degree of internal consistency.

Table 5.29: Factor Matrix for JIT items of small companies

	Factor 1 Lot size reduction	Factor 2 Inventory reduction	Factor 3 Setup time reduction
Eigen Value	2.86	0.99	0.78
Percent	47.68	16.44	12.98
Cum.Percent	47.68	64.12	77.1
Eigenvectors			
63	0.75		
64	0.88		
65	0.80		
67		0.64	
68		0.90	
66			0.92

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.30. These names constitute the description of the constructs of the JIT practices.

Table 5.30: JIT constructs for small companies

Factor	Description
1	Lot size reduction
2	Inventory reduction
3	Setup time reduction

5.3.4 Maquiladoras

Total Quality Management (TQM)

The 47 TQM context measurement items were factor analysed using SAS. As shown in Table 5.31, ten distinct Varimax rotated factors were identified from the original 47 items.

Table 5.31: Factor Matrix for TQM items of Maquiladoras

	Factor 1 Problem solving	Factor 2 Customer focus	Factor 3 Quality evaluation	Factor 4 Quality policies	Factor 5 Top manag involv.	Factor 6 Quality eval & ins	Factor 7 Employee interaction	Factor 8 Product evaluation	Factor 9 SPC	Factor 10 Benchmarking
Eigen Value	19.60	3.26	2.60	2.07	1.96	1.66	1.52	1.30	1.20	1.11
Percent	41.70	6.94	5.53	4.40	4.16	3.54	3.24	2.77	2.56	2.36
Cum.Percent	41.70	48.64	54.17	58.57	62.73	66.27	69.51	72.28	74.84	77.20
Eigenvectors										
11	0.56									
15	0.73									
16	0.72									
17	0.57									
18	0.69									
23	0.70									
24	0.60									
26	0.59									
37	0.77									
38	0.75									
41	0.62									
13		0.62								
27		0.44								
43		0.69								
44		0.85								
45		0.51								
47		0.56								
25			0.62							
28			0.45							
35			0.55							
36			0.57							
39			0.76							
4				0.87						
5				0.84						
6				0.87						
21				0.44						
1					0.77					
2					0.60					
3					0.52					
7					0.48					
8					0.46					
9					0.60					
19						0.53				
30						0.59				
31						0.77				
32						0.53				
42						0.42				
29							0.75			
46							0.66			
22								0.53		
33								0.40		
34								0.69		
40								0.72		
12									0.62	
14									0.50	
10										0.51
20										0.75

These 10 factors accounted for 77.20 percent of the total variance of the original items. All these 10 factors had an eigenvalue of 1.0 or higher. Eleven items formed the first and the most significant factor (accounting for 41.70 percent of the variance of the original items, with an eigenvalue of 19.60); six variables formed the second significant factor (accounting for 6.94 percent of the variance of the original items, with an eigenvalue of 3.26); five items generated the third significant factor (accounting for 5.53 percent of the variance of the original items, with an eigenvalue of 2.60); four variables formed the fourth significant factor (accounting for 4.40 percent of the variance of the original items, with an eigenvalue of 2.07); six items generated the fifth significant factor (accounting for 4.16 percent of the variance of the original items, with an eigenvalue of 1.96); five variables generated the sixth significant factor (accounting for 6.54 percent of the variance of the original items, with an eigenvalue of 1.66); two items formed the seventh significant factor (accounting for 3.24 percent of the variance of the original items, with an eigenvalue of 1.52); four variables formed the eighth significant factor (accounting for 2.77 percent of the variance of the original items, with an eigenvalue of 1.30); two items generated the ninth significant factor (accounting for 2.56 percent of the variance of the original items, with an eigenvalue of 1.20); and two variables formed the tenth significant factor (accounting for 2.36 percent of the variance of the original items, with an eigenvalue of 1.11).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9665, showing a high degree of internal consistency.

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. A thorough search was made into the variables included in each factor, looking for common practices, and taking into account the sign and the size of each factor loading. These names are found in Table 5.32. These names constitute the description of the constructs of the TQM practices.

Table 5.32: TQM constructs for Maquiladoras

Factor	Description
1	Problem solving and analysis
2	Customer focus
3	Quality evaluation during design
4	Quality policies
5	Top management involvement
6	Quality evaluation and inspection
7	Employee interaction with customers
8	Product evaluation
9	Statistical Process Control
10	Benchmarking

Work Teams (WT)

The fifteen WT context measurement items were factor analysed using SAS. As shown in Table 5.33, four distinct Varimax rotated factors were identified from the original 15 items. These 4 factors accounted for 71.95 percent of the total variance of the original items. Six items formed the first and the most significant factor (accounting for 48.76 percent of the variance of the original items, with an eigenvalue of 7.31); four variables generated the second significant factor (accounting for 9.21 percent of the variance of the original items, with an eigenvalue of 1.38); three items formed the third significant factor (accounting for 8.26 percent of the variance of the original items, with an eigenvalue of 1.24); and two items generated the fourth significant factor (accounting for 5.72 percent of the variance of the original items, with an eigenvalue of 0.86). The fourth factor although had an eigenvalue less than 1.0, was included in the analysis order to accomplish an cumulative variance explained of above 70 percent.

The reliability Coefficient Cronbach's Alpha was obtained to be 0.9193, showing a high degree of internal consistency.

Table 5.33: Factor Matrix for WT items of Maquiladoras

	Factor 1 Employee involvement	Factor 2 Problem solving	Factor 3 Training	Factor 4 Performance payment
Eigen Value	7.31	1.38	1.24	0.86
Percent	48.76	9.21	8.26	5.72
Cum.Percent	48.76	57.97	66.23	71.95
Eigenvectors				
48	0.63			
49	0.75			
50	0.47			
51	0.74			
52	0.72			
53	0.86			
56		0.55		
57		0.79		
58		0.47		
62		0.67		
54			0.64	
55			0.81	
61			0.66	
59				0.87
60				0.76

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.34. These names constitute the description of the constructs of the WT practices.

Table 5.34: WT constructs for Maquiladoras

Factor	Description
1	Employee involvement
2	Problem solving in team
3	Training
4	Performance payment in teamwork

Just-In-Time (JIT)

The six JIT context measurement items were factor analysed using SAS. As shown in Table 5.35, three distinct Varimax rotated factors were identified from the original 6 items. The third factor although did not have an eigenvalue of 1.0 or higher, was included in the analysis in order to reach a cumulative variance explained of higher than 70 percent of the original items. These 3 factors accounted for 76.47 percent of the total variance of the original items. Three items formed the first and the most significant factor (accounting for 41.89 percent of the variance of the original items, with an eigenvalue of 2.51); Two items generated the second significant factor (accounting for 18.96 percent of the variance of the original items, with an eigenvalue of 1.14); and one variable formed the third significant factor (accounting for 12.62 percent of the variance of the original items, with an eigenvalue of 0.94).

The reliability Coefficient Cronbach's Alpha was obtained to be 0.7091, showing a good degree of internal consistency.

Table 5.35: Factor Matrix for JIT items of Maquiladoras

	Factor 1 lot size reduction	Factor 2 Inventory reduction	Factor 3 Setup time reduction
Eigen Value	2.51	1.14	0.94
Percent	41.89	18.96	15.62
Cum.Percent	41.89	60.85	76.47
Eigenvectors			
63	0.61		
64	0.85		
65	0.84		
67		0.85	
68		0.79	
66			0.89

A name was assigned to each factor taking into account that stronger loadings have higher influence in the naming process. These names are found in Table 5.36. These names constitute the description of the constructs of the JIT practices.

Table 5.36: JIT constructs for Maquiladoras

Factor	Description
1	Lot size reduction
2	Inventory reduction
3	Setup time reduction

5.4 Research Question One

The questionnaire designed to gather information about the type of practices that the manufacturing companies in Mexico concentrate on. Factor Analysis was performed on the questionnaire to address research question one stated below:

R1.- What are the TQM, WT, and JIT practices which Mexican large, medium, small, and Maquiladora firms concentrate on ?

The information gathered and factor analysed from a large sample of large, medium, small, and Maquiladora companies from various parts of Mexico. Tables 5.37, 5.38, and 5.39 give the information on TQM, WT, and JIT practices of large, medium, small, and Maquiladora firms in order of the most significant factors to least significant in terms of their explained variance (Var.)

Table 5.37: Practices of TQM

Large(70.99%)		Medium(79.76%)		Small (79.70%)		Maquiladoras(77.20%)	
Var.	Constructs	Var.	Constructs	Var.	Constructs	Var.	Constructs
43.75	Customer focus	39.30	Problem solving and analysis	30.98	Top management involvemen	41.7	Problem solving and analysis
6.34	Supplier relation and evaluation	7.48	Customer focus	9.06	Customer focus	6.94	Customer focus
3.97	Top management involvemen	5.56	Quality policies	6.60	Quality policies	5.53	Quality evaluation during design
3.62	Quality policies	4.51	Quality goals based on customer's requirements	5.43	Quality evaluation and inspection	4.40	Quality policies
2.98	Problem solving and analysis	3.67	Product evaluation	5.15	Problem Solving and Analysis	4.16	Top management involvemen
2.84	Benchmarking	3.43	Top management involvemen	4.29	Quality assurance and improvement	3.54	Quality evaluation and inspection
2.57	Product evaluation	3.13	Supplier relation and evaluation	4.06	Quality planning	3.24	Employee interaction with customers
2.53	Statistical Process Control	2.96	Statistical Process Control	3.73	Quality documentation	2.77	Product evaluation
2.39	Strategic planning	2.78	Benchmarking	2.92	Supplier relation and evaluation	2.56	Statistical Process Control
		2.44	Empowerment	2.78	Statistical Process Control	2.36	Benchmarking
		2.31	Quality costs	2.47	Benchmarking		
		2.19	Feedback from clients	2.25	Product evaluation		

Table 5.37 gives the TQM constructs for of large, medium, small, and Maquiladora firms. As can be seen, top management involvement, customer focus, quality policies, and problem solving and analysis are among the most significant practices- judged by the amount of variance explained- that firms utilise. These practices are common in companies in spite of the differences in their size or type.

Table 5.38: Practices of WT

Large (70 86%)		Medium (75 67%)		Small (71 07%)		Maquiladoras (71 95%)	
Var.	Constructs	Var.	Constructs	Var.	Constructs	Var.	Constructs
48 00	Employee involvement	40 47	Employee involvement	47.06	Employee involvement	48 76	Employee involvement
10 11	Training	12.97	Performance payment in teamwork	10.03	Training	9 21	Problem solving in team
6 46	Performance payment in teamwork	8 09	Problem solving in team	7 15	Problem solving in team	8 26	Training
6 29	Problem solving in team	7.26	Training	6 83	Performance payment in teamwork	6 72	Performance payment in teamwork
		6 88	Communication between Top management and employees				

Table 5.38 gives the WT constructs for large, medium, small, and Maquiladora firms. As can be seen, employee involvement, training, problem solving in teams, and performance payment in teamwork are among the most significant practices that the firms utilise independently of their size or type. Communication between top management and employees was found to be the least significant factor in medium firms and was a practice that was not used by other firms.

Table 5.39: Practices of JIT

Large (75.19%)		Medium (75.56%)		Small (77.10%)		Maquiladoras (76 47%)	
Var.	Constructs	Var.	Constructs	Var.	Constructs	Var.	Constructs
44 95	Lot size reduction	40 19	Lot size reduction	47 68	Lot size reduction	41 89	Lot size reduction
17 18	Setup time reduction	19 07	Inventory reduction	16 44	Inventory reduction	18.98	Inventory reduction
13.06	Inventory reduction	16 30	Setup time reduction	12 98	Setup time reduction	15 62	Setup time reduction

Table 5.39 gives the JIT constructs for large, medium, small, and Maquiladora firms. Lot size reduction, inventory reduction, and setup time reduction -in this order- are the practices that are used by the firms. The order of the last two factors changes for the large companies, but the difference in the variance explained by these factors, is very small. This assumes that the companies independently of their size or type utilise the same JIT practices.

5.5 Results of the comparison among groups

In this section we will examine whether differences among large, medium, small, and Maquiladora firms. This comparison involve the *pattern* of the correlations between variables and factors, or both the *pattern and magnitude* of the correlations between them.

The comparison is performed for each TQM, WT, and JIT construct of large, medium, small, and Maquiladora firms. All the constructs were found through similar procedures employed at the various stages of analysis with the data sets to be compared.

Same variables - 47 for TQM, 15 for WT, and 6 for JIT-were included during data collection. Similar procedures for handling missing data and outliers were employed. Factor Analysis using Principal Component procedure including an Orthogonal Transformation with a Varimax Rotation was utilised for generating the factors.

After the data set was factor analysed, a careful inspection of the loading matrices for both groups revealed similarities in factor structure. Although the same label was used to name factors , there was not an obvious difference in overall structure, and the same variables loaded highly on the different factors for different firms, it was decided to use a formal statistical procedure for the comparison among groups. This procedure was applied only to the TQM constructs of the large, medium, small, and Maquiladora firms, since there was almost no doubt about the similarities of the practices of WT and JIT of firms of different sizes and types.

Most of the more formal numerical comparisons are performed on either the loading matrix or the pattern matrix. The magnitude of loadings may be influenced by extraneous features of data collection (such as homogeneity of a sample for factors being compared). *Cattell's salient similarity index, s,* is sensitive to pattern of loadings, while the *Pearson correlation Coefficient, r,* is sensitive to both pattern and magnitude of loadings.

By inspecting the loadings and the labels assigned to each factor, a list of TQM factors for different firms was made for further examination in detail using the *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r*. Table 5.40 gives the list of TQM factors that will be examined for similarity.

Table 5.40: TQM factors to be examined for similarity

Large S Medium		Large S Small		Large VS Maquil		Medium S Small		Medium S Maquil.		Small VS Maquil.	
1	2	1	2	1	2	2	2	2	2	2	2
2	11	2	9	3	5	7	9	6	5	11	10
3	6	5	5	4	4	9	11	3	4	10	9
4	3	6	11	6	10	1	10	9	10	12	8
5	1	8	10	8	9	5	12	1	9	1	5
6	9	9	1	7	8	1	5	5	8	5	1
2	7	7	12	5	1	3	3	1	1	3	4
8	1	3	1			6	1	11	3	4	6
7	5	4	3			8	5				
		7	7								

5.5.1 Similarities between large and medium firms

Nine factors between large and small firms were analysed using *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r*:

The results of the Cattell's salient similarity index is found in Table 5.41 giving the significance level of the comparison analysis among different factors between large and medium companies.

Table 5.41: Cattell's salient similarity index for TQM factors between large and medium companies

Medium (Fact 2)

		PS	HP	NS
	PS	5	6	0
Large	HP	3	33	0
Fact 1	NS	0	0	0

s = 0.526
Hyperplane count 70%
at 0 significant level indicates a relationship

Medium (Fact 3)

		PS	HP	NS
	PS	3	3	0
Large	HP	2	39	0
Fact 4	NS	0	0	0

s = 0 545
Hyperplane count 83%
at 0 significant level indicates a relationship

Medium (Fact 7)

		PS	HP	NS
	PS	3	6	0
Large	HP	2	36	0
Fact 2	NS	0	0	0

s = 0 429
Hyperplane count 77%
at 123 significant level indicates a relationship

Medium (Fact 11)

		PS	HP	NS
	PS	2	7	0
Large	HP		38	0
Fact 2	NS	0	0	0

s = 0.364
Hyperplane count 81%
at .0035 significant level indicates a relationship

Medium (Fact 1)

		PS	HP	NS
	PS	3	2	0
Large	HP	9	33	0
Fact 5	NS	0	0	0

s = 0.353
Hyperplane count 70%
at .004 significant level indicates a relationship

Medium (Fact 1)

		PS	HP	NS
	PS	1	3	0
Large	HP	11	32	0
Fact 8	NS	0	0	0

s = 0 125
Hyperplane count 68%
at .123 significant level indicates a relationship

Medium (Fact 6)

		PS	HP	NS
	PS	2	3	0
Large	HP	2	40	0
Fact 3	NS	0	0	0

s = 0 444
Hyperplane count 85%
at 0006 significant level indicates a relationship

Medium (Fact 9)

		PS	HP	NS
	PS	2	3	0
Large	HP	1	41	0
Fact 6	NS	0	0	0

s = 0 5
Hyperplane count 87%
at 0 significant level indicates a relationship

Medium (Fact 5)

		PS	HP	NS
	PS	4	1	0
Large	HP	1	41	0
Fact 7	NS	0	0	0

s = 0 8
Hyperplane count 87%
at 0 significant level indicates a relationship

The Table 5.42 gives the summary of the Cattell's salient index and Pearson correlation study of the similarity of the TQM constructs between the large and medium firms:

Table 5.42: Summary of the comparison of TQM factors between large and medium companies

Large	S	Medium	Pearson r	Cattell s	Hyper plane	Signif. Level
1		2	0.6516	0.53	70%	0.00%
2		11	0.4244	0.36	81%	0.35%
3		6	0.5093	0.44	85%	0.06%
4		3	0.6277	0.55	83%	0.00%
5		1	0.3738	0.35	70%	0.40%
6		9	0.5602	0.50	87%	0.00%
2		7	0.2279	0.43	77%	0.08%
8		1	0.0487	0.13	68%	12.3%
7		5	0.6866	0.80	87%	0.00%

By examining the Pearson's r correlation and the significance level for Cattell's salient index s, for the factors between large and medium companies, some factors found to be statistically similar between them. In particular TQM factors 1, 2,3,4,5,6,7, and 8 of large companies are statistically similar to TQM factors 2,7,6,3,1,9,5, and 8 of medium companies correspondingly.

Table 5.43 reviews the summary of the TQM factors found to be similar between large and medium companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.43: Similar TQM factors between large and medium companies

TQM constructs			
Large		Medium	
Factors	Var.	Factors	Var.
1	43.75	2	7.48
2	6.34	7	3.13
3	3.97	6	3.43
4	3.62	3	5.56
5	2.98	1	39.30
6	2.84	9	2.78
7	2.57	5	3.67
8	2.53	8	2.96
Total	68.60	Total	68.31

As can be seen from the Table 5.43, 68.60 percent of total variance of the original variables of TQM practices of the large companies (representing 96.6 percent of cumulative variance explained of 70.99 percent) is explained by 68.31 percent of the total variance of TQM practices of the original variables of the medium companies (representing 85.6 percent of cumulative variance explained of 79.76 percent). It can be concluded that, large and medium firms practice the same TQM constructs.

By examining the factor loadings and labels assigned to WT and JIT constructs between large and medium companies, Table 5.44 was constructed. This table demonstrates the similar WT and JIT factors for both large and medium companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.44: Similar WT and JIT factors between large and medium companies

WT constructs				JIT constructs			
Large		Medium		Large		Medium	
Factors	Var.	Factors	Var.	Factors	Var.	Factors	Var.
1	48.00	1	40.47	1	44.95	1	40.19
2	10.11	4	7.26	2	17.18	3	16.30
3	6.46	2	12.97	3	13.06	2	19.07
4	6.29	3	8.09				
Total	70.86	Total	68.79	Total	75.19	Total	75.56

As can be seen from the Table 5.44, 70.86 percent of total variance of the original variables of WT practices of the large companies (representing 100 percent of cumulative variance explained of 70.86 percent) is explained by 68.79 percent of the total variance of WT practices of the original variables of the medium companies (representing 90.91 percent of cumulative variance explained of 75.67 percent). Similarly 75.19 percent of total variance of the original variables of JIT practices of the large companies (representing 100 percent of cumulative variance explained of 75.19 percent) is explained by 75.56 percent of the total variance of JIT practices of the original variables of the medium companies (representing 100 percent of cumulative variance explained of 75.56 percent). It can be concluded that , large and medium firms practice the same WT, and JIT constructs.

5.5.2 Similarities between large and small firms

Ten factors between large and small firms were analysed using *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r:*

The results of the Cattell's salient similarity index is found in Table 5.45 giving the significance level of the comparison analysis among different factors between large and small companies.

Table 5.45: Cattell's salient similarity index for TQM factors between large and small companies

Small (Fact 2)

		PS	HP	NS
	PS	6	5	0
Large	HP	3	33	0
Fact 1	NS	0	0	0

s = 0.6

Hyperplane count 70%
at 0 significant level indicates a relationship

Small (Fact 1)

		PS	HP	NS
	PS	2	3	0
Large	HP	6	36	0
Fact 9	NS	0	0	0

s = 0.308

Hyperplane count 77%
at .006 significant level indicates a relationship

Small (Fact 9)

		PS	HP	NS
	PS	4	5	0
Large	HP	1	37	0
Fact 2	NS	0	0	0

s = 0.571

Hyperplane count 79%
at 0 significant level indicates a relationship

Small (Fact 12)

		PS	HP	NS
	PS	2	3	0
Large	HP	2	40	0
Fact 7	NS	0	0	0

s = 0.444

Hyperplane count 85%
at .0005 significant level indicates a relationship

Small (Fact 5)

		PS	HP	NS
	PS	2	4	0
Large	HP	2	39	0
Fact 5	NS	0	0	0

s = 0.4

Hyperplane count 83%
at .0015 significant level indicates a relationship

Small (Fact 1)

		PS	HP	NS
	PS	4	1	0
Large	HP	4	38	0
Fact 3	NS	0	0	0

s = 0.615

Hyperplane count 81%
at 0 significant level indicates a relationship

Small (Fact 11)

		PS	HP	NS
	PS	3	2	0
Large	HP	2	40	0
Fact 6	NS	0	0	0

s = 0.6

Hyperplane count 85%
at 0 significant level indicates a relationship

Small (Fact 3)

		PS	HP	NS
	PS	3	3	0
Large	HP	0	41	0
Fact 4	NS	0	0	0

s = 0.667

Hyperplane count 87%
at 0 significant level indicates a relationship

Small (Fact 10)

		PS	HP	NS
	PS	1	3	0
Large	HP	2	41	0
Fact 8	NS	0	0	0

s = 0.286

Hyperplane count 87%
at .0108 significant level indicates a relationship

Small (Fact 7)

		PS	HP	NS
	PS	2	3	0
Large	HP	3	39	0
Fact 7	NS	0	0	0

s = 0.4

Hyperplane count 83%
at .0015 significant level indicates a relationship

The Table 5.46 gives the summary of the Cattell's salient index and Pearson correlation study of the similarity of the TQM constructs between the large and small firms:

Table 5.46: Summary of the comparison of TQM factors between large and small companies

Large	S	Small	Pearson r	Cattell s	Hyper plane	Signif. Level
1		2	0.59	0.60	70%	0.00%
2		9	0.34	0.57	79%	0.00%
5		5	0.53	0.40	83%	0.15%
6		11	0.54	0.60	85%	0.00%
8		10	0.42	0.29	87%	1.08%
9		1	0.27	0.31	77%	0.60%
7		12	0.36	0.44	85%	0.05%
3		1	0.50	0.62	81%	0.00%
4		3	0.70	0.67	87%	0.00%
7		7	0.45	0.40	83%	0.15%

By examining the Pearson's r correlation and the significance level for Cattell's salient index s, for the factors between large and small companies, some factors found to be statistically similar between them. In particular TQM factors 1,2,3,4,5,6,7, and 8 of large companies were found to be similar to TQM factors 2,9,1,3,5,11,12, and 10 of small companies correspondingly.

Table 5.47 reviews the summary of the TQM factors found to be similar between large and small companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.47: Similar TQM factors between large and small companies

TQM constructs			
Large		Small	
Factors	Var.	Factors	Var.
1	43.75	2	9.06
2	6.34	9	2.92
3	3.97	1	30.98
4	3.62	3	6.60
5	2.98	5	5.15
6	2.84	11	2.47
7	2.57	12	2.25
8	2.53	10	2.76
Total	68.60	Total	62.19

Table 5.47 shows that 68.60 percent of total variance of the original variables of TQM practices of the large companies (representing 96.6 percent of cumulative variance explained of 70.99 percent) is explained by 62.19 percent of the total variance of TQM practices of the original variables of the small companies (representing 78.03 percent of cumulative variance explained of 79.70 percent). It can be concluded that, large and small firms practice the same TQM constructs.

By examining the factor loadings and labels assigned to WT and JIT constructs between large and small companies, Table 5.48 was constructed to analyse the similarities between them. This table demonstrates the similar WT and JIT factors for both large and small companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.48: Similar WT and JIT factors between large and small companies

WT constructs				JIT constructs			
Large		Small		Large		Small	
Factors	Var.	Factors	Var.	Factors	Var.	Factors	Var.
1	48.00	1	47.06	1	44.95	1	47.68
2	10.11	2	10.03	2	17.18	3	12.98
3	6.46	4	6.83	3	13.06	2	16.44
4	6.29	3	7.15				
Total	70.86	Total	71.07	Total	75.19	Total	77.10

As can be seen from the Table 5.48, 70.86 percent of total variance of the original variables of WT practices of the large companies (representing 100 percent of cumulative variance explained of 70.86 percent) is explained by 71.07 percent of the total variance of WT practices of the original variables of the small companies (representing 100 percent of cumulative variance explained of 71.07 percent). Similarly 75.19 percent of total variance of the original variables of JIT practices of the large companies (representing 100 percent of cumulative variance explained of 75.19 percent) is explained by 77.10 percent of the total variance of JIT practices of the original variables of the small companies (representing 100 percent of cumulative variance explained of 77.10 percent). It can be concluded that, large and small firms practice the same WT, and JIT constructs.

5.5.3 Similarities between large and Maquiladora firms

Seven factors between large and Maquiladora firms were analysed using *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r*:

The results of the Cattell's salient similarity index is found in Table 5.49 giving the significance level of the comparison analysis among different factors between large and Maquiladora companies

Table 5.49: Cattell's salient index for TQM factors between large and Maquiladora companies

Maquil. (Fact 2)

		PS	HP	NS
	PS	4	7	0
Large	HP	4	32	0
Fact 1	NS	0	0	0

s = 0.421

Hyperplane count 68%

at .0009 significant level indicates a relationship

Maquil. (Fact 10)

		PS	HP	NS
	PS	1	4	0
Large	HP	2	40	0
Fact 6	NS	0	0	0

s = 0.25

Hyperplane count 85%

at .024 significant level indicates a relationship

Maquil. (Fact 5)

		PS	HP	NS
	PS	4	1	0
Large	HP	2	40	0
Fact 3	NS	0	0	0

s = 0.727

Hyperplane count 85%

at 0 significant level indicates a relationship

Maquil. (Fact 9)

		PS	HP	NS
	PS	2	2	0
Large	HP	1	42	0
Fact 8	NS	0	0	0

s = 0.571

Hyperplane count 89%

at 0 significant level indicates a relationship

Maquil (Fact 4)

		PS	HP	NS
	PS	4	2	0
Large	HP	0	41	0
Fact 4	NS	0	0	0

s = 0.8

Hyperplane count 87%

at 0 significant level indicates a relationship

Maquil. (Fact 1)

		PS	HP	NS
	PS	5	0	0
Large	HP	11	31	0
Fact 5	NS	0	0	0

s = 0.476

Hyperplane count 66%

at 0 significant level indicates a relationship

Maquil. (Fact 8)

		PS	HP	NS
	PS	1	4	0
Large	HP	4	38	0
Fact 7	NS	0	0	0

s = 0.2

Hyperplane count 81%

at 0 .036 significant level indicates a relationship

The Table 5.50 gives the summary of the Cattell's salient index and Pearson correlation study of the similarity of the TQM constructs between the large and Maquiladora firms:

Table 5.50: Summary of the comparison of TQM factors between large and Maquiladora companies

Large	S Maquil.	Pearson r	Cattell s	Hyper plane	Signif. Level
1	2	0.57	0.42	68%	0.09%
3	5	0.63	0.73	85%	0.00%
4	4	0.68	0.80	87%	0.00%
6	10	0.35	0.25	85%	2.40%
8	9	0.52	0.57	89%	0.00%
7	8	0.41	0.20	81%	3.60%
5	1	0.58	0.48	66%	0.00%

By examining the Pearson's r correlation and the significance level for Cattell's salient index s, for the factors between large and Maquiladora companies, some factors found to be statistically similar between them. In particular TQM factors 1,3,4,5,6,7, and 8 of large companies were found to be similar to TQM factors 2,5,4,1,10,8, and 9 of Maquiladora companies correspondingly.

Table 5.51 reviews the summary of the TQM factors found to be similar between large and Maquiladora companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.51: Similar TQM factors between large and Maquiladora companies

TQM constructs			
Large		Maquiladora	
Factors	Var.	Factors	Var.
1	43.75	2	6.94
3	3.97	5	4.16
4	3.62	4	4.40
5	2.98	1	41.7
6	2.84	10	2.36
7	2.57	8	2.77
8	2.53	9	2.56
Total	62.26	Total	64.89

Table 5.51 shows that 62.26 percent of total variance of the original variables of TQM practices of the large companies (representing 87.7 percent of cumulative variance explained of 70.99 percent) is explained by 64.89 percent of the total variance of TQM practices of the original variables of the Maquiladora companies (representing 84.05 percent of cumulative variance explained of 77.20 percent). It can be concluded that, large and Maquiladora firms practice the same TQM constructs.

By examining the factor loadings and labels assigned to WT and JIT constructs between large and Maquiladora companies, Table 5.52 was constructed to analyse the similarities between them. This table demonstrates the similar WT and JIT factors for both large and Maquiladora companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.52: Similar WT and JIT factors between large and Maquiladora companies

WT constructs				JIT constructs			
Large		Maquiladora		Large		Maquiladora	
Factors	Var.	Factors	Var.	Factors	Var.	Factors	Var.
1	48.00	1	48.76	1	44.95	1	41.89
2	10.11	3	8.26	2	17.18	3	15.62
3	6.46	4	5.72	3	13.06	2	18.96
4	6.29	2	9.21				
Total	70.86	Total	71.95	Total	75.19	Total	76.47

Table 5.52 shows that 70.86 percent of total variance of the original variables of WT practices of the large companies (representing 100 percent of cumulative variance explained of 70.86 percent) is explained by 71.95 percent of the total variance of WT practices of the original variables of the Maquiladora companies (representing 100 percent of cumulative variance explained of 71.95 percent). Similarly 75.19 percent of total variance of the original variables of JIT practices of the large companies (representing 100 percent of cumulative variance explained of 75.19 percent) is explained by 76.47 percent of the total variance of JIT practices of the original variables of the Maquiladora companies (representing 100 percent of cumulative variance explained of 76.47 percent). It can be concluded that, large and Maquiladora firms practice the same WT, and JIT constructs.

5.5.4 Similarities between medium and small firms

Six factors between medium and small firms were analysed using *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r:*

The results of the Cattell's salient similarity index is found in Table 5.53 giving the significance level of the comparison analysis among different factors between medium and small companies.

Table 5.53: Cattell's salient index for TQM factors between medium and small companies

Small (Fact 2)

Medium Fact 2	PS	HP	NS
PS	5	3	0
HP	4	35	0
NS	0	0	0

s = 0.588

Hyperplane count 74%

at 0 significant level indicates a relationship

Small (Fact 10)

Medium Fact 1	PS	HP	NS
PS	2	10	0
HP	1	34	0
NS	0	0	0

s = 0.267

Hyperplane count 72%

at .018 significant level indicates a relationship

Small (Fact 3)

Medium Fact 3	PS	HP	NS
PS	3	3	0
HP	0	41	0
NS	0	0	0

s = 0.667

Hyperplane count 87%

at 0 significant level indicates a relationship

Small (Fact 9)

Medium Fact 7	PS	HP	NS
PS	3	2	0
HP	1	41	0
NS	0	0	0

s = 0.667

Hyperplane count 87%

at 0 significant level indicates a relationship

Small (Fact 12)

Medium Fact 5	PS	HP	NS
PS	2	3	0
HP	1	41	0
NS	0	0	0

s = 0.5

Hyperplane count 87%

at 0 significant level indicates a relationship

Small (Fact 1)

Medium Fact 6	PS	HP	NS
PS	2	2	0
HP	6	37	0
NS	0	0	0

s = 0.333

Hyperplane count 79%

at .005 significant level indicates a relationship

Small (Fact 11)

Medium Fact 9	PS	HP	NS
PS	2	1	0
HP	3	41	0
NS	0	0	0

s = 0.5

Hyperplane count 87%

at 0 significant level indicates a relationship

Small (Fact 5)

Medium Fact 1	PS	HP	NS
PS	2	10	0
HP	2	32	0
NS	0	1	0

s = 0.235

Hyperplane count 68%

at .035 significant level indicates a relationship

Small (Fact 5)

Medium Fact 8	PS	HP	NS
PS	2	3	0
HP	2	40	0
NS	0	0	0

s = 0.444

Hyperplane count 85%

at .0007 significant level indicates a relationship

The Table 5.54 gives the summary of the Cattell's salient index and Pearson correlation study of the similarity of the TQM constructs between the medium and small firms:

Table 5.54: Summary of the comparison of TQM factors between medium and small companies

Medium	S	Small	Pearson r	Cattell s	Hyper plane	Signif. Level
2		2	0.53	0.59	74%	0.00%
7		9	0.20	0.67	87%	0.00%
9		11	0.30	0.50	87%	0.00%
1		10	0.45	0.27	72%	1.80%
5		12	0.50	0.50	87%	0.00%
1		5	0.39	0.24	68%	3.50%
3		3	0.77	0.67	87%	0.00%
6		1	0.56	0.33	79%	0.50%
8		5	0.40	0.44	85%	0.07%

By examining the Pearson's r correlation and the significance level for Cattell's salient index s, for the factors between medium and small companies, some factors found to be statistically similar between them. In particular TQM factors 1,2,3,5,6,7, 8 and 9 of medium companies were found to be similar to TQM factors 5,2,3,12,1,9,10, and 11 of small companies correspondingly.

Table 5.55 reviews the summary of the TQM factors found to be similar between medium and small companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.55: Similar TQM factors between medium and small companies

TQM constructs			
Medium		Small	
Factors	Var.	Factors	Var.
1	39.30	5	5.15
2	7.48	2	9.06
3	5.56	3	6.60
5	3.67	12	2.25
6	3.43	1	30.98
7	3.13	9	2.92
8	2.96	10	2.76
9	2.78	11	2.47
Total	68.31	Total	62.19

Table 5.55 shows that 68.31 percent of total variance of the original variables of TQM practices of the medium companies (representing 85.6 percent of cumulative variance explained of 79.76 percent) is explained by 62.19 percent of the total variance of TQM practices of the original variables of the small companies (representing 80.6 percent of cumulative variance explained of 77.20 percent). It can be concluded that, medium and small firms practice the same TQM constructs.

By examining the factor loadings and labels assigned to WT and JIT constructs between medium and small companies, Table 5.56 was constructed to analyse the similarities between them. This table demonstrates the similar WT and JIT factors for both medium and small companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.56: Similar WT and JIT factors between medium and small companies

WT constructs				JIT constructs			
Medium		Small		Medium		Small	
Factors	Var.	Factors	Var.	Factors	Var.	Factors	Var.
1	40.47	1	47.06	1	40.19	1	47.68
2	12.97	4	6.83	2	19.07	2	16.44
3	8.09	3	7.15	3	16.30	3	12.98
4	7.26	2	10.03				
Total	68.79	Total	71.07	Total	75.56	Total	77.10

Table 5.56 shows that 68.79 percent of total variance of the original variables of WT practices of the medium companies (representing 90.9 percent of cumulative variance explained of 75.67 percent) is explained by 71.07 percent of the total variance of WT practices of the original variables of the small companies (representing 100 percent of cumulative variance explained of 71.07 percent). Similarly 75.56 percent of total variance of the original variables of JIT practices of the medium companies (representing 100 percent of cumulative variance explained of 75.56 percent) is explained by 77.10 percent of the total variance of JIT practices of the original variables of the small companies (representing 100 percent of cumulative variance explained of 77.1 percent). It can be concluded that, medium and small firms practice the same WT, and JIT constructs.

5.5.5 Similarities between medium and Maquiladora firms

Eight factors between medium and Maquiladora firms were analysed using *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r*:

The results of the Cattell's salient similarity index is found in Table 5.57 giving the significance level of the comparison analysis among different factors between medium and Maquiladora companies.

Table 5.57: Cattell's salient index for TQM factors between medium and Maquiladora companies

Medium Fact 2 × Maquil. (Fact 2) — s = 0.625

	PS	HP	NS
PS	5	3	0
HP	3	36	0
NS	0	0	0

Hyperplane count 77%
at 0 significant level indicates a relationship

Medium Fact 1 × Maquil. (Fact 9) — s = 0.267

	PS	HP	NS
PS	2	10	0
HP	1	34	0
NS	0	0	0

Hyperplane count 72%
at .018 significant level indicates a relationship

Medium Fact 6 × Maquil. (Fact 5) — s = 0.4

	PS	HP	NS
PS	2	2	0
HP	4	39	0
NS	0	0	0

Hyperplane count 83%
at .001 significant level indicates a relationship

Medium Fact 5 × Maquil. (Fact 8) — s = 0.444

	PS	HP	NS
PS	2	3	0
HP	2	40	0
NS	0	0	0

Hyperplane count 85%
at .0005 significant level indicates a relationship

Medium Fact 3 × Maquil. (Fact 4) — s = 0.6

	PS	HP	NS
PS	3	3	0
HP	1	40	0
NS	0	0	0

Hyperplane count 85%
at 0 significant level indicates a relationship

Medium Fact 1 × Maquil. (Fact 1) — s = 0.429

	PS	HP	NS
PS	6	6	0
HP	10	25	0
NS	0	0	0

Hyperplane count 53%
at .0005 significant level indicates a relationship

Medium Fact 9 × Maquil. (Fact 10) — s = 0.333

	PS	HP	NS
PS	1	2	0
HP	2	42	0
NS	0	0	0

Hyperplane count 89%
at .01 significant level indicates a relationship

Medium Fact 11 × Maquil. (Fact 3) — s = 0.182

	PS	HP	NS
PS	1	1	0
HP	8	37	0
NS	0	0	0

Hyperplane count 79%
at .0678 significant level indicates a relationship

The Table 5.58 gives the summary of the Cattell's salient index and Pearson correlation study of the similarity of the TQM constructs between the medium and Maquiladora firms:

Table 5.58: Summary of the comparison of TQM factors between medium and Maquiladora companies

Medium S	Maquil.	Pearson r	Cattell s	Hyper plane	Signif. Level
2	2	0.61	0.63	77%	0.00%
6	5	0.35	0.40	83%	0.10%
3	4	0.64	0.60	85%	0.00%
9	10	0.42	0.33	89%	1.00%
1	9	0.42	0.27	72%	1.80%
5	8	0.45	0.44	85%	0.05%
1	1	0.31	0.43	53%	0.05%
11	3	0.34	0.18	79%	6.78%

By examining the Pearson's r correlation and the significance level for Cattell's salient index s, for the factors between medium and Maquiladora companies, some factors found to be statistically similar between them. In particular TQM factors 1,2,3,5,6,8, and 9 of medium companies were found to be similar to TQM factors 1,2,4,8,5,9, and 10 of Maquiladora companies correspondingly.

Table 5.59 reviews the summary of the TQM factors found to be similar between medium and Maquiladora companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.59: Similar TQM factors between medium and Maquiladora companies

TQM constructs			
Medium		Maquiladora	
Factors	Var.	Factors	Var.
1	39.30	1	41.7
2	7.48	2	6.94
3	5.56	4	4.40
5	3.67	8	2.77
6	3.43	5	4.16
8	2.96	9	2.56
9	2.78	10	2.36
Total	65.18	Total	64.89

Table 5.59 shows that 65.18 percent of total variance of the original variables of TQM practices of the medium companies (representing 81.7 percent of cumulative variance explained of 79.76 percent) is explained by 64.89 percent of the total variance of TQM practices of the original variables of the Maquiladora companies (representing 84.05 percent of cumulative variance explained of 77.20 percent). It can be concluded that, medium and Maquiladora firms practice the same TQM constructs.

By examining the factor loadings and labels assigned to WT and JIT constructs between medium and Maquiladora companies, Table 5.60 was constructed to analyse the similarities between them. This table demonstrates the similar WT and JIT factors for both medium and Maquiladora companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.60: Similar WT and JIT factors between medium and Maquiladora companies

WT constructs				JIT constructs			
Medium		Maquiladora		Medium		Maquiladora	
Factors	Var.	Factors	Var.	Factors	Var.	Factors	Var.
1	40.47	1	48.76	1	40.19	1	41.89
2	12.97	4	5.72	2	19.07	2	18.96
3	8.09	2	9.21	3	16.30	3	15.62
4	7.26	3	8.26				
Total	68.79	Total	71.95	Total	75.56	Total	76.47

Table 5.60 shows that 68.79 percent of total variance of the original variables of WT practices of the medium companies (representing 90.91 percent of cumulative variance explained of 75.67 percent) is explained by 71.95 percent of the total variance of WT practices of the original variables of the Maquiladora companies (representing 100 percent of cumulative variance explained of 71.95 percent). Similarly 75.56 percent of total variance of the original variables of JIT practices of the medium companies (representing 100 percent of cumulative variance explained of 75.56 percent) is explained by 76.47 percent of the total variance of JIT practices of the original variables of the Maquiladora companies (representing 100 percent of cumulative variance explained of 76.47 percent). It can be concluded that, medium and Maquiladora firms practice the same WT, and JIT constructs.

5.5.6 Similarities between small and Maquiladora firms

Eight factors between small and Maquiladora firms were analysed using *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r*:

The results of the Cattell's salient similarity index is found in Table 5.61 giving the significance level of the comparison analysis among different factors between small and Maquiladora companies.

Table 5.61: Cattell's salient index for TQM factors between small and Maquiladora companies

Maquil. (Fact 2)

		PS	HP	NS
	PS	5	4	0
Small	HP	3	35	0
Fact 2	NS	0	0	0

s = 0.588

Hyperplane count 74%

at 0 significant level indicates a relationship

Maquil. (Fact 4)

		PS	HP	NS
	PS	3	0	0
Small	HP	1	43	0
Fact 3	NS	0	0	0

s = 0.857

Hyperplane count 91%

at 0 significant level indicates a relationship

Maquil. (Fact 10)

		PS	HP	NS
	PS	1	4	0
Small	HP	2	40	0
Fact 11	NS	0	0	0

s = 0.25

Hyperplane count 85%

at .014 significant level indicates a relationship

Maquil. (Fact 5)

		PS	HP	NS
	PS	3	5	0
Small	HP	3	36	0
Fact 1	NS	0	0	0

s = 0.429

Hyperplane count 77%

at .0007 significant level indicates a relationship

Maquil. (Fact 9)

		PS	HP	NS
	PS	1	2	0
Small	HP	1	43	0
Fact 10	NS	0	0	0

s = 0.4

Hyperplane count 91%

at 0 significant level indicates a relationship

Maquil. (Fact 1)

		PS	HP	NS
	PS	2	2	0
Small	HP	14	29	0
Fact 5	NS	0	0	0

s = 0.2

Hyperplane count 62%

at .061 significant level indicates a relationship

Maquil. (Fact 8)

		PS	HP	NS
	PS	2	2	0
Small	HP	3	40	0
Fact 12	NS	0	0	0

s = 0.444

Hyperplane count 85%

at .0005 significant level indicates a relationship

Maquil. (Fact 6)

		PS	HP	NS
	PS	3	3	0
Small	HP	3	38	0
Fact 4	NS	0	0	0

s = 0.5

Hyperplane count 81%

at 0 significant level indicates a relationship

The Table 5.62 gives the summary of the Cattell's salient index and Pearson correlation study of the similarity of the TQM constructs between the small and Maquiladora firms:

Table 5.62: Summary of the comparison of TQM factors between small and Maquiladora companies

Small	VS Maquil.	Pearson r	Cattell s	Hyper plane	Signif. Level
2	2	0.56	0.59	74%	0.00%
11	10	0.37	0.25	85%	1.40%
10	9	0.52	0.40	91%	0.00%
12	8	0.22	0.44	85%	0.05%
1	5	0.38	0.43	77%	0.07%
5	1	0.37	0.20	62%	6.10%
3	4	0.80	0.86	91%	0.00%
4	6	0.4943	0.50	81%	0.00%

By examining the Pearson's r correlation and the significance level for Cattell's salient index s, for the factors between small and Maquiladora companies, some factors found to be statistically similar between them. In particular TQM factors 1,2,3,4,5,10,11, and 12 of small companies were found to be similar to TQM factors 5,2,4,6,1,9,10, and 8 of Maquiladora companies correspondingly.

Table 5.63 reviews the summary of the TQM factors found to be similar between small and Maquiladora companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.63: Similar TQM factors between small and Maquiladora companies

TQM constructs			
Small		Maquiladora	
Factors	Var.	Factors	Var.
1	30.98	5	4.16
2	9.06	2	6.94
3	6.60	4	4.40
4	5.43	6	3.54
5	5.15	1	41.7
10	2.76	9	2.56
11	2.47	10	2.36
12	2.25	8	2.77
Total	64.70	Total	68 43

Table 5.63 shows that 64.7 percent of total variance of the original variables of TQM practices of the small companies (representing 81.18 percent of cumulative variance explained of 79.70 percent) is explained by 68.43 percent of the total variance of TQM practices of the original variables of the Maquiladora companies (representing 88.64 percent of cumulative variance explained of 77.20 percent). It can be concluded that, small and Maquiladora firms practice the same TQM constructs.

By examining the factor loadings and labels assigned to WT and JIT constructs between small and Maquiladora companies, Table 5.64 was constructed to analyse the similarities between them. This table demonstrates the similar WT and JIT factors for both small and Maquiladora companies and their corresponding explained variances (Var) as found in the factor analysis.

Table 5.64: Similar WT and JIT factors between small and Maquiladora companies

WT constructs				JIT constructs			
Small		Maquiladora		Small		Maquiladora	
Factors	Var.	Factors	Var.	Factors	Var.	Factors	Var.
1	47.06	1	48.76	1	47.68	1	41.89
2	10.03	3	8.26	2	16.44	2	18.96
3	7.15	2	9.21	3	12.98	3	15.62
4	6.83	4	5.72				
Total	71.07	Total	71.95	Total	77.10	Total	76.47

Table 5.64 shows that 71.07 percent of total variance of the original variables of WT practices of the small companies (representing 100 percent of cumulative variance explained of 71.07 percent) is explained by 71.95 percent of the total variance of WT practices of the original variables of the Maquiladora companies (representing 100 percent of cumulative variance explained of 71.95 percent). Similarly 75.1 percent of total variance of the original variables of JIT practices of the small companies (representing 100 percent of cumulative variance explained of 75.10 percent) is explained by 76.47 percent of the total variance of JIT practices of the original variables of the Maquiladora companies (representing 100 percent of cumulative variance explained of 76.47 percent). It can be concluded that, small and Maquiladora firms practice the same WT, and JIT constructs.

5.6 Research Question Two

Using the TQM, WT, and JIT practices found in Mexican industries through factor analysis in the this chapter, a *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient, r* was performed to address the following research question:

R2.- Are there any differences in TQM, WT, and JIT practices among large, medium, small, and Maquiladora industries in Mexico?

The analysis of the differences and similarities included a detailed study of pattern and magnitude of the loadings of TQM, WT, and JIT among large, medium, small, and Maquiladora firms. This meant that for most factors of each construct, each firm was compared to other firms. An initial list of possible similar factors of different constructs for each firm was constructed, and using the information on factor loadings from the earlier factor analysis, a *Cattell's salient similarity index, s,* and *Pearson correlation Coefficient,* *r* was performed. The final results of this comparison study are found in Tables, 5.65, 5.66, and 5.67. These tables demonstrate the similar factors for large, medium, small, and Maquiladora companies and the explained variances (Var), and Cumulative variances (Cum.Var.) as found in the corresponding factor analysis.

Table 5.65: Similar and different practices of TQM constructs

	Description	Large			Medium			Small			Maquiladora		
		Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.
S	Customer focus	1	43.75	43.75	2	7.48	7.48	2	9.06	9.06	2	6.94	6.94
I	Supplier relation and evaluation	2	6.34	50.09	7	3.13	10.61	9	2.92	11.98	-	0	6.94
M	Top management involvement	3	3.97	54.06	6	3.43	14.04	1	30.98	42.96	5	4.16	11.10
I	Quality policies	4	3.62	57.68	3	5.56	19.60	3	6.60	49.56	4	4.40	15.50
L	Problem solving and analysis	5	2.98	60.66	1	39.30	58.90	5	5.15	54.71	1	41.7	57.20
A	Benchmarking	6	2.84	63.50	9	2.78	61.68	11	2.47	57.18	10	2.36	59.56
R	Product evaluation	7	2.57	66.07	5	3.67	65.35	12	2.25	59.43	8	2.77	62.33
	Statistical Process Control	8	2.53	68.60	8	2.96	68.31	10	2.76	62.19	9	2.56	64.89
	Strategic planning	9	2.39	2.39									
D	Quality goals based on customer's requirements				4	4.51	4.51						
I	Empowerment				10	2.44	6.95						
F	Quality costs				11	2.31	9.26						
F	Feedback from clients				12	2.19	11.45						
E	Quality evaluation and inspection							4	5.43	5.43	6	3.54	3.54
R	Quality assurance and improvement							6	4.29	9.72			
E	Quality planning							7	4.06	13.78			
N	Quality documentation							8	3.73	17.51			
T	Quality evaluation during design										3	5.53	9.07
	Employee interaction with customers										7	3.24	12.31

Table 5.65 shows that for TQM practices, 68.60 percent of total variance of the original variables in large companies is explained by 68.31 percent of total variance of the original variables in medium firms, by 62.19 percent of total variance of the original variables in small companies, and by 64.89 percent of total variance of the original variables of the Maquiladora firms.

This information is shown in a different manner in Figure 5.1 which represents the variance of similar TQM factors as a percentage of the cumulative variance explained. This means that 96.6 percent of the cumulative variance explained of 70.99 percent of the original variables (represented by 68.6 percent of the total variance) of TQM factors for large companies is explained by 85.6 percent of the cumulative variance explained of 79.76 percent of the original variables (represented by 68.31 percent of the total variance) of TQM factors for medium companies is explained by 78 percent of the cumulative variance explained of 79.7 percent of the original variables (represented by 62.19 percent of the total variance) of TQM factors for small companies is explained by 84.1 percent of the cumulative variance explained of 77.2 percent of the original variables (represented by 64.89 percent of the total variance) of the TQM factors for Maquiladora companies.

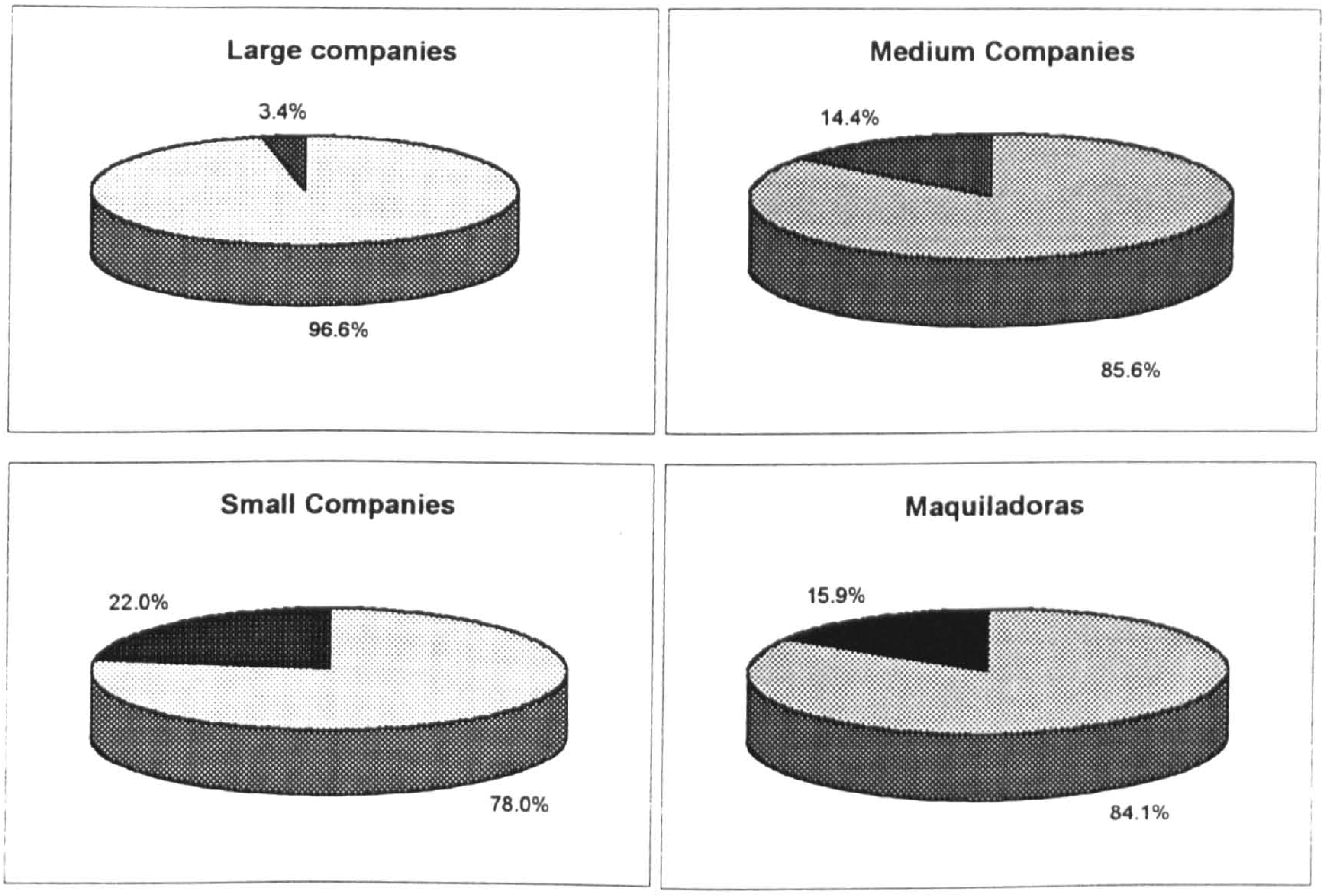


Figure 5.1: Variance of similar TQM factors as a percentage of the cumulative variance explained

This means that the size of the firm does not affect the TQM practices being most employed in the companies. The common TQM practices are: customer focus, supplier relation and evaluation (except for Maquiladoras), top management involvement, quality policies, problem solving and analysis, benchmarking, product evaluation, and statistical process control.

There are several practices which are not common among the firms, and change according the size of the company. These differences represent a small proportion of the total variance explained by their original variables.

Table 5.66: Similar and different practices of WT constructs

Description	Large			Medium			Small			Maquiladora		
	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.	Factors	Var.	Cum Var.
Employee involvement	1	48 00	48 00	1	40.47	40 47	1	47 06	47 06	1	48 76	48 76
Training	2	10.11	58 11	4	7.26	47.73	2	10.03	57.09	3	8.26	57 02
Performance payment in teamwork	3	6.46	64 57	2	12 97	60 70	4	6 83	63 92	4	5 72	62 74
Problem solving in team	4	6 29	70 86	3	8 09	68 79	3	7 15	71 07	2	9 21	71 95
Communication between Top management and employees				5	6 88	6 88						

Table 5.66 shows that for WT practices, 70.86 percent of total variance of the original variables in large companies is explained by 68.79 percent of total variance of the original variables in medium firms, by 71.07 percent of total variance of the original variables in small companies, and by 71.95 percent of total variance of the original variables of the Maquiladora firms. This means that the size of the firm does not affect the WT practices being most employed in the companies. The common WT practices are: employee involvement, training, performance payment in team work, and problem solving in team.

Only medium companies practice the additional factor- Communication between top management and employees- which was not found in other companies.

This information is shown in Figure 5.2 which represents the variance of similar WT factors as a percentage of the cumulative variance explained. This means that 100 percent of the cumulative variance explained of 70.86 percent of the original variables (represented by 70.86 percent of the total variance) of WT factors for large companies is explained by 90.91 percent of the cumulative variance explained of 75.67 percent of the original variables (represented by 68.79 percent of the total variance) of WT factors for medium companies is explained by 100 percent of the cumulative variance explained of 71.07 percent of the original variables (represented by 71.07 percent of the total variance) of WT factors for small companies is explained by 100 percent of the cumulative variance explained of 71.95 percent of the original variables (represented by 71.95 percent of the total variance) of the WT factors for Maquiladora companies.

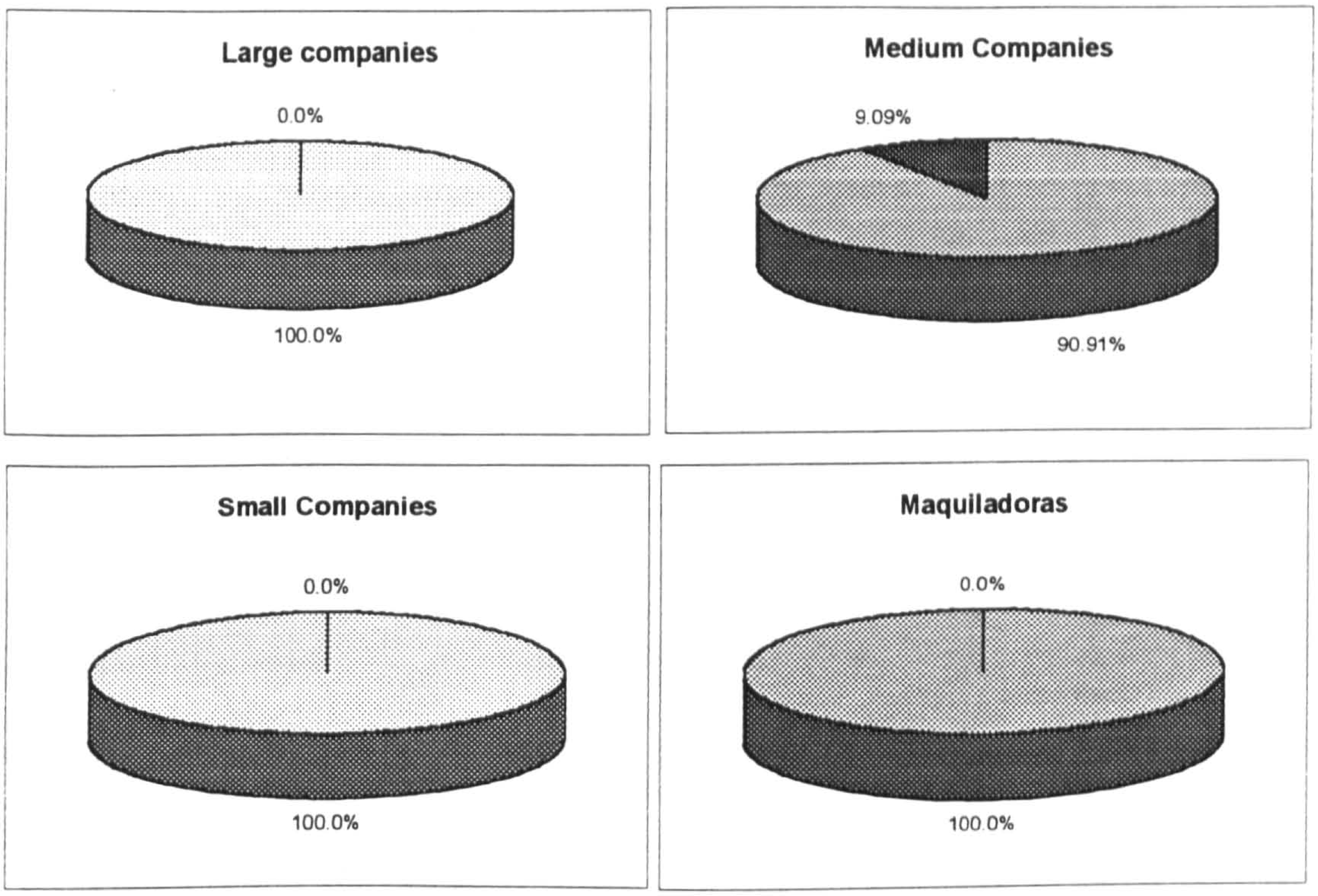


Figure 5.2: Variance of similar WT factors as a percentage of the cumulative variance explained

Table 5.67: Similar and different practices of JIT constructs

Description	Large			Medium			Small			Maquiladora		
	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.	Factors	Var.	Cum. Var.
Lot size reduction	1	44.95	44.95	1	40.19	40.19	1	47.68	47.68	1	41.89	41.89
Setup time reduction	2	17.18	62.13	3	16.30	56.49	3	12.98	60.66	3	15.62	57.51
Inventory reduction	3	13.06	75.19	2	19.07	75.56	2	16.44	77.10	2	18.96	76.47

Table 5.67 shows that for JIT practices, 75.19 percent of total variance of the original variables in large companies is explained by 75.56 percent of total variance of the original variables in medium firms, by 77.1 percent of total variance of the original variables in small companies, and by 76.47 percent of total variance of the original variables of the Maquiladora firms. This means that the size of the firm does not affect the JIT practices being most employed in the companies. The common JIT practices are: lot size reduction, setup time reduction, and inventory reduction. This information is shown in Figure 5.3 which represents the variance of similar WT factors as a percentage of the cumulative variance explained. This means that 100 percent of the cumulative variance

explained of 75.19 percent of the original variables (represented by 75.19 percent of the total variance) of JIT factors for large companies is explained by 100 percent of the cumulative variance explained of 75.56 percent of the original variables (represented by 75.56 percent of the total variance) of JIT factors for medium companies is explained by 100 percent of the cumulative variance explained of 77.10 percent of the original variables (represented by 77.10 percent of the total variance) of JIT factors for small companies is explained by 100 percent of the cumulative variance explained of 76.47 percent of the original variables (represented by 76.47 percent of the total variance) of the JIT factors for Maquiladora companies.

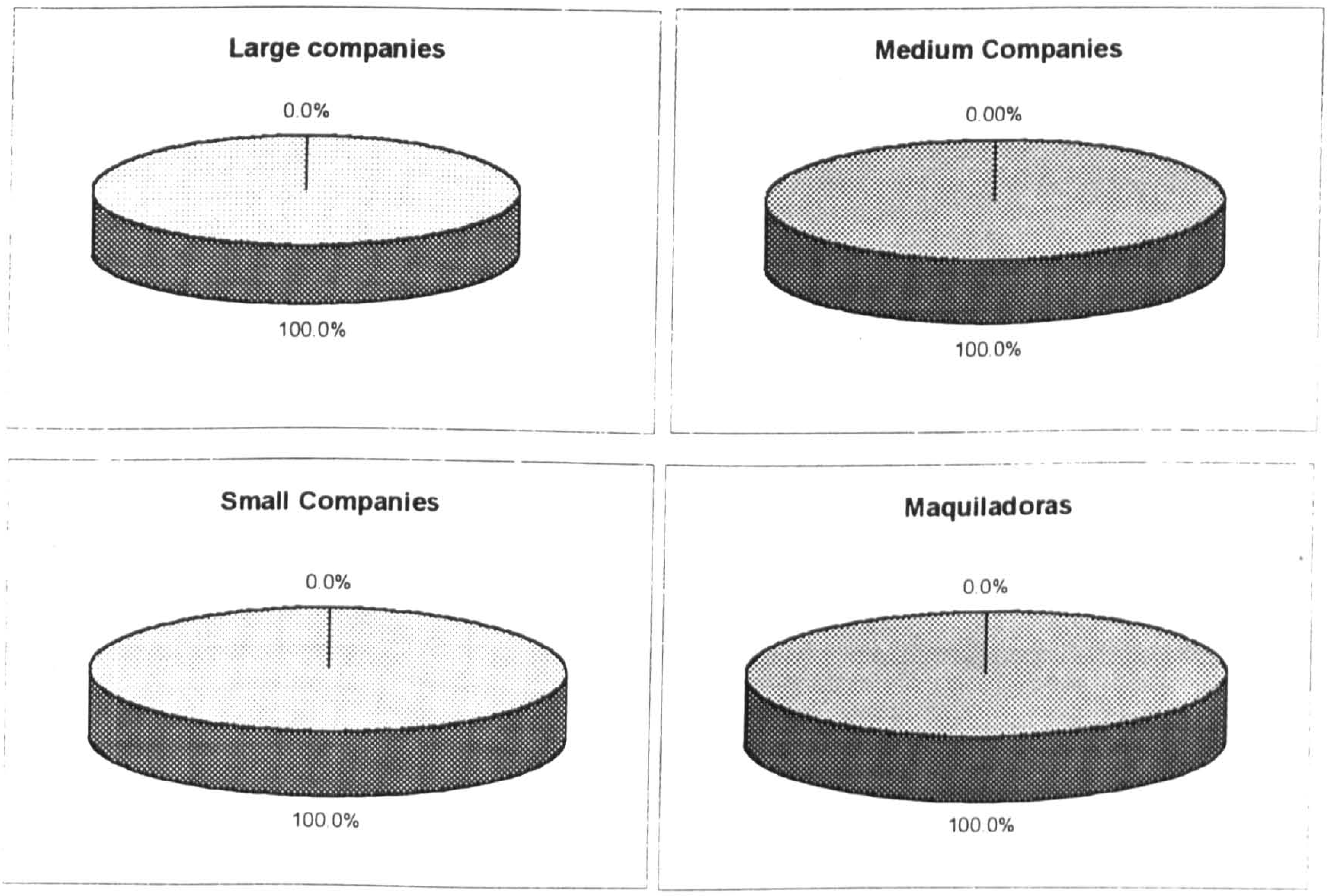


Figure 5.3: Variance of similar JIT factors as a percentage of the cumulative variance explained

5.7 Canonical Correlation Study

Once an entirely new and reduced set of factors were created by factor analysis to replace the original set of variables, the canonical correlation was used to investigate the impact of TQM, WT, and JIT constructs of the performance of large, medium, small, and

Maquiladora manufacturing firms in Mexico. SAS, and JMP computer systems were employed for this purpose.

In these analysis, the interpretability of the canonical functions were tested by three criteria in conjunction with each other: 1) the level of statistical significance of the function, 2) the magnitude of the canonical correlation, 3) and the redundancy measure for the percentage of variance accounted for from the two data sets (Hair, 1991).

The significance of the canonical correlations was tested using F statistic based on Rao's approximation (Bartlett, 1991). The level of significance of a canonical correlation that is generally considered to be the minimum for interpretation is the 0.05 level. The 0.05 level has become the generally accepted level for considering a Correlation Coefficient statistically significant. Since the significance test employed on the Canonical Correlation Coefficients requires multivariate normality, all variables were tested for normality. All were found to be approximately normally distributed. This along with the relatively large sample size justifies the assumption of multivariate normality (Tabachnik and Fidell, 1983).

Once significance is established, amount of variance accounted for is of critical importance. Because there are two sets of variables, several assessment of variance are relevant. The first, and easiest, is the variance overlap between each pair of significant variates. Overlapping variance for a pair is the eigenvalue, or the squared canonical correlation, for the pair. Because canonical correlation values of 0.30 or less represent , squared, less than 10% of the variance, most researchers do not interpret pairs with a canonical correlation lower than 0.30 even if significant (Tabachnik and Fidell, 1988). The size of the canonical correlations also should be considered in deciding which functions to interpret considering the fact that canonical correlations refer to the variance explained in the canonical variates (linear composites), not the original variables.

The Stewart-Love index of redundancy is a measure that tries to calculate the amount of variance in one set of variables that can be explained by the variance in the other set. It provides a summary measure of the ability of a set of predictor variables to explain variation in the criterion variables. As such, the redundancy measure is perfectly analogous to multiple regression's R^2 statistic. The R^2 measures the amount of variance in the dependent (criterion) variable explained by the regression function of the independent (predictor) variables.

Once the canonical relationship is proven to be significant and the magnitude of the canonical root and the redundancy index is acceptable, the results of the canonical correlations is interpreted used by three methods: 1) Canonical Weights (standardised Coefficients), 2) Canonical Loadings (structure correlations), and 3) Canonical Cross-Loadings. As it was discussed in detail in Chapter 5, the use of canonical cross-loadings is preferred, although it is recommended to compare the three methods. The approach to interpreting canonical functions involves examining the magnitude of the Weights, Loadings, and Cross-Loadings. Variables with relatively larger values contribute more to the functions, and vice versa. Similarly, those with opposite signs show an inverse relationship with each other, and those with the same sign show a direct relationship.

The results of canonical correlation analysis will be presented next in the following sections for each company size and type, i.e., Large, Medium, Small, and Maquiladora. Within each company size, the impact of different combinations of TQM, WT, and JIT practices will examined on the performance of the firms. The combinations of TQM, WT, and JIT related to the performance employing the canonical correlation were the following: TQM/JIT/WT, TQM/JIT, TQM/WT, JIT/WT, TQM, WT, JIT. In the cases of WT, and JIT only a selected elements of performance (criterion) were selected, since the canonical correlation analysis needs the same or less number of criterion (dependent) variables compared to the number of predictor (independent) factors. In other cases, all seven elements of the performance were used.

The performance known as the criterion (dependent) variables employed in this study was defined as:

1.- Operational Results

- C1) Productivity (measured as value added per employee),
- C2) Quality (measured as reduction of wastes and defects), and
- C3) cycle (lead) time.

2.- Customer Satisfaction

- C4) Customer Satisfaction

3.- Organisational Climate

- C5) Turnover,
- C6) Absenteeism, and
- C7) Morale

5.7.1 Large companies

All the proposed combinations of TQM, WT, and JIT were correlated against the performance measures. The detailed results of the canonical correlation analysis can be found in Appendix 4

Prior to analysing the relationship between the predictor (independent) variates and criterion (dependent) variates, the interpretability of the canonical functions were examined. The summary of this test for the first (most important) function is found in Table 5.68.

Table 5.68: Interpretability tests of canonical functions for large companies

Large	First function		
	Significant Level	Canonical Correlation	Redundancy Index
TQM/JIT/WT	0.0002	0.7250	0.1630
TQM/JIT	0.2000	0.6961	0.0387
TQM/WT	0.3000	0.6991	0.0133
JIT/WT	0.0000	0.6728	0.0063
TQM	0.0000	0.6730	0.0047
WT	0.0000	0.6015	0.0097
JIT	0.6019	0.2110	0.0081

It can be observed from the Table 5.68 that although the combinations of TQM/JIT/WT, JIT/WT, TQM, and WT are statistically significant and have an acceptable (higher than 0.4) canonical correlation size, only TQM/JIT/WT is interpretable, since its redundancy index shows that it can realistically be used as the measure of the predictive ability of canonical relationships. This indicates that 16.3 percent of the variance in the dependent variables (performance measures) has been explained by the canonical variate for the independent variable set (TQM/JIT/WT practices simultaneously). The rest of the combinations show a small percentage of the variance in the independent canonical variates that could be explained by the predictor canonical.

Now that the TQM/JIT/WT relationships with performance has proven to be significant and the magnitude of the canonical root and the redundancy index is acceptable, the results of the canonical correlations is interpreted used by three methods: 1) canonical weights (standardised Coefficients), 2) canonical loadings (structure correlations), and 3) canonical cross-loadings. The results are shown in Table 5.69.

Table 5.69: Canonical Structure for large companies

		First function			
C	Performance measures	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
R					
I	***C1***	0.2572	**0.6695**	**0.4854**	23.56%
T	***C2***	0.2947	**0.6853**	**0.4968**	24.68%
E	C3	-0.1842	0.1190	0.0863	
R	C4	0.1280	**0.4975**	0.3607	
I	C5	-0.1506	0.1573	0.1140	
O	C6	0.2969	**0.4714**	0.3418	
N	***C7***	**0.5422**	**0.8629**	**0.6256**	39.14%
	Constructs	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
	TQM1	0.1913	**0.3829**	0.2776	
	TQM2	-0.0486	0.0990	0.0718	
	TQM3	**0.4086**	**0.5344**	**0.3874**	15.01%
	TQM4	0.2251	0.3555	0.2577	
P	TQM5	0.1009	0.1284	0.0931	
R	TQM6	0.2688	0.3609	0.2617	
E	TQM7	0.0990	0.1532	0.1110	
D	TQM8	0.1071	0.1159	0.0840	
I	TQM9	0.1373	0.2836	0.2056	
C	***WT1***	0.2680	**0.5629**	**0.4081**	16.65%
T	***WT2***	0.3491	**0.6768**	**0.4907**	24.08%
O	WT3	0.0041	0.0836	0.0606	
R	WT4	-0.1328	-0.0138	-0.0100	
	JIT1	-0.1879	-0.0358	-0.0259	
	JIT2	-0.2523	-0.2419	-0.1754	
	JIT3	-0.0558	0.0071	0.0052	

In studying the first canonical function for large companies shown in Table 5.69, we see that C1 (productivity), C2 (quality), and C7 (morale) show an acceptable correlations with the predictor canonical variate : 0.4854, 0.4968, and 0.6256 respectively. By squaring these terms, we can find the percentage of the variance of each variables explained by the first canonical function. The results show that 23.56 percent of the variance in C1 (productivity), 24.68 percent of the variance in C2 (quality), and 39.14 percent of the variance in C7 (morale) is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we see that TQM3 (top management involvement), WT1 (employee involvement), and WT2 (training) have an acceptable correlations of 0.3874, 0.4081, and 0.4907 with the criterion canonical variate. From this information, we observe that 15.01 percent of the variance in TQM3, 16.65 percent of the variance in WT1, and 24.08 percent of the variance in WT2 is explained by the criterion variate.

It can be inferred that for large companies; productivity, quality, and employee morale of the performance measures are influenced by top management involvement, employee involvement, and employee training.

5.7.2 Medium companies

All the proposed combinations of TQM, WT, and JIT were correlated against the performance measures. The detailed results of the canonical correlation analysis can be found in Appendix 4

Prior to analysing the relationship between the predictor (independent) variates and criterion (dependent) variates, the interpretability of the canonical functions were examined. The summary of this test for the first (most important) function is found in Table 5.70.

Table 5.70: Interpretability tests of canonical functions for medium companies

Medium	First function		
	Significant Level	Canonical Correlation	Redundancy Index
TQM/JIT/WT	0.1056	0.8106	0.1971
TQM/JIT	0.2600	0.7704	0.0531
TQM/WT	0.2840	0.6557	0.0484
JIT/WT	0.5300	0.6462	0.0499
TQM	0.1110	0.7521	0.0532
WT	0.2500	0.5604	0.0601
JIT	0.4460	0.4764	0.0750

It can be observed from the Table 5.70 that although all the combinations have an acceptable (higher than 0.4) canonical correlation size, but only TQM/JIT/WT is interpretable, since it is the only combination has better significant level than the others (the Roy's Greatest Root multivariate test statistic shows a probability of 0.0001 for the significance test) and its redundancy level shows that it can realistically be used as the measure of the predictive ability of canonical relationships. This indicates that 19.71 percent of the variance in the dependent variables (performance measures) has been explained by the canonical variate for the independent variable set (TQM/JIT/WT practices simultaneously). The rest of the combinations show a small percentage of the variance in the independent canonical variates that could be explained by the predictor canonical.

Now that the TQM/JIT/WT relationships with performance has proven to be significant and the magnitude of the canonical root and the redundancy index is acceptable, the results of the canonical correlations is interpreted used by three methods: 1) canonical weights (standardised Coefficients), 2) canonical loadings (structure correlations), and 3) canonical cross-loadings. The results are shown in Table 5.71.

Table 5.71: Canonical Structure for medium companies

		First function			
C R	Performance measures	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
I	C1	-0.1421	**0.3788**	0.3071	
T	***C2***	0.2541	**0.5949**	**0.4822**	23.25%
E	***C3***	0.2879	**0.4767**	**0.3864**	14.93%
R	***C4***	**0.3667**	**0.5763**	**0.4671**	21.82%
I	C5	**-0.4599**	-0.1043	-0.0846	
O	***C6***	**0.3552**	**0.6566**	**0.5322**	28.32%
N	***C7***	**0.3519**	**0.7755**	**0.6286**	39.51%
	Constructs	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
	TQM1	0.2952	0.2071	0.1678	
	TQM2	0.2755	0.3030	0.2456	
	TQM3	0.2845	0.1458	0.1182	
	TQM4	0.2634	0.3078	0.2495	
	TQM5	0.0549	-0.0053	-0.0043	
	TQM6	**0.4710**	**0.3844**	**0.3116**	9.71%
P	TQM7	0.1577	-0.0095	-0.0077	
R	TQM8	**0.3639**	0.2461	0.1995	
E	***TQM9***	0.2892	**0.4374**	**0.3546**	12.57%
D	TQM10	0.1934	0.0596	0.0483	
I	TQM11	0.2517	0.3158	0.2560	
C	TQM12	-0.2172	-0.2348	-0.1903	
T	WT1	-0.2901	0.1617	0.1311	
O	***WT2***	**0.4611**	**0.5187**	**0.4204**	17.67%
R	WT3	-0.0600	0.2434	0.1973	
	WT4	-0.0350	0.2677	0.2170	
	WT5	0.0158	0.3289	0.2666	
	JIT1	-0.0628	**-0.3693**	-0.2993	
	JIT2	0.0043	0.1591	0.1290	
	JIT3	-0.0241	0.0722	0.0585	

In studying the first canonical function for medium companies shown in Table 5.71, we see that C2 (quality), C3 (lead time), C4 (customer satisfaction), C6 (employee absenteeism), and C7 (employee morale) show an acceptable correlations with the predictor canonical variate : 0.4822, 0.3864, 0.4671, 0.5322, and 0.6286 respectively. By squaring these terms, we can find the percentage of the variance of each variables explained by the first canonical function. The results show that 23.25 percent of the variance in C2 (quality), 14.93 percent of the variance in C3 (lead time), 21.82 percent of the variance in C4 (customer satisfaction), 28.32 percent of the variance in C6 (employee absenteeism), and 39.51 percent of the variance in C7 (employee morale) is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we see that TQM6 (top management involvement), TQM9 (benchmarking), and WT2 (performance payment in team) have an acceptable correlations of 0.3116, 0.3546, and 0.4204 with the criterion canonical variate. From this information, we observe that 9.71 percent of the variance in TQM6, 12.57 percent of the variance in TQM9, and 17.67 percent of the variance in WT2 is explained by the criterion variate.

It can be inferred that for medium companies; quality, lead time, customer satisfaction, employee absenteeism, and employee morale of the performance measures are influenced by top management involvement, benchmarking, and performance payment in team for employees.

5.7.3 Small companies

All the proposed combinations of TQM, WT, and JIT were correlated against the performance measures. The detailed results of the canonical correlation analysis can be found in Appendix 4.

Prior to analysing the relationship between the predictor (independent) variates and criterion (dependent) variates, the interpretability of the canonical functions were examined. The summary of this test for the first (most important) function is found in Table 5.72.

Table 5.72: Interpretability tests of canonical functions for small companies

Small	First function		
	Significant Level	Canonical Correlation	Redundancy Index
TQM/JIT/WT	0.0068	0.8381	0.1906
TQM/JIT	0.1500	0.8205	0.0961
TQM/WT	0.9600	0.7705	0.0998
JIT/WT	0.1100	0.6871	0.0839
TQM	0.8730	0.7445	0.0840
WT	0.7200	0.5704	0.0870
JIT	0.4700	0.5472	0.1107

It can be observed from the Table 5.72 that although the all the combinations have an acceptable (higher than 0.4) canonical correlation size, but only TQM/JIT/WT is interpretable, since it is the only combination has an acceptable significant level and its redundancy level shows that it can realistically be used as the measure of the predictive ability of canonical relationships. This indicates that 19.06 percent of the variance in the dependent variables (performance measures) has been explained by the canonical variate for the independent variable set (TQM/JIT/WT practices simultaneously). The rest of the combinations show a small percentage of the variance in the independent canonical variates that could be explained by the predictor canonical.

Now that the TQM/JIT/WT relationships with performance has proven to be significant and the magnitude of the canonical root and the redundancy index is acceptable, the results of the canonical correlations is interpreted used by three methods: 1) canonical weights (standardised Coefficients), 2) canonical loadings (structure correlations), and 3) canonical cross-loadings. The results are shown in Table 5.73.

Table 5.73: Canonical Structure for small companies

		First function			
C R I T E R I O N	Performance measures	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
	C1	0.1618	0.0744	0.0624	
	C2	**-0.7415**	**-0.4100**	-0.3436	
	C3	**0.7414**	**0.7688**	**0.6443**	41.51%
	C4	0.0493	0.3488	0.2924	
	C5	0.2213	0.2615	0.2191	
	C6	0.0704	0.0785	0.0658	
	C7	0.1146	0.2913	0.2441	
	Constructs	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
P R E D I C T O R	TQM1	-0.3169	-0.1034	-0.0866	
	TQM2	0.2042	0.2553	0.2140	
	TQM3	-0.0545	-0.0891	-0.0746	
	TQM4	-0.2741	-0.0253	-0.0212	
	TQM5	0.3412	0.3309	0.2773	
	TQM6	-0.2062	0.0040	0.0034	
	TQM7	-0.0097	0.2140	0.1793	
	TQM8	-0.2235	-0.3127	-0.2621	
	TQM9	0.0177	0.1122	0.0940	
	TQM10	0.1672	0.2361	0.1979	
	TQM11	**-0.4595**	**-0.3708**	-0.3107	
	TQM12	0.0951	-0.1340	-0.1123	
	WT1	0.0746	0.0573	0.0480	
	WT2	0.3585	0.1724	0.1445	
	WT3	0.0072	-0.2813	-0.2358	
	WT4	0.0797	0.1109	0.0929	
	JIT1	**0.5363**	**0.3948**	**0.3309**	10.95%
	JIT2	**0.4091**	-0.1833	**0.4584**	21.01%
	JIT3	-0.0870	**0.5469**	-0.1536	

In studying the first canonical function for small companies shown in Table 5.73, we see that only C3 (lead time) show an acceptable correlation of 0.6443 with the predictor canonical variate. The results show that 41.51 percent of the variance in C3 (lead time) is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we see that JIT1 (lot size reduction), and JIT2 (inventory reduction) have an acceptable correlations of 0.3309, and 0.4584 with the criterion canonical variate. From this information, we observe that 10.95 percent of the variance in JIT1, and 21.01 percent of the variance in JIT2 is explained by the criterion variate.

It can be inferred that for small companies; lead time of the performance measures is influenced by lot size and inventory reduction.

5.7.4 Maquiladora companies

All the proposed combinations of TQM, WT, and JIT were correlated against the performance measures. The detailed results of the canonical correlation analysis can be found in Appendix 4.

Prior to analysing the relationship between the predictor (independent) variates and criterion (dependent) variates, the interpretability of the canonical functions were examined. The summary of this test for the first (most important) function is found in Table 5.74.

Table 5.74: Interpretability tests of canonical functions for Maquiladora companies

Maquiladora	First function		
	Significant Level	Canonical Correlation	Redundancy Index
TQM/JIT/WT	0.0161	0.7969	0.0745
TQM/JIT	0.3500	0.7741	0.1972
TQM/WT	0.4670	0.7204	0.1156
JIT/WT	0.4640	0.6682	0.0566
TQM	0.1060	0.6985	0.1452
WT	0.7800	0.5379	0.0796
JIT	0.3056	0.4120	0.0798

It can be observed from the Table 5.74 that only TQM/JIT/WT is interpretable, since it is the only combination has an acceptable significant level and high canonical correlation. The redundancy level which shows that it can be used as the measure of the predictive ability of canonical relationships, indicates that 7.45 percent of the variance in the dependent variables (performance measures) has been explained by the canonical variate for the independent variable set (TQM/JIT/WT practices simultaneously). By examining the second function for the TQM/JIT/WT combinations, we observe that the significant level is 0.1797, Canonical Correlation is 0.7033, and the redundancy index is 0.1238. This indicates that the second function although is less significant , but has a better predictive ability of the canonical relationships than the first function. The canonical correlation for both functions is very high. The Roy's Greatest Root multivariate test of statistic is 0.0001, which means that the canonical relationship can be interpreted with high degree of reliability. In this study we analyse the canonical correlations using the second function.

Now that the TQM/JIT/WT relationships with performance has proven to be significant and the magnitude of the canonical root and the redundancy index is acceptable, the results of the canonical correlations is interpreted used by three methods: 1) canonical weights (standardised Coefficients), 2) canonical loadings (structure correlations), and 3) canonical cross-loadings. The results are shown in Table 5.75.

Table 5.75: Canonical Structure for Maquiladora companies

		Second function			
CRITERION	Performance measures	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
	C1	**0.7340**	**0.7849**	**0.5520**	30.47%
	C2	-0.0152	**0.5027**	**0.3535**	12.50%
	C3	-0.3349	0.1451	0.1021	
	C4	**0.4879**	**0.7026**	**0.4941**	24.41%
	C5	0.2495	0.3333	0.2345	
	C6	-0.2542	0.0091	0.0064	
	C7	0.1476	**0.5077**	**0.3570**	12.74%
PREDICTOR	Constructs	Canonical Weights	Canonical Loadings	Canonical Cross-Load.	Percent Variance
	TQM1	**0.5360**	**0.4535**	**0.3190**	10.18%
	TQM2	0.2457	0.0431	0.0303	
	TQM3	**0.6566**	0.2997	0.2108	
	TQM4	0.1042	-0.0309	-0.2180	
	TQM5	0.0661	-0.0044	-0.0031	
	TQM6	**0.6244**	0.3017	0.2122	
	TQM7	0.3814	0.1681	0.1182	
	TQM8	**0.6397**	**0.4726**	**0.3324**	11.05%
	TQM9	-0.0319	-0.1411	-0.0993	
	TQM10	0.2529	0.1575	0.1108	
	WT1	**-0.7085**	0.2924	0.2056	
	WT2	0.0610	**0.4355**	**0.3063**	9.38%
	WT3	-0.0681	0.2085	0.1466	
	WT4	-0.1578	-0.1533	-0.1078	
	JIT1	0.1354	0.0884	0.0622	
	JIT2	**-0.4678**	-0.0239	-0.1681	
	JIT3	0.0348	0.0571	0.0402	

In studying the second canonical function for Maquiladora companies shown in Table 5.75, we see that C1 (productivity), C2 (quality), C4 (customer satisfaction), and C7 (employee morale) show an acceptable correlations with the predictor canonical variate : 0.552, 0.3535, 0.4941, and 0.357 respectively. By squaring these terms, we can find the percentage of the variance of each variables explained by the canonical function. The results show that 30.47 percent of the variance in C1 (productivity) , 12.5 percent of the variance in C2 (quality), 24.41 percent of the variance in C4 (customer satisfaction), and 12.74 percent of the variance in C7 (employee morale) is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we see that TQM1 (problem solving and analysis), TQM8 (product evaluation), and WT2 (problem solving in team) have an acceptable correlations of 0.319, 0.3324, and 0.3063 with the criterion canonical variate. From this information, we observe that 10.18 percent of the variance in TQM1, 11.05 percent of the variance in TQM8, and 9.38 percent of the variance in WT2 is explained by the criterion variate.

It can be inferred that for Maquiladora companies; productivity, quality, customer satisfaction, and employee morale of the performance measures is influenced by problem solving and analysis, product evaluation, and problem solving in teams.

5.8 Research Question Three

Using the TQM, WT, and JIT practices found in Mexican industries through factor analysis in the this chapter, a canonical correlation analysis was performed to address the following research question:

R3) What combination of manufacturing practices impact the performance of large, medium, small, and Maquiladora industries?

3.1 Do TQM practices individually impact performance measures?
3.2 Do JIT practices individually impact performance measures?
3.3 Do WT practices individually impact performance measures?
3.4 Do TQM and JIT practices together impact performance measures?
3.5 Do TQM and WT practices together impact performance measures?
3.6 Do JIT and WT practices together impact performance measures?
3.7 Do the combination of TQM, WT, and JIT practices together impact performance measures?

This research question consisted of performing different combinations of canonical correlation of TQM, WT, and JIT practices against performance measures. These combinations can be viewed in Figure 5.4.

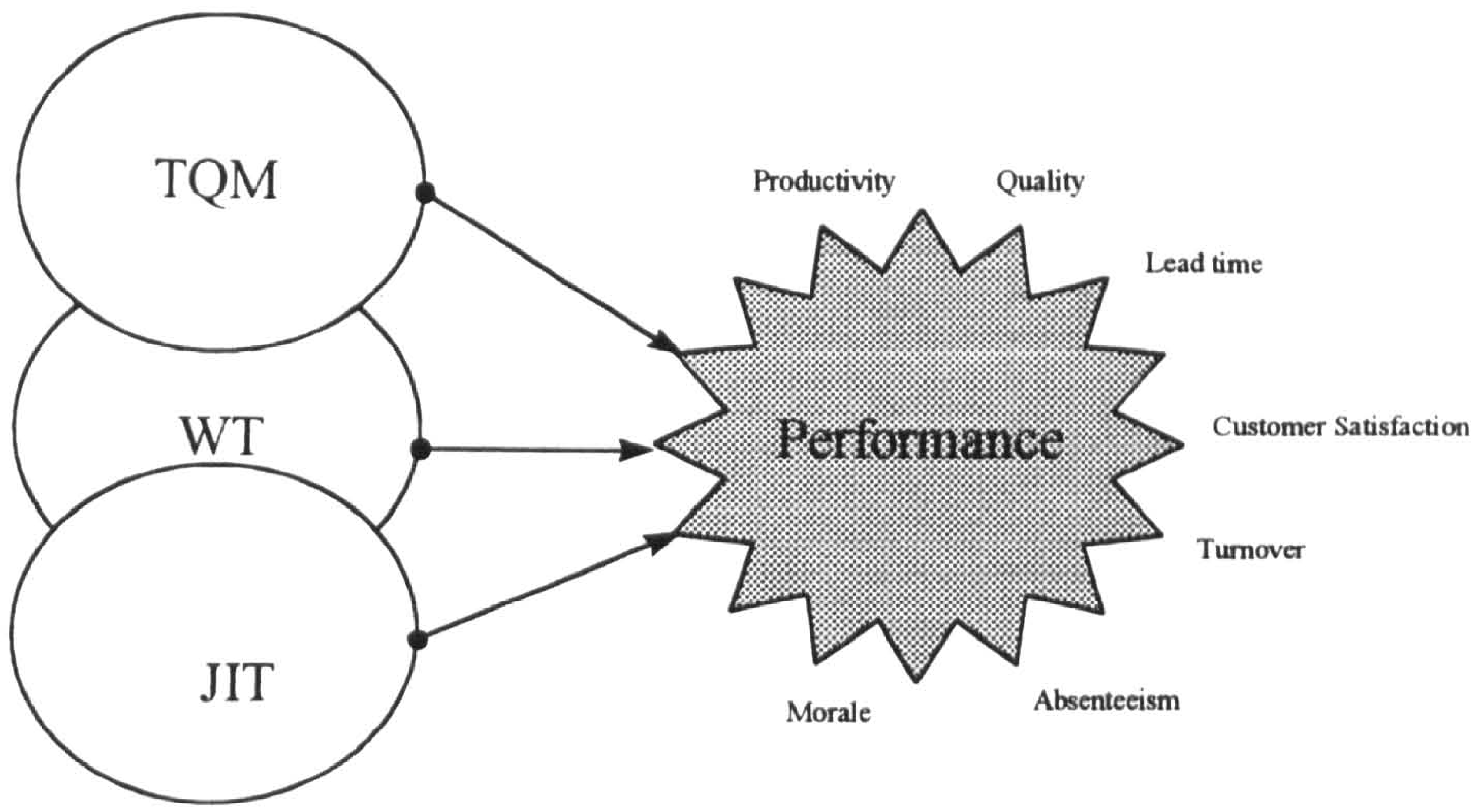


Figure 5.4: Model of possible relationship between TQM, WT, and JIT with performance measures

Canonical Correlation analysis was performed on all combinations addressed in the research question three. Prior to interpreting the canonical correlation and analysis of the results, different tests were performed to examine the interpretability of the canonical function. Table 5.76 reviews a summary of these tests.

Table 5.76: Summary of the interpretability tests

Combinations	Large			Medium			Small			Maquiladora		
	Sig. Level	Can. Corr.	Red. Index	Sig. Level	Can. Corr.	Red. Index	Sig. Level	Can. Corr.	Red. Index	Sig Level	Can Corr.	Red Index
TQM/JIT/WT	0.0002	0.7250	0.1630	0.1056	0.8106	0.1971	0.0068	0.8381	0.1906	0.0161	0.7969	0.0745
TQM/JIT	0.2000	0.6961	0.0387	0.2600	0.7704	0.0531	0.1500	0.8205	0.0961	0.3500	0.7741	0.1972
TQM/WT	0.3000	0.6991	0.0133	0.2840	0.6557	0.0484	0.9600	0.7705	0.0998	0.4670	0.7204	0.1156
JIT/WT	0.0000	0.6728	0.0063	0.5300	0.6462	0.0499	0.1100	0.6871	0.0839	0.4640	0.6682	0.0566
TQM	0.0000	0.6730	0.0047	0.1110	0.7521	0.0532	0.8730	0.7445	0.0840	0.1060	0.6985	0.1452
WT	0.0000	0.6015	0.0097	0.2500	0.5604	0.0601	0.7200	0.5704	0.0870	0.7800	0.5379	0.0796
JIT	0.6019	0.2110	0.0081	0.4460	0.4764	0.0750	0.4700	0.5472	0.1107	0.3056	0.4120	0.0798

As can be seen from the Table 5.76, only the relationship between simultaneous combinations of TQM/JIT/WT and performance measures could be interpreted. This means that the other relationships- TQM/JIT, TQM/WT, JIT/WT, TQM, WT, and JIT with performance measures- were not significant and their canonical functions were not interpretable.

We proceeded with examining the impact of simultaneous TQM/JIT/WT practices on the performance of the large, medium, small and Maquiladora companies.

Large companies

Figure 5.5 views the TQM, JIT, and WT constructs to be related to the performance using the canonical correlation.

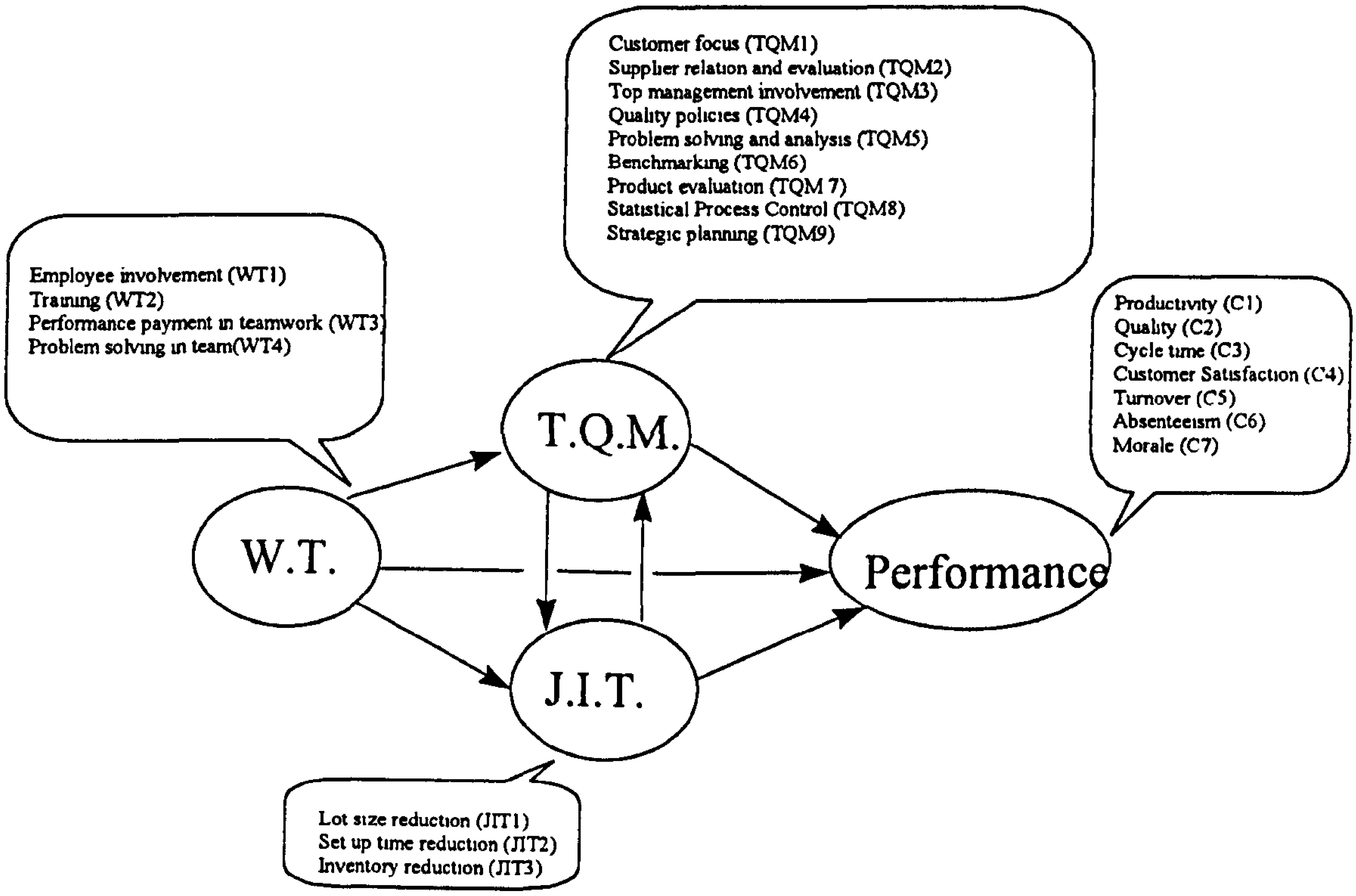


Figure 5.5: Model of impact of TQM, WT, and JIT constructs on performance for large companies

The result of the canonical correlation for large companies revealed that 23.56 percent of the variance in productivity, 24.68 percent of the variance in quality, and 39.14 percent of the variance in morale is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we observed that 15.01 percent of the variance in top management involvement, 16.65 percent of the variance in employee involvement , and 24.08 percent of the variance in training was explained by the criterion variate.

It can be inferred that for large companies; productivity, quality, and employee morale of the performance measures are influenced by top management involvement, employee involvement, and employee training.

Figure 5.6 shows the constructs that were found to be significant and impacted performance against those that were not found to influence the performance of the large companies.

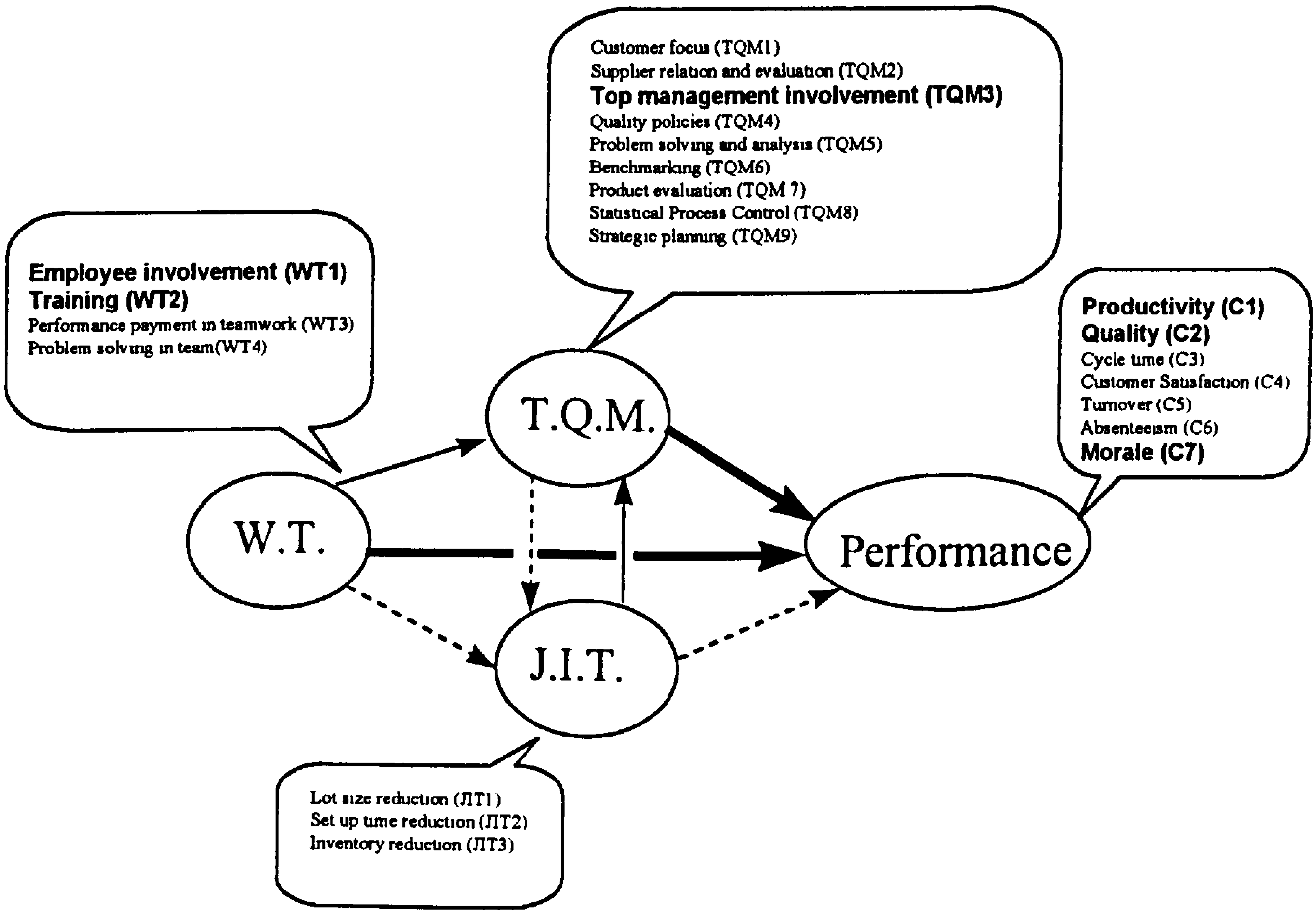


Figure 5.6: TQM, JIT, and WT constructs which influence the performance of large companies

Medium companies

Figure 5.7 views the TQM, JIT, and WT constructs to be related to the performance using the canonical correlation.

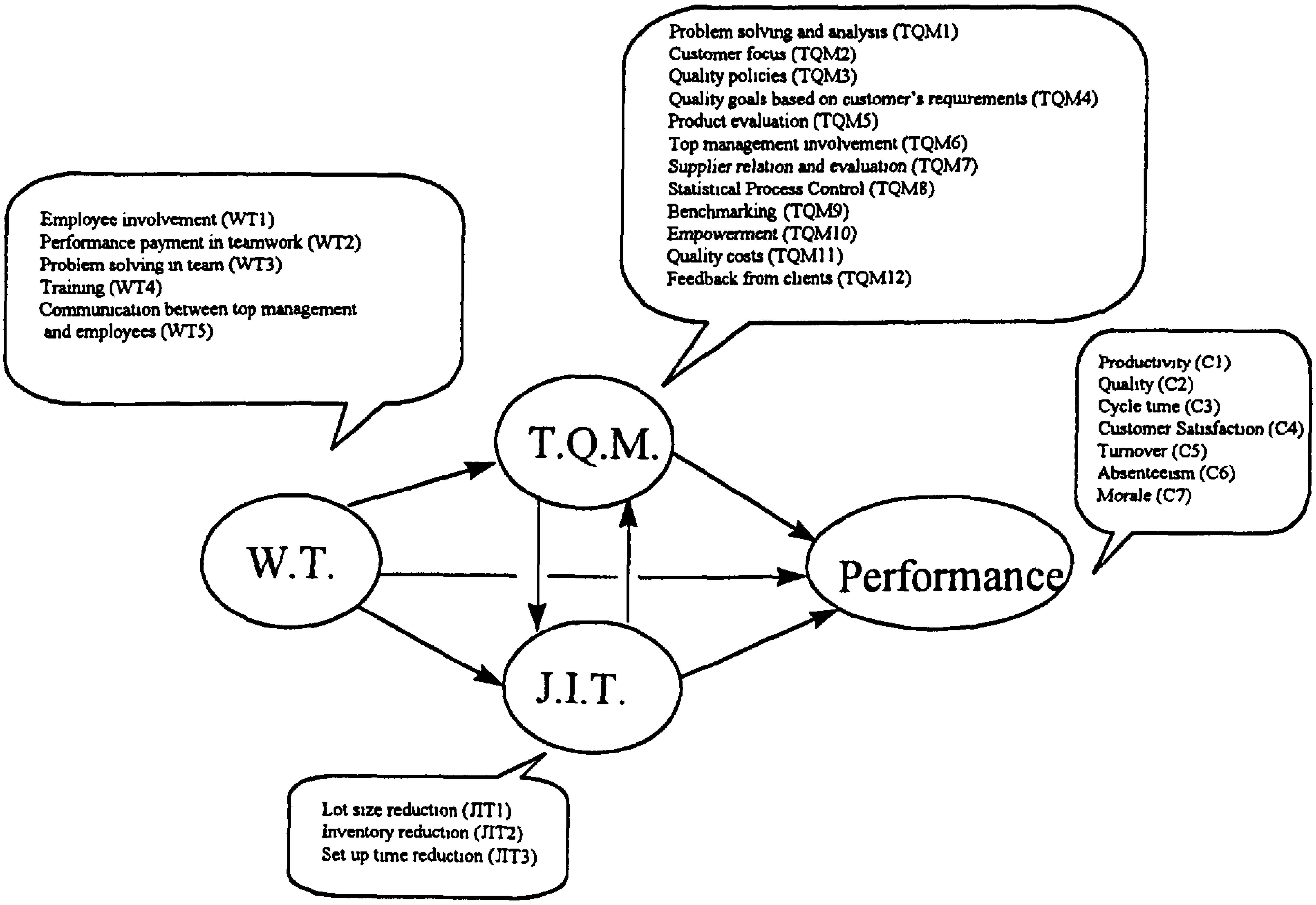


Figure 5.7: Model of impact of TQM, WT, and JIT constructs on performance for medium companies

The result of the canonical correlation for medium companies revealed that 23.25 percent of the variance in quality, 14.93 percent of the variance in lead time, 21.82 percent of the variance in customer satisfaction, 28.32 percent of the variance in employee absenteeism, and 39.51 percent of the variance in employee morale is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we found that 9.71 percent of the variance in top management involvement, 12.57 percent of the variance in benchmarking, and 17.67 percent of the variance in performance payment in team was explained by the criterion variate.

It can be inferred that for medium companies; quality, lead time, customer satisfaction, employee absenteeism, and employee morale of the performance measures are influenced by top management involvement, benchmarking, and performance payment in team for employees.

Figure 5.8 shows the constructs that were found to be significant and impacted performance against those that were not found to influence the performance of the medium companies.

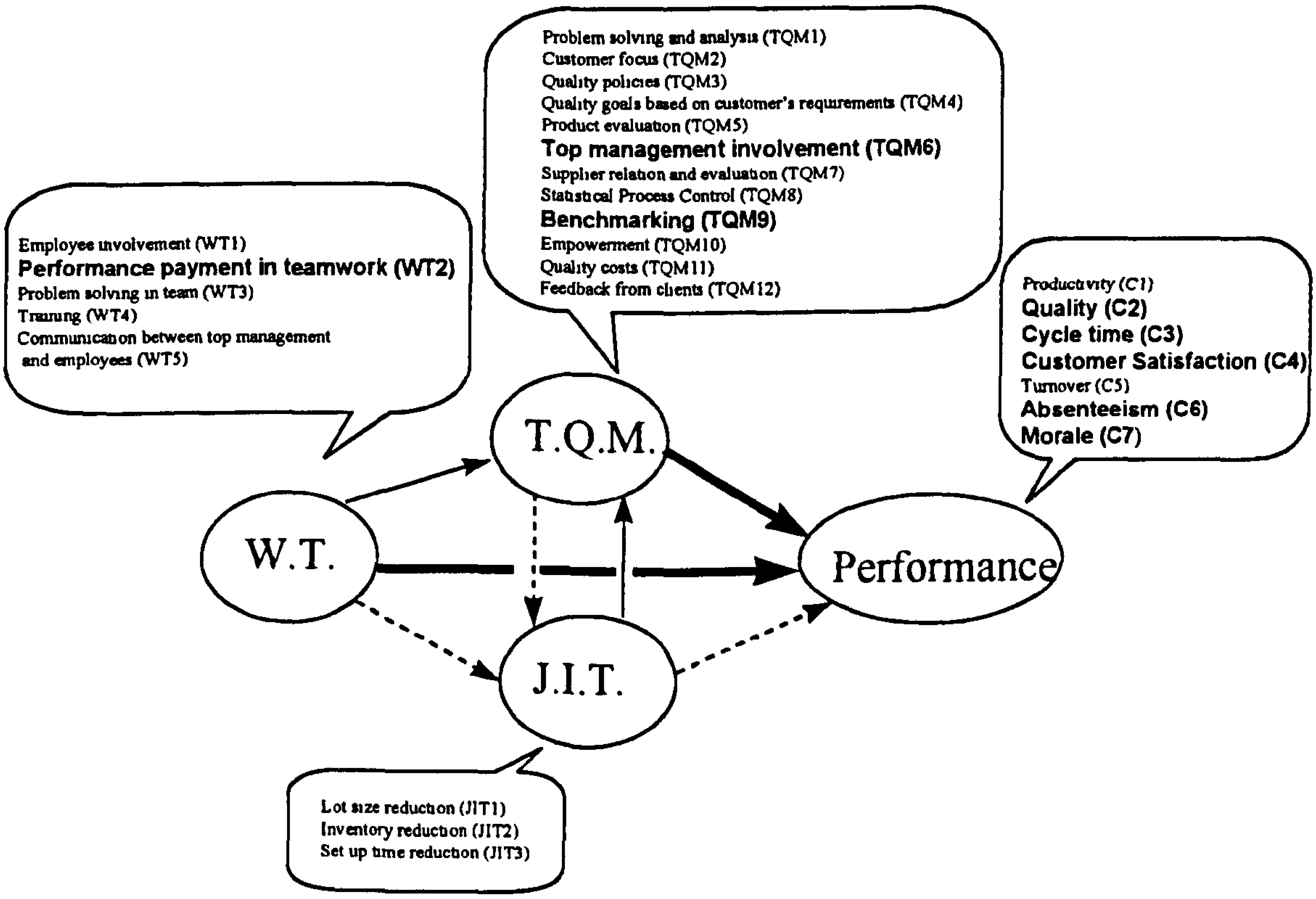


Figure 5. 8: TQM, JIT, and WT constructs which influence the performance of medium companies

Small companies

Figure 5.9 views the TQM, JIT, and WT constructs to be related to the performance using the canonical correlation.

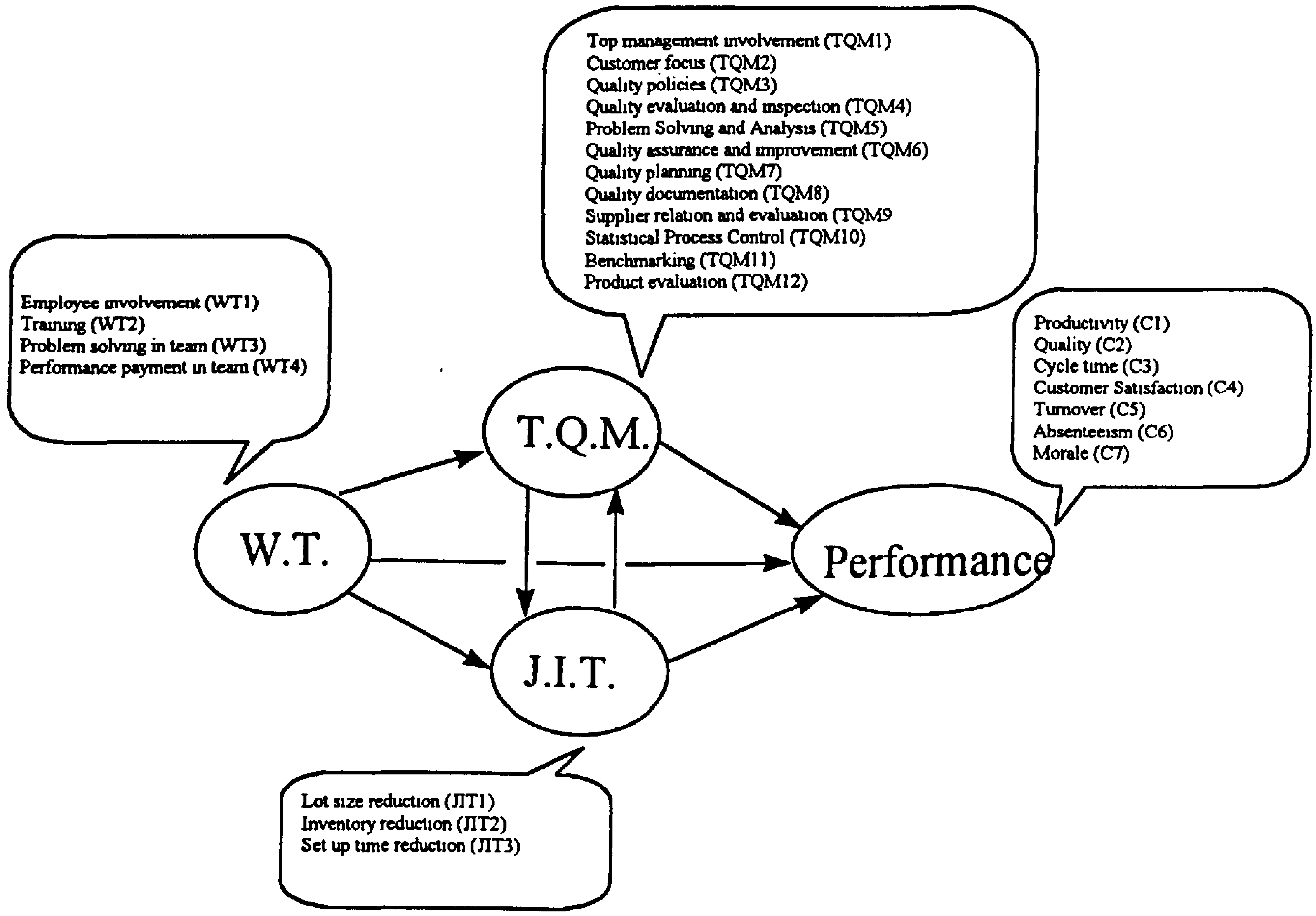


Figure 5.9: Model of impact of TQM, WT, and JIT constructs on performance for small companies

The result of the canonical correlation for small companies revealed that 41.51 percent of the variance in lead time was explained by the canonical function. By looking at the predictor variables' Cross-Loadings, lot size reduction), and JIT2 (inventory reduction) have an acceptable correlations of 0.3309, and 0.4584 with the criterion canonical variate. From this information, we observed that 10.95 percent of the variance in lot size reduction, and 21.01 percent of the variance in inventory reduction were explained by the criterion variate.

It can be inferred that for small companies; lead time of the performance measures is influenced by lot size and inventory reduction.

Figure 5.10 shows the constructs that were found to be significant and impacted performance against those that were not found to influence the performance of the small companies.

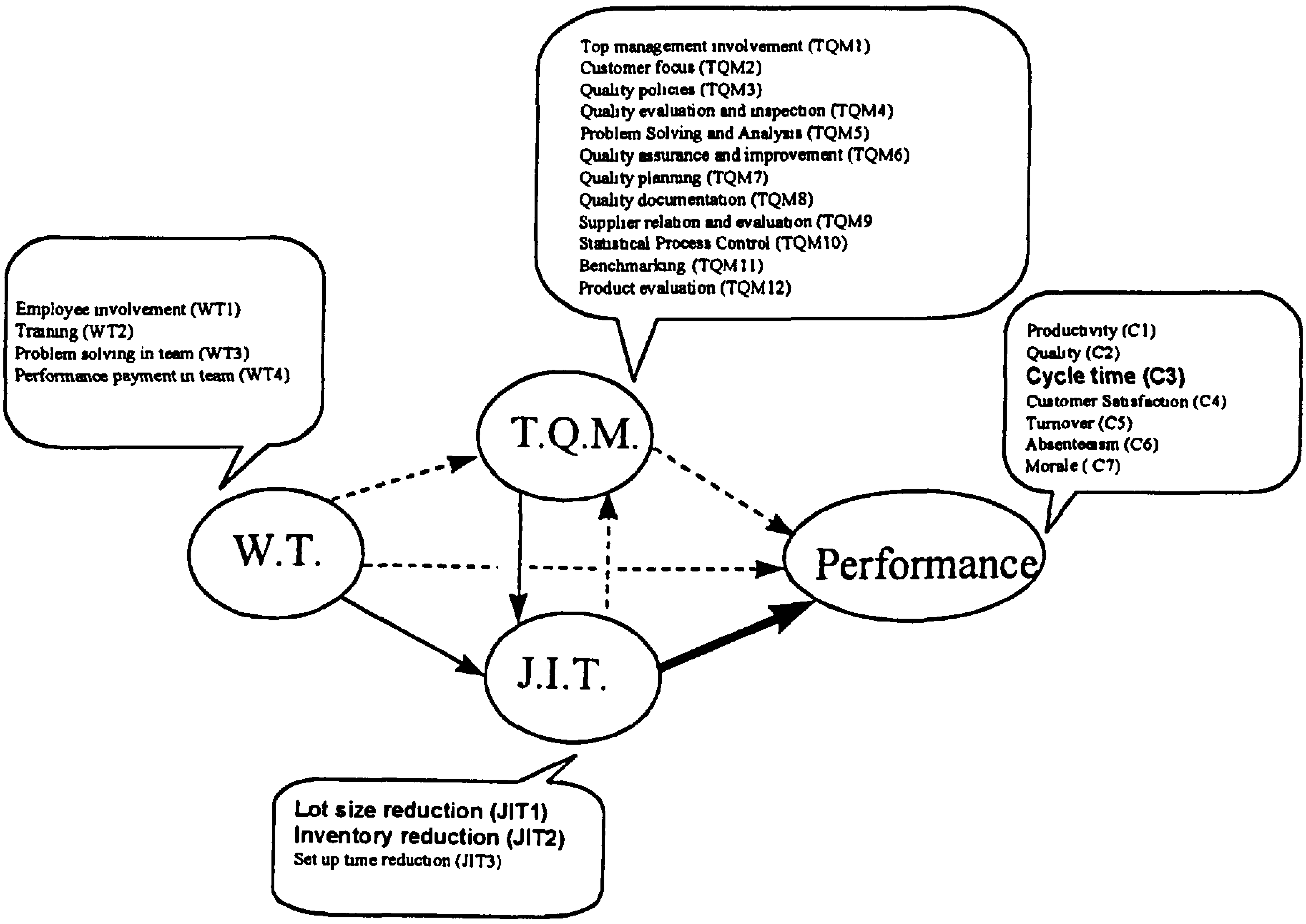


Figure 5.10: TQM, JIT, and WT constructs which influence the performance of small companies

Maquiladora companies

Figure 5.11 views the TQM, JIT, and WT constructs to be related to the performance using the canonical correlation.

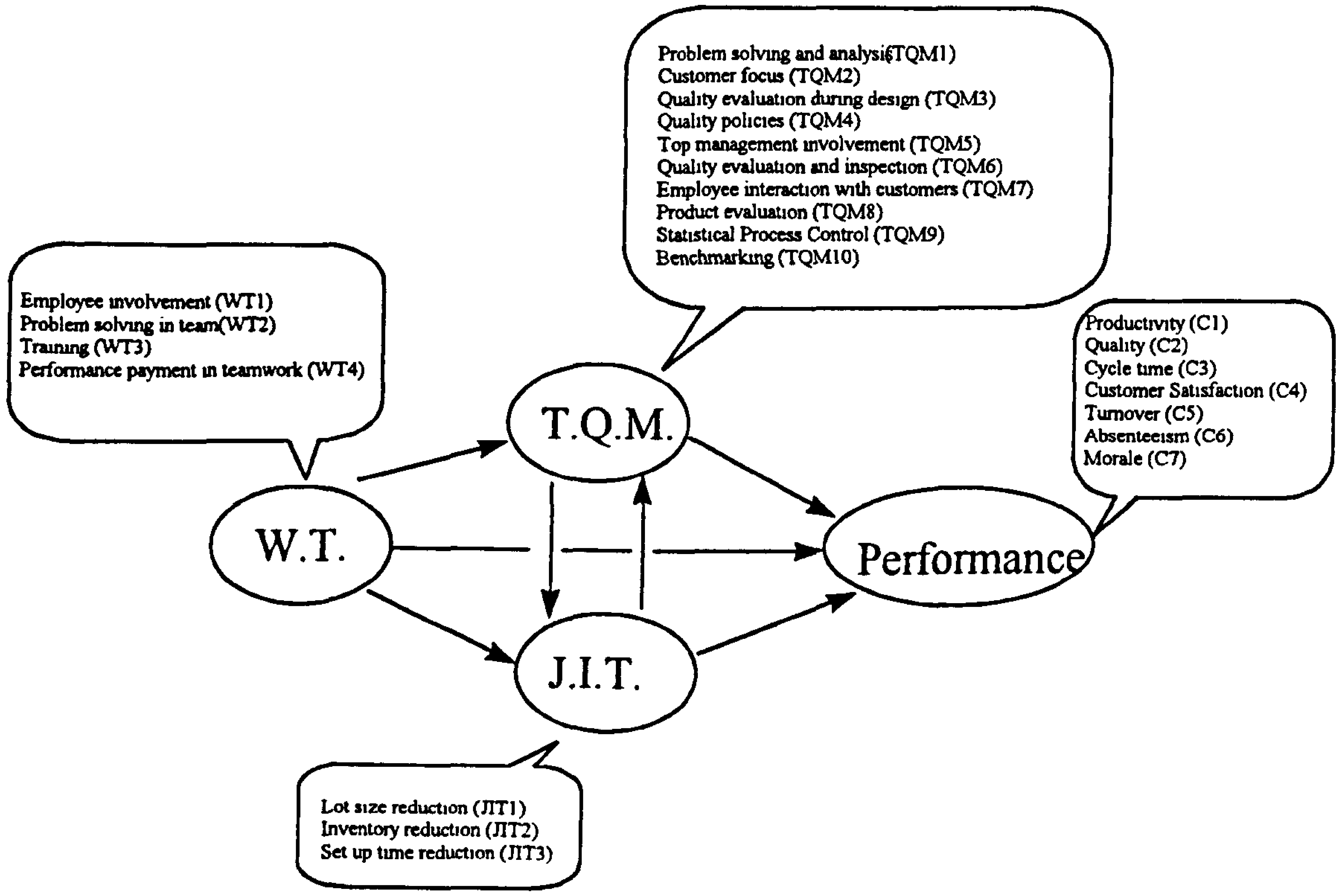


Figure 5.11: Model of impact of TQM, WT, and JIT constructs on performance for Maquiladoras

The result of the canonical correlation for Maquiladora companies revealed that 30.47 percent of the variance in productivity , 12.5 percent of the variance in quality, 24.41 percent of the variance in customer satisfaction, and 12.74 percent of the variance in employee morale is explained by the canonical function. By looking at the predictor variables' Cross-Loadings, we observe that 10.18 percent of the variance in problem solving and analysis, 11.05 percent of the variance in product evaluation, and 9.38 percent of the variance in problem solving in team are explained by the criterion variate.

It can be inferred that for Maquiladora companies; productivity, quality, customer satisfaction, and employee morale of the performance measures are influenced by problem solving and analysis, product evaluation, and problem solving in teams.

Figure 5.12 shows the constructs that were found to be significant and impacted performance against those that were not found to influence the performance of the Maquiladora companies.

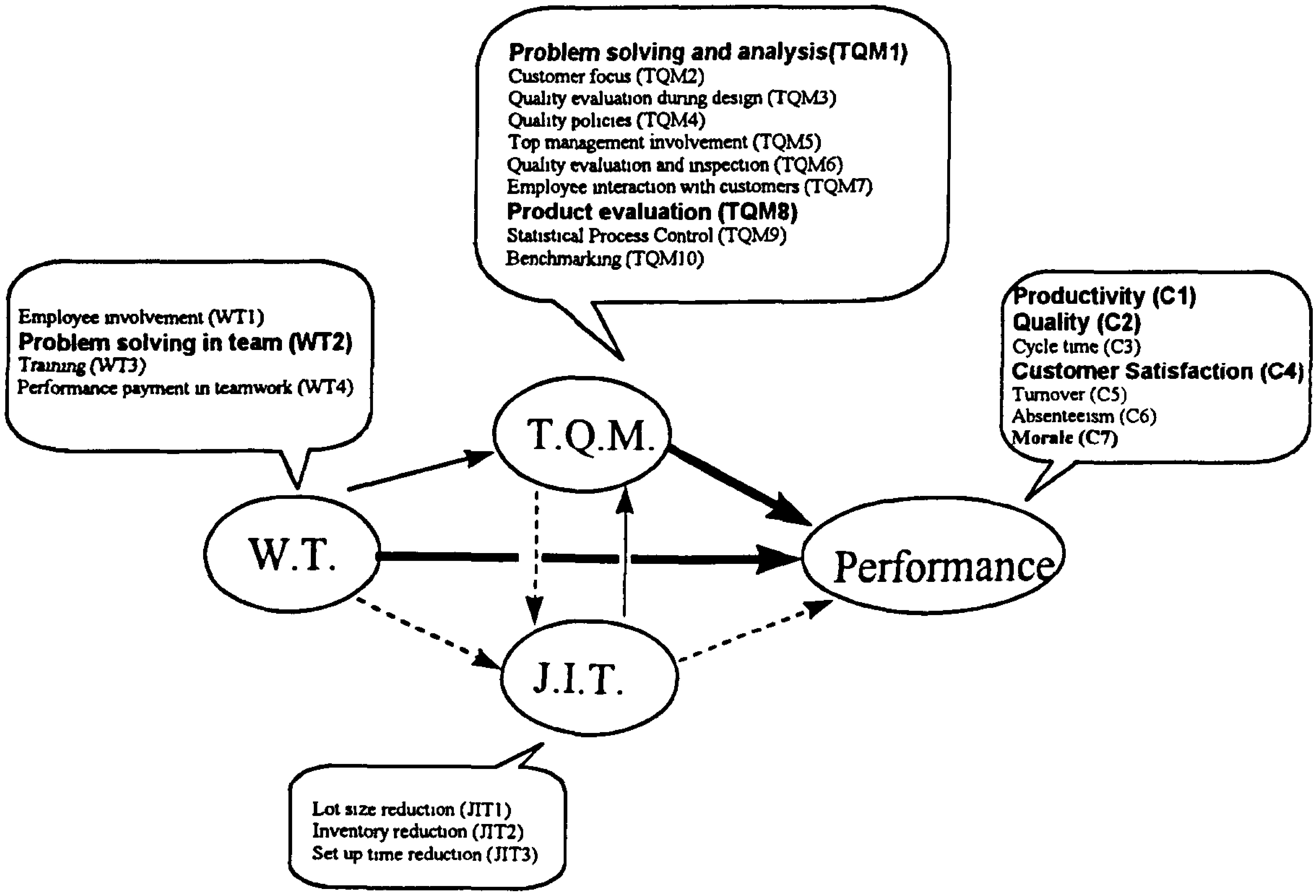


Figure 5.12: TQM, JIT, and WT constructs which influence the performance of Maquiladoras

After obtaining the constructs that impact the performance measures for each company size and type, a comparison of the practices of the TQM, WT, and JIT are made for large (LA), medium (ME), small (SM), and Maquiladora (MA) in Table 5.77 and Figure 5.13.

Table 5.77: Comparison of practices which impact the performance of the companies

Constructs		Operational Results							Cust Satisf.		Organisational Climate			
		Productivity		Quality			Cycle time		Customer Satisfaction		Absenteeism	Morale		
		LA.	MA.	LA.	ME.	MA.	ME.	SM	ME.	MA.	ME.	LA.	ME.	MA.
TQM	Top management involvement	X		X	X		X		X		X	X	X	
	Benchmarking				X		X		X		X		X	
	Problem solving and analysis		X			X				X				X
	Product evaluation		X			X				X				X
WT	Employee involvement	X		X								X		
	Training	X		X								X		
	Performance payment in team				X				X		X		X	
	Problem solving in team		X			X				X				X
JIT	Lot size reduction							X						
	Inventory reduction							X						

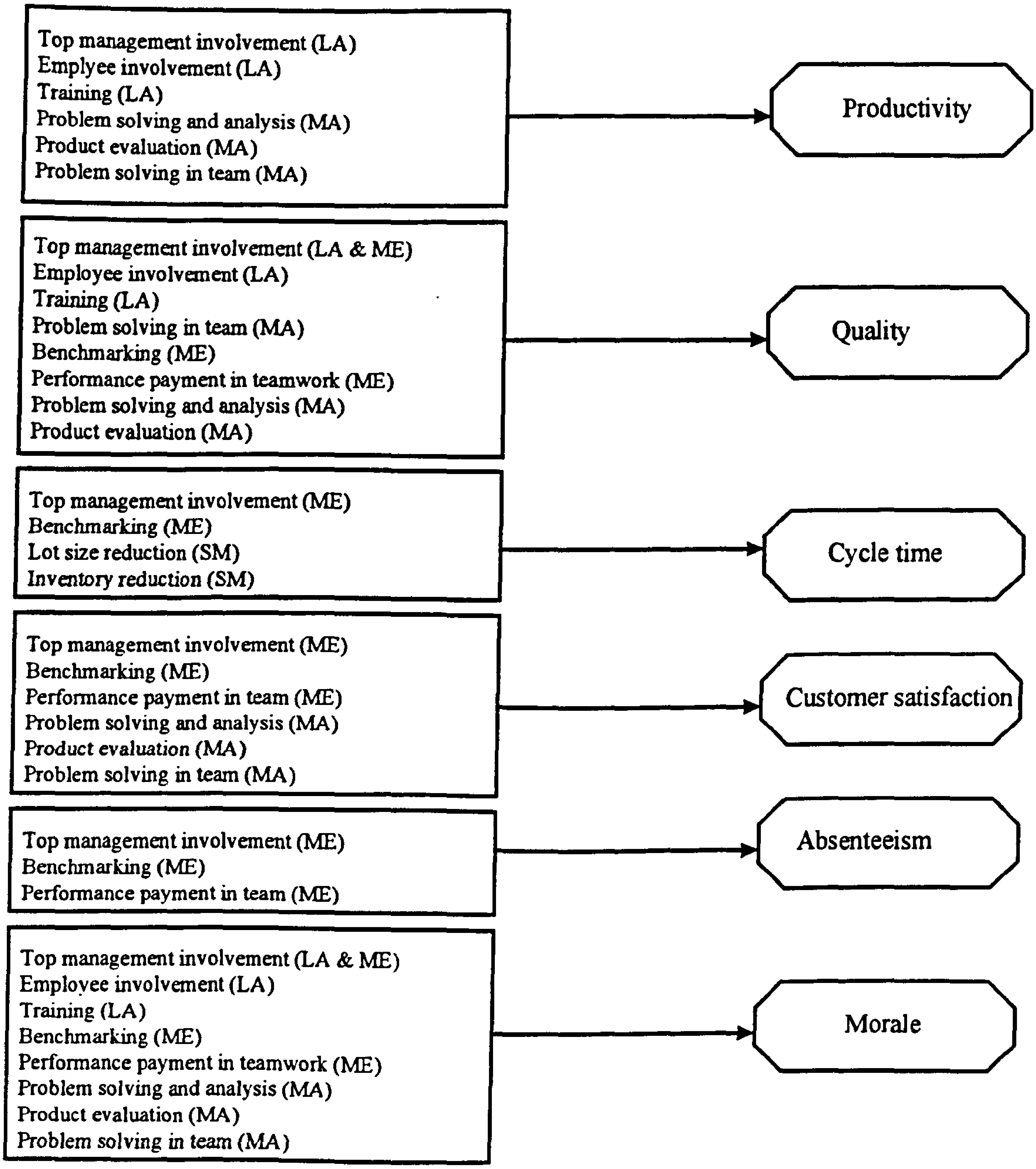


Figure 5.13: Comparison of practices which impact the performance of the companies

CHAPTER 6

DISCUSSION AND CONCLUSIONS

6.1 Introduction

The literature argues that advanced manufacturing technology such as Total Quality Management (TQM), Just In Time (JIT) and Work Teams (WT) complement one another and work in concert to transform manufacturing organisations (Gunn, 1987). For example, Just In Time enhances total quality because reducing inventory exposes previously hidden quality problems, and total quality facilitates Just In Time because poor quality is among the main reasons for maintaining " just in case" inventory levels (Schonberger, 1986) and work teams integrate nicely with TQM and JIT since both programmes place heavy responsibility on every employee to perform their jobs excellently and to contribute ideas on how to improve productivity and quality (Mefford, 1991).

The research led to the development of TQM, JIT, and WT constructs, and the analysis of the impact of these constructs on performance of large, medium, small, and Maquiladora firms in Mexico. The literature review showed that there is little empirical evidence for the theoretical impact of these manufacturing practices, and most of the studies are based on case studies or the analysis of the impact of each factor as a stand-alone system on organisations.

The empirical findings in this research are based on the analysis results of the canonical correlation study of the impact of the TQM, JIT, and WT on the performance of the manufacturing firms in Mexico presented in Chapter 5. Chapter 6 discusses the findings relating to the impact of the manufacturing practices for large, medium, small, and Maquiladora firms. The chapter discusses some of the limitations of the study which were encountered. This chapter identifies directions for further research and concludes with a summary of what has been learned and the managerial implications of this knowledge for the Mexican industry as to what improvement techniques might be useful if the objective is to improve the performance of the organisation.

6.2 Review of the findings

Before discussing the meaning and the implications of the results as to the impact of the TQM, JIT, and WT on the performance, a review of the findings is given.

6.2.1 Validity and Reliability

The results provide tentative evidence that the instrument presented here is reliable and valid. Reliability was demonstrated with Cronbach's Alpha values, which all exceeded the minimum criterion. This is quite good for an instrument which is composed of entirely new scales.

Content validity throughout this study was demonstrated in the documentation of the steps followed in the construction, pretesting and analysis of the instrument. Every effort was made to follow sensible methods of test construction.

Construct validity was very strong for the scales. All scales had high eigenvalues and loadings of individual items on constructs, verifying that the scales measure single and independent constructs.

Criterion related validity was also demonstrated because it related the practices to the seven dimensions of the performance.

Thus, this analysis showed that the instrument is a valid predictor of the performance

6.2.2 TQM, JIT, and WT constructs

The Factor Analysis was conducted individually on each set of the three main groups of independent variables- Total Quality Management (TQM), Work Team (WT), and Just-In-Time (JIT)- to create an independent construct for each group. This procedure created an entirely new set of a smaller number of variables (factors) to replace the original set of variables for inclusion in subsequent Canonical Correlation Analysis. The SAS system was used to perform the Factor Analysis using the Principal Component procedure including an Orthogonal Transformation with a Varimax Rotation. Table 6.1 gives the summary of the finding:

Table 6.1: Summary of the TQM, WT, and JIT constructs among firms

	Large (70.99%)	Medium (79.76%)	Small (79.70%)	Maquiladoras (77.20%)
	Constructs	Constructs	Constructs	Constructs
TQM	•Customer focus	•Problem solving and analysis	•Top management involvement	•Problem solving and analysis
	•Supplier relation and evaluation	•Customer focus	•Customer focus	•Customer focus
	•Top management involvement	•Quality policies	•Quality policies	•Quality evaluation during design
	•Quality policies	•Quality goals based on customer's requirements	•Quality evaluation and inspection	•Quality policies
	•Problem solving and analysis	•Product evaluation	•Problem Solving and Analysis	•Top management involvement
	•Benchmarking	•Top management involvement	•Quality assurance and improvement	•Quality evaluation and inspection
	•Product evaluation	•Supplier relation and evaluation	•Quality planning	•Employee interaction with customers
	•Statistical Process Control	•Statistical Process Control	•Quality documentation	•Product evaluation
	•Strategic planning	•Benchmarking	•Supplier relation and evaluation	•Statistical Process Control
		•Empowerment	•Statistical Process Control	•Benchmarking
		•Quality costs	•Benchmarking	
		•Feedback from clients	•Product evaluation	
	Large (70.86%)	Medium (75.67%)	Small (71.07%)	Maquiladoras (71.95%)
	Constructs	Constructs	Constructs	Constructs
WT	•Employee involvement	•Employee involvement	•Employee involvement	•Employee involvement
	•Training	•Performance payment in teamwork	•Training	•Problem solving in team
	•Performance payment in teamwork	•Problem solving in team	•Problem solving in team	•Training
	•Problem solving in team	•Training	•Performance payment in teamwork	•Performance payment in teamwork
		•Communication between Top management and employees		
	Large (75.19%)	Medium (75.56%)	Small (77.10%)	Maquiladoras (76.47%)
	Constructs	Constructs	Constructs	Constructs
JIT	•Lot size reduction	•Lot size reduction	•Lot size reduction	•Lot size reduction
	•Setup time reduction	•Inventory reduction	•Inventory reduction	•Inventory reduction
	•Inventory reduction	•Setup time reduction	•Setup time reduction	•Setup time reduction

6.2.3 Comparison of TQM, JIT, and WT practices among firms

Using the TQM, WT, and JIT practices found in Mexican industries through factor analysis, a Cattell's salient similarity index, s, and Pearson correlation coefficient, r, was calculated.

The analysis of the differences and similarities included a detailed study of pattern and magnitude of the loadings of TQM, WT, and JIT among large, medium, small, and Maquiladora firms. This meant that for most factors of each construct, each firm was compared to other firms. An initial list of possible similar factors of different constructs for each firm was constructed, and using the information on factor loadings from the earlier factor analysis, a Cattell's salient similarity index, s, and Pearson correlation coefficient, r, was calculated. Table 6.2 gives the summary of the findings:

Table 6.2: Summary of comparison of TQM, WT, and JIT practices among firms

		Description	Large			Medium			Small			Maquiladora		
			Factors	Var	Cum Var	Factors	Var	Cum Var	Factors	Var	Cum Var	Factors	Var	Cum Var
	S	Customer focus	1	43 75	43 75	2	7 48	7 48	2	9 06	9 06	2	6 94	6 94
	I	Supplier relation and	2	6 34	50.09	7	3 13	10 61	9	2 92	11 98	-	0	6 94
	M	Top management	3	3 97	54 06	6	3 43	14 04	1	30 98	42 96	5	4 16	11 10
	I	Quality policies	4	3.62	57 68	3	5 56	19 60	3	6 60	49 56	4	4 40	15 50
	L	Problem solving and	5	2 98	60 66	1	39 30	58 90	5	5 15	54 71	1	41 7	57.20
	A	Benchmarking	6	2.84	63.50	9	2.78	61 68	11	2 47	57 18	10	2 36	59 56
	R	Product evaluation	7	2 57	66 07	5	3 67	65 35	12	2 25	59 43	8	2 77	62 33
T		Statistical Process Control	8	2 53	68 60	8	2 96	68 31	10	2 76	62 19	9	2 56	64 89
Q		Strategic planning	9	2 39	2.39									
M	D	Quality goals based on customer's				4	4 51	4.51						
	I	Empowerment				10	2 44	6 95						
	F	Quality costs				11	2.31	9.26						
	F	Feedback from				12	2 19	11 45						
	E	Quality evaluation and							4	5 43	5 43	6	3 54	3 54
	R	Quality assurance and							6	4 29	9 72			
	E	Quality planning							7	4 06	13 78			
	N	Quality							8	3 73	17 51			
	T	Quality evaluation during										3	5 53	9 07
		Employee interaction with										7	3 24	12 31
		Description	Large			Medium			Small			Maquiladora		
			Factors	Var	Cum Var	Factors	Var	Cum Var	Factors	Var	Cum Var	Factors	Var	Cum Var
		Employee	1	48 00	48 00	1	40 47	40 47	1	47.06	47 06	1	48 76	48 76
		Training	2	10.11	58 11	4	7.26	47.73	2	10 03	57.09	3	8 26	57.02
W	S	Performance payment in	3	6 46	64 57	2	12 97	60 70	4	6 83	63 92	4	5 72	62 74
T		Problem solving in	4	6 29	70 86	3	8 09	68 79	3	7 15	71 07	2	9 21	71 95
	D	Communication between top management and				5	6 88	6 88						
		Description	Large			Medium			Small			Maquiladora		
			Factors	Var	Cum Var	Factors	Var	Cum Var	Factors	Var	Cum Var	Factors	Var	Cum Var
J		Lot size reduction	1	44 95	44 95	1	40 19	40 19	1	47 68	47 68	1	41 89	41 89
I	S	Setup time	2	17 18	62 13	3	16 30	56 49	3	12 98	60 66	3	15 62	57 51
T		Inventory reduction	3	13 06	75 19	2	19 07	75 56	2	16 44	77 10	2	18 96	76 47

As it is show in Table 6.2, statistically, no significant differences with respect to TQM, WT, and JIT strategies were found in large, medium, small, and Maquiladora companies. This means that the size of the company does not affect the type of strategies they practice. This is consistent with the Malcolm Baldrige philosophy that size is not critical factor in implementation of the TQM elements.

6.2.4 Impact of TQM, JIT, and WT practices on the performance

Using the TQM, WT, and JIT practices found in Mexican industries through factor analysis, a canonical correlation analysis was performed to study the impact of all possible combinations of TQM, WT, and JIT on the performance of the Mexican firms. These combinations were:

1) Stand-alone techniques: TQM, WT, and JIT
2) Combinations of two techniques: TQM x WT, TQM x JIT, and WT x JIT
3) Combined techniques: TQM x WT x JIT

Although TQM, WT, and JIT strategies were found to be statistically the same in Large, Medium, Small, and Maquiladora companies, the canonical correlation was performed on each company size separately. This was due to the belief that the companies might practice the same strategies, but this does not mean that these would influence their performance in the same manner.

The result of canonical correlation study demonstrated that only the combined techniques:- TQM x WT x JIT- had a significant impact on the performance and could be interpreted. This meant that none of the techniques as a stand-alone system or any combinations of two techniques were found to have any significant influence on the performance. Figure 6.1 gives a summary of the significant factors of TQM, WT, JIT that impact the performance of the large, medium, small, and Maquiladora companies.

As can be seen from Figure 6.1, Employee turnover as one of the dimensions of the firms performance was not influenced by any of the practices performed by the Mexican companies. This could be due to the fact that turnover is caused by external factors and is pervasive problem endemic to all viable industrial locations and types.

The results also show that although the companies statistically practice the same strategies with respect to TQM, WT, and JIT, the factors did not affect their performance in the same way.

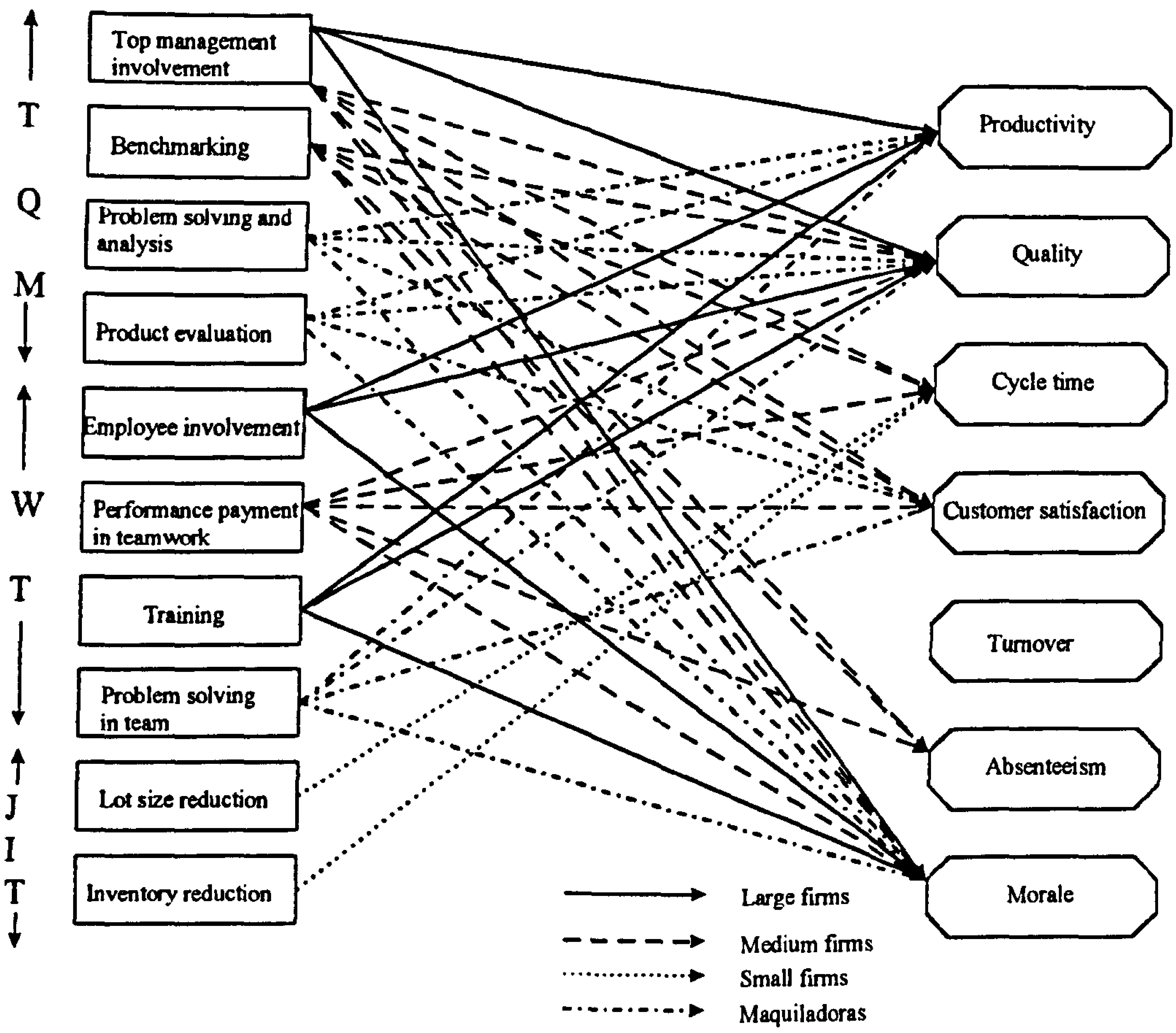


Figure 6.1: Significant TQM, WT, and JIT practices which impact the performance

6.3 Discussion of the findings

The discussion and the interpretation of the findings are separated by the size and type of the industry, i.e., large, medium, small, and Maquiladora.

6.3.1 Large companies

The impact of different combinations of TQM, WT, and JIT practices were studied on the performance of the large companies in Mexico. No stand alone system, and neither of any two of the practices in combination were found to have a significant impact on performance. The only significant impact was found when TQM, WT, and JIT were practised simultaneously.

The significant factors are shown in the Figure 6.2. The numbers shown in parenthesis indicate the cross-loadings for the canonical correlation. The thick arrows indicate that the canonical correlation findings strongly support a particular link, thin arrows show a support between practices, and dotted arrows show a possible indirect link.

This indicates that top management involvement, employee involvement, and training together impact quality, productivity, and employee morale simultaneously. Although JIT practices were not found to impact directly the performance of the large companies, its effects can be seen as an indirect support to TQM. This is confirmed since in the canonical correlation analysis without JIT, i.e., simultaneous TQM and WT, did not have a significant impact on performance. This confirms that the simultaneous practices of TQM, WT, and JIT impact the performance.

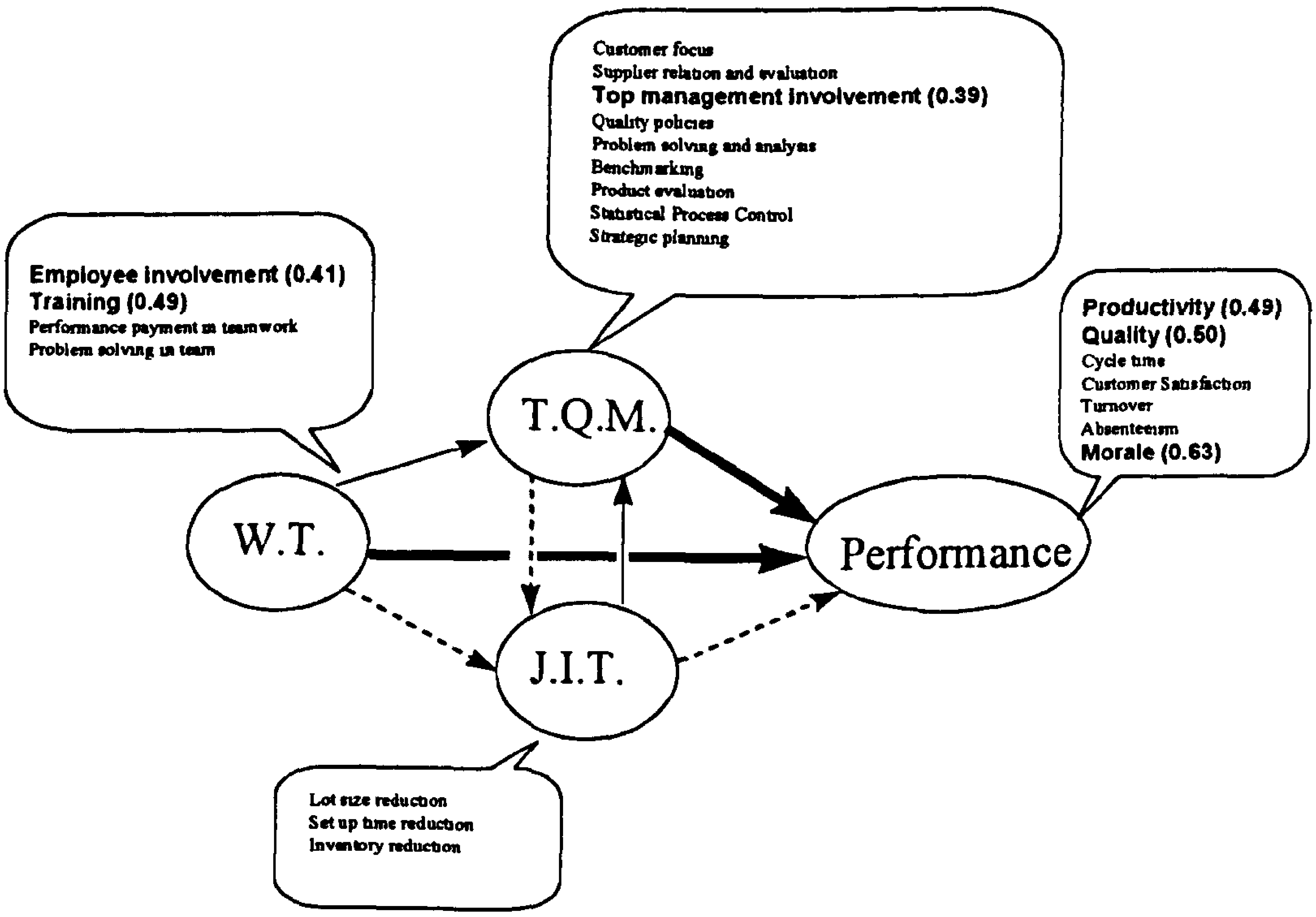


Figure 6.2: Impact of TQM, JIT, and WT practices on the performance of large companies

Top management commitment has been identified as one of the major determinants of successful TQM implementation (Dale and Duncalf, 1984; Ebrahimpour, 1985). Top management acts as a driver of TQM implementation, creating values, goals, and systems to satisfy customer expectations and to improve an organisation's performance. The clarity of quality goals for an organisation determines the effectiveness of the quality efforts (Senge, 1990; Stalk, et. al., 1992) Top management committed to quality must convey the philosophy that quality will receive a higher priority over cost or schedule, and that in the long-run, superior and consistent quality will lead to improvements in cost and delivery performance (Ferdows and Demeyer, 1990; Krajewski and Ritzman; 1993; Garvin, 1984).

Employees involvement is vital in activities related to problem solving, decision making, and continuous improvement (Schonberger, 1982). This type of involvement requires workers to possess certain type of skills. As a result, the low entry-level skills of typical Mexican workers create obstacles to achieving the desired level of employee participation. Achieving meaningful employee participation requires a company's commitment to employee training. The lower entry-level skills of Mexican workers require firms to make even greater commitments to training, giving rise to Ebrahimpour and Schonberger's (1984) claim that lack of training represents the chief obstacle to successful JIT and TQM implementation in developing countries. Mexican culture also poses obstacles to achieving employee participation. Mexican culture is very hierarchical, promoting the creation of well defined lines of responsibility and authority (Kras, 1989). As a result, the typical worker is unlikely to see problem solving and continuous improvement as a part of his or her task. In addition, Mexican culture encourages the use of intuition and emotion over rational analysis (Bourgeois and Boltvinik , 1981), which could make some Mexicans uncomfortable using TQM and JIT's analytical tools. Another obstacle to gain full employee participation is the high rate of employee turnover common in Mexico.

The involvement of line workers is a key to the success of TQM and JIT. Workers have more authority in designing and enriching their jobs and more responsibility in quality control. This causes a reduction in the amount of support and supervisory activity in the plant. Traditionally the quality control or inspection was done at the end of the manufacturing process, but this should be the responsibility of each person performing a task. Thus employee involvement increases employee morale which in turn leads to further improvements in productivity and quality. There are several reasons why this occurs. Effective quality and productivity improvement programmes utilise employee involvement. By getting employees involved in quality circles, quality of worklife groups, and work teams, employees receive more satisfaction from their jobs and may feel more committed to the firm.

One would expect large firms to be more successful at such strategies as internal quality information usage, benchmarking, and supplier quality management due to their relatively well-established information infrastructure and market clout over suppliers (Newman, 1988; Finch, 1986). Perhaps the infrastructural strengths of large firms were offset by their slower response to changes in the environment, reduced adaptability, and limited ability to innovate.

6.3.2 Medium companies

The impact of different combinations of TQM, WT, and JIT practices were studied on the performance of the medium companies in Mexico. No stand alone system, and neither of any two of the practices in combination were found to have a significant impact on performance. The only significant impact was found when TQM, WT, and JIT were practised simultaneously. The significant factors are shown in the Figure 6.3

The numbers shown in parenthesis indicate the cross-loadings for the canonical correlation. The thick arrows indicate that the canonical correlation findings strongly support a particular link, thin arrows show a support between practices, and dotted arrows show a possible indirect link.

This indicates that top management involvement, benchmarking, and performance payment in teamwork together impact quality, cycle time, customer satisfaction, absenteeism, and employee morale simultaneously. Although JIT practices were not found to impact directly the performance of the medium companies, its effects can be seen as an indirect support to TQM. This is confirmed since in the canonical correlation analysis without JIT, i.e., simultaneous TQM and WT, did not have a significant impact on performance. This confirms that the simultaneous practices of TQM, WT, and JIT impact the performance.

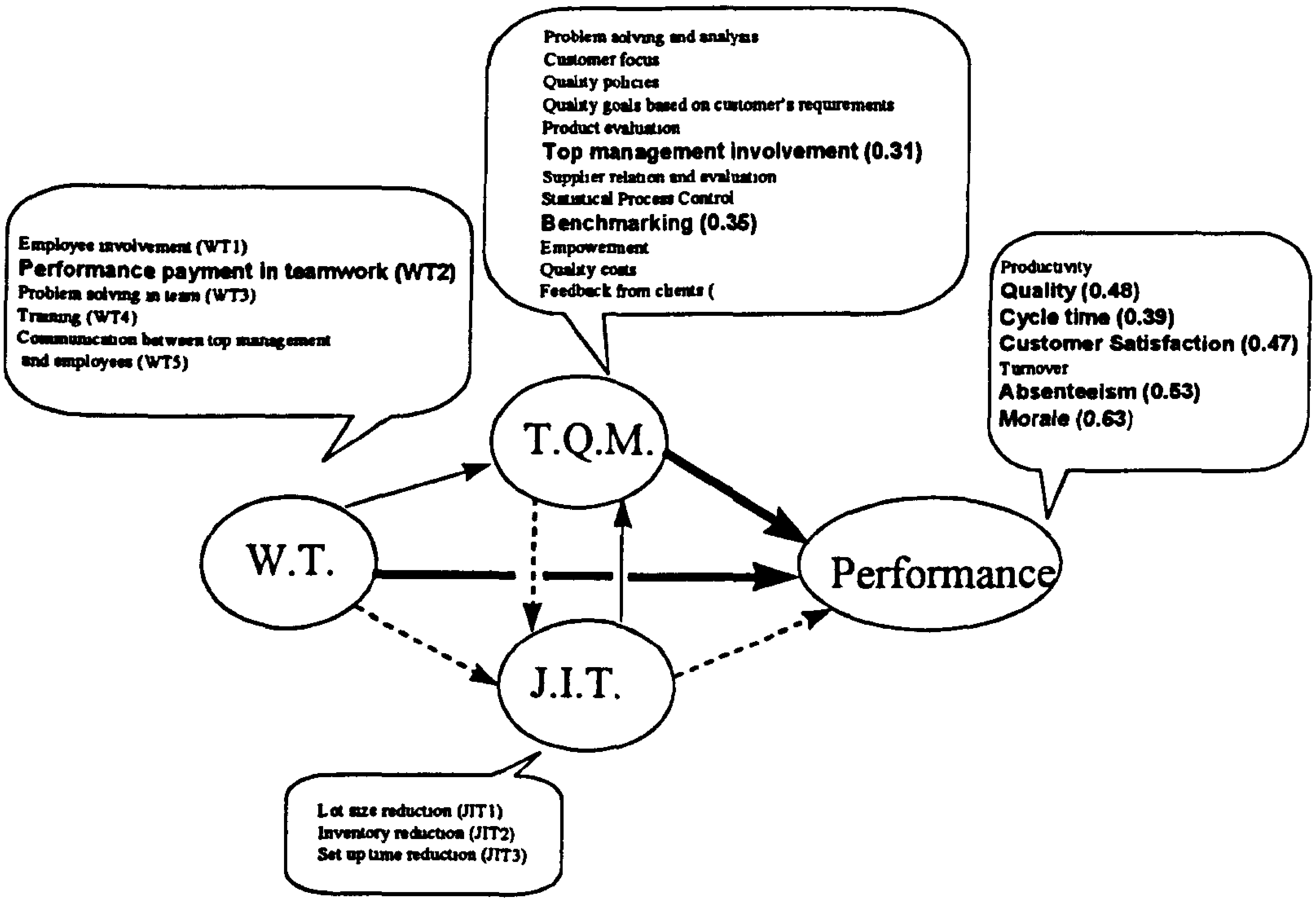


Figure 6.3: Impact of TQM, JIT, and WT practices on the performance of medium companies

Top management commitment has been identified as one of the major determinants of successful TQM implementation (Dale and Duncalf, 1984; Ebrahimpour, 1985) Top management acts as a driver of TQM implementation, creating values, goals, and systems to satisfy customer expectations and to improve an organisation's performance. The clarity of quality goals for an organisation determines the effectiveness of the quality efforts (Senge, 1990; Stalk, et. al., 1992). Top management committed to quality must convey the philosophy that quality will receive a higher priority over cost or schedule, and that in the long-run, superior and consistent quality will lead to improvements in cost and delivery performance (Ferdows and Demeyer, 1990; Krajewski and Ritzman, 1993; Garvin, 1984).

Effective management of quality of products and internal processes without losing perspective of the external factors, such as competition, requires judicious use of benchmarking. Benchmarking consists of analysing the best products and processes of leading competitors in the same industry, or leading organisations in other industries, using similar processes. An organisation should then, use this knowledge to improve its own products and processes.

Many productivity and quality improvement programmes involve financial rewards and bonuses to employees. This, of course, is to encourage effort on the part of the employee to the programme, but also may, if positive results are achieved, lead to feelings of accomplishment and personal growth by the employee and thus greater job satisfaction. Linking employee compensation to company performance, an integral part of many productivity/ quality improvement programmes, thus may also increase employee morale which in turn may lead to further improvements in productivity and quality. This is likely to lead to reduced absenteeism and turnover and a greater commitment on the part of the employee to do a good job.

6.3.3 Small companies

The impact of different combinations of TQM, WT, and JIT practices were studied on the performance of the small companies in Mexico. No stand alone system, and neither of any two of the practices in combination were found to have a significant impact on performance. The only significant impact was found when TQM, WT, and JIT were practised simultaneously. The significant factors are shown in the Figure 6.4

The numbers shown in parenthesis indicate the cross-loadings for the canonical correlation. The thick arrows indicate that the canonical correlation findings strongly support a particular link, thin arrows show a support between practices, and dotted arrows show a possible indirect link.

This indicates that lot size reduction and inventory reduction simultaneously impact cycle time. Although TQM and WT practices were not found to impact directly the performance of the small companies, their effects can be seen as an indirect support to JIT. This is confirmed since in the canonical correlation analysis without TQM, and WT, i.e., JIT as a stand-alone system, did not have a significant impact on performance. This confirms that the simultaneous practices of TQM, WT, and JIT impact the performance.

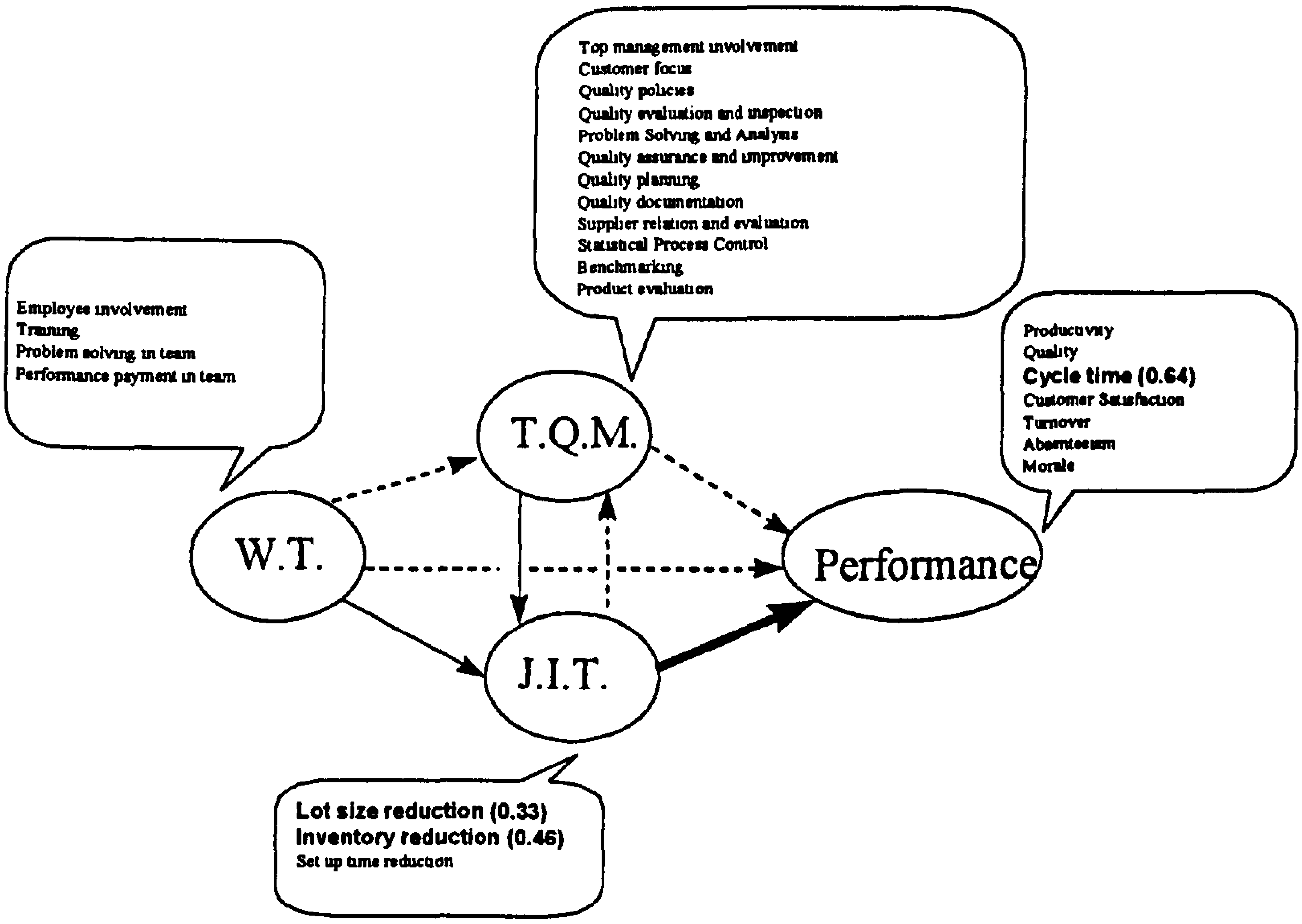


Figure 6.4: Impact of TQM, JIT, and WT practices on the performance of small companies

Human resource strategies such as employee training (Ebrahimpour and Withers, 1992), employee involvement (Oliver, 1988), and employee empowerment (Everett and Sohal, 1991) are fundamental to the success of strategies such as benchmarking and statistical process control. Due to a lack of managerial expertise, small firms may not recognise the importance of human resource management (HRM) strategies (McEvoy, 1984; Amba-Rao and Pendse, 1985). Thus, one would expect a relatively lower level of employee empowerment, use of employee involvement strategies, and employee quality training in small firms. Lack of professional management expertise (Sironopolis, 1994) and the short-term focus of many small firms (Verser, 1987) should result in a low level of commitment to quality from top management. This may be reflected further in inadequate allocation of resources to TQM efforts in these firms. Since quality training may not be a priority of management for the above reasons, quality tracking and improvement techniques such as benchmarking and SPC may also be used less frequently and less effectively in small firms (Ebrahimpour and Withers, 1992). Further, through a less effective use of internal quality information, the lack of an information infrastructure can add to the difficulties experienced by small firms in implementing these techniques (Ashmore, 1992).

Small business owners and managers tend to view human resource management strategy as being less important than finance, marketing, and planning (McEvoy, 1984). Furthermore, small business managers do not perceive incentives to be critical to improving productivity (Amba-Rao and Pendse, 1985).

The reasons that the practice of JIT by small companies influences their performance could be explained by two factors. The first possible explanation for this finding relates to the employee participation component of JIT. Smaller Mexican plants studied in the past (Lawrence, and Hottenstein, 1992) have been more successful implementing employee participation programmes because they have an easier time creating a shared vision within the plant. This shared vision seemed to help break down cultural barriers to employee participation. Small firms do not recognise employee involvement to be an important factor, although they do practice it. This could be because in small companies, work is usually done in teams and every employee is involved in different tasks.

The second possible explanation could be due to the nature of the job shop type environments of small firms. Originally JIT was developed in order to enhance the performance in repetitive manufacturing environments. While it is unlikely that job shops can approach the level of JIT operations achieved by repetitive manufacturers in terms of material flow, it is very possible that the incremental benefits to be gained from moving in the direction of JIT operations are greater in job shop. Reducing set-up times, for instance, may benefit a job shop more than a repetitive manufacturer since a job shop has to perform many more of these set-ups. Likewise, increasing workers involvement may offer greater benefits to a job shop because there are more decisions that must be made on the production floor on a daily basis. The result may also reflect the conversion of traditional job shops to cellular systems as JIT is implemented.

6.3.4 Maquiladoras

The impact of different combinations of TQM, WT, and JIT practices were studied on the performance of the Maquiladora companies in Mexico. No stand alone system, and neither of any two of the practices in combination were found to have a significant impact on performance. The only significant impact was found when TQM, WT, and JIT were practised simultaneously. The significant factors are shown in the Figure 6.5

The numbers shown in parenthesis indicate the cross-loadings for the canonical correlation. The thick arrows indicate that the canonical correlation findings strongly support a particular link, thin arrows show a support between practices, and dotted arrows show a possible indirect link.

This indicates that problem solving and analysis, product evaluation, and problem solving in teams together impact quality, productivity, customer satisfaction , and morale simultaneously. Although JIT practice was not found to impact directly the performance of the Maquiladora companies, its effects can be seen as an indirect support to TQM and WT. This is confirmed since in the canonical correlation analysis without JIT, i.e., simultaneous TQM and WT, did not have a significant impact on performance. This confirms that the simultaneous practices of TQM, WT, and JIT impact the performance.

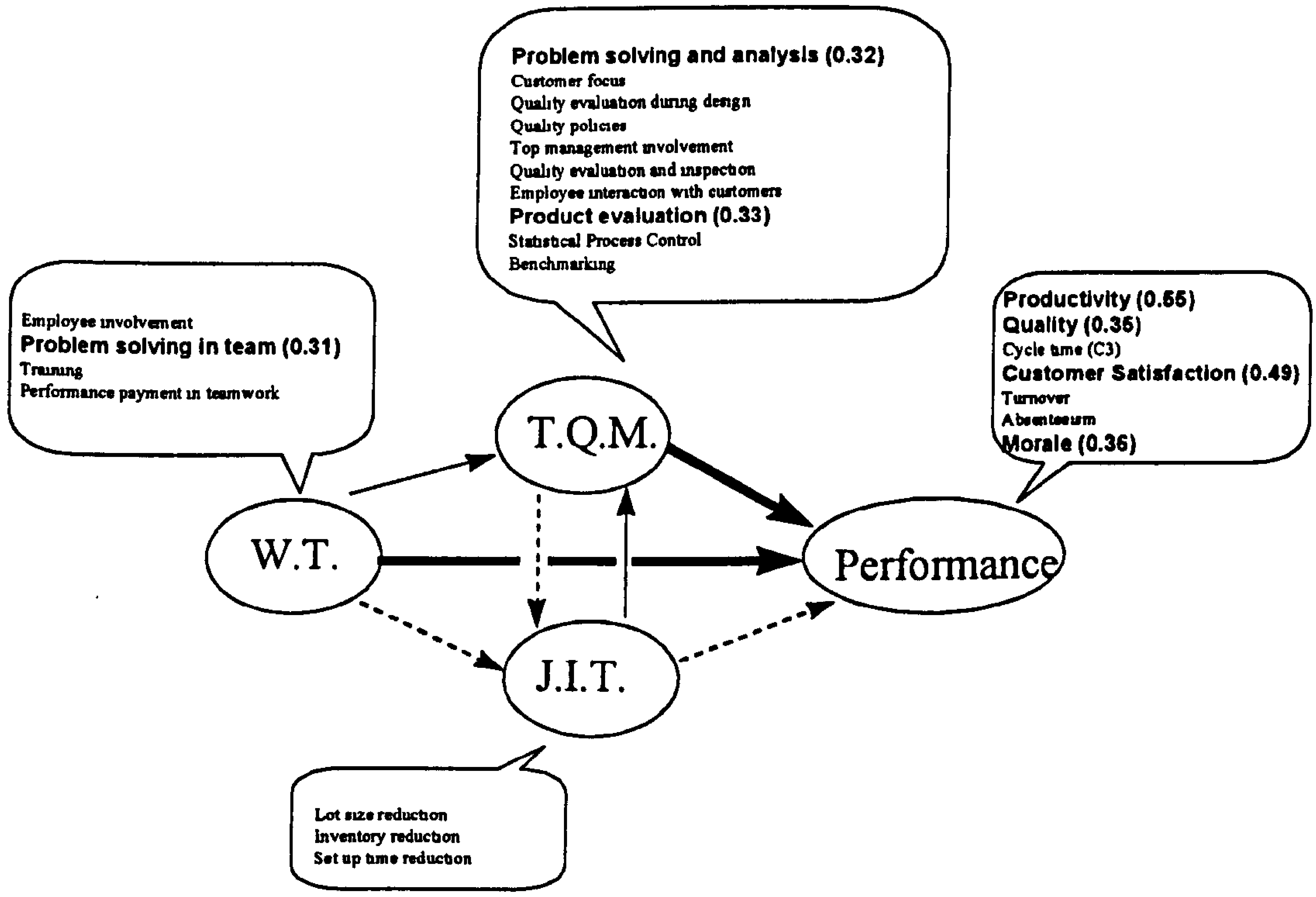


Figure 6.5: Impact of TQM, JIT, and WT practices on the performance of Maquiladora companies

The problem-solving processes that characterise TQM also engender collaboration across functions- problems are viewed as systemic rather than as isolated in particular departments. Similarly, JIT's focus on lead time reduction involves virtually all of a plant's functions in a joint effort.

To identify and resolve problems as they appear on the line, workers must have both a conceptual grasp of the production process and the analytical skills to identify the root cause of problems. Developing an integrated conception of the production system requires that workers directly encounter problems, through the decentralisation of production responsibilities such as quality inspection, equipment maintenance, job specification, and statistical process control (SPC) from specialised inspectors and engineers to shop-floor teams. Developing the skills for this problem-solving requires a variety of multiskilling practices, including extensive off and on the-job training, a few broad job classifications, allowing job rotation within and across teams, and "off-line" group problem-solving activities (for example, employee involvement groups for quality circles).

The multiple skills and conceptual knowledge developed by the work force under flexible production are of little use unless workers are motivated to contribute mental as well as physical effort. Workers will only contribute their discretionary effort to problem-solving if they believe that their individual interests are aligned with those of the company, and that the company will make a reciprocal investment in their well-being. Thus, flexible production is characterised by such "high commitment" human resource policies as employment security, compensation that is partially contingent of performance, and a reduction of status barriers between managers and workers. The company investment in building worker skills also contribute to his "psychological contract" of reciprocal commitment (Cole, 1979; Dore, 1992).

This characteristic of flexible production is also linked to the reduction of buffers and the development of problem-solving capabilities. With no buffers present, any defect can bring the entire system to a standstill, so there is a strong incentive to drive quality defects toward zero. Stopping the line to deal with a quality problem can ultimately boost uptime and productivity if the problem can be traced back to its root cause and eliminated.

Problem-solving efforts are not limited to quality matters. Workers and engineers should work in team and apply their problem-solving abilities to the task of improving equipment performance over time- a process identified by Monden (1983) as "giving wisdom to the machine." As a result, production technology need not be automatically subject to decay and depreciation but can actually appreciate in value over time. The same principle applies to all job specification. Although the basic structure of production jobs is determined by engineers, teams of production workers have responsibility for developing, recording, and modifying job specifications- a process known as "standardised work." These specifications are as detailed as any industrial engineering time study, but with the crucial difference that workers, rather than managers or engineers, take charge of their revision. Thus the problem-solving capabilities that arise from linking lean buffers with enriched human resources can help boost performance by improving the efficiency with which the root cause of quality problems are identified, by helping technology to be used more effectively, and by refining job specification.

In Maquiladoras, heavy emphasis is put on product evaluation which consists of gathering data from customers requirements and suppliers, auditing and evaluating the performance of the product after selling, and measuring the effectiveness of the quality management.

6.4 Conclusions

The study indicates that although companies practice statistically similar TQM, WT, and JIT practices, these practices did not impact their performance in the same measure. The three methods -TQM, WT, and JIT- are much more likely to be effective if implemented jointly rather than independently or sequentially.

There exists synergy among the three programmes, and firms using all three approaches as part of a complete quality and productivity improvement programme are reporting the best results. There appear to be at least two reasons for the synergistic relationship. First, JIT and TQM to be effective involve a complete analysis and overhauling of the production system. If they are narrowly focused on only inventory or quality improvement (respectively) many of the potential gains will be lost. Broadly conceived they implicitly recognise the positive relationship between quality and productivity and thus really have the same objective- design of more effective production system. The second reason for synergy between these programmes is the strong emphasis placed on worker involvement and commitment in TQM and JIT. Work teams integrate nicely with TQM and JIT. The use of TQM practices leads to improved JIT performance by reducing manufacturing process variance. Variance reduction permits safety stock inventory reduction and yields shorter cycle times, both standard measures of JIT performance, through elimination of rework. Conversely, the use of JIT practices is suggested to affect quality performance by reducing lot sizes, which reduces potential scrap and rework associated with JIT induce immediate parts starvation in the event of a obvious benefits for quality performance. Both programmes place heavy responsibility on every employee to perform their jobs excellently and to contribute ideas on how to improve productivity and quality. Work teams have been shown to be an effective way to engender such worker involvement. The combined effects of TQM, WT, and JIT on performance can be observed in the Figure 6.6

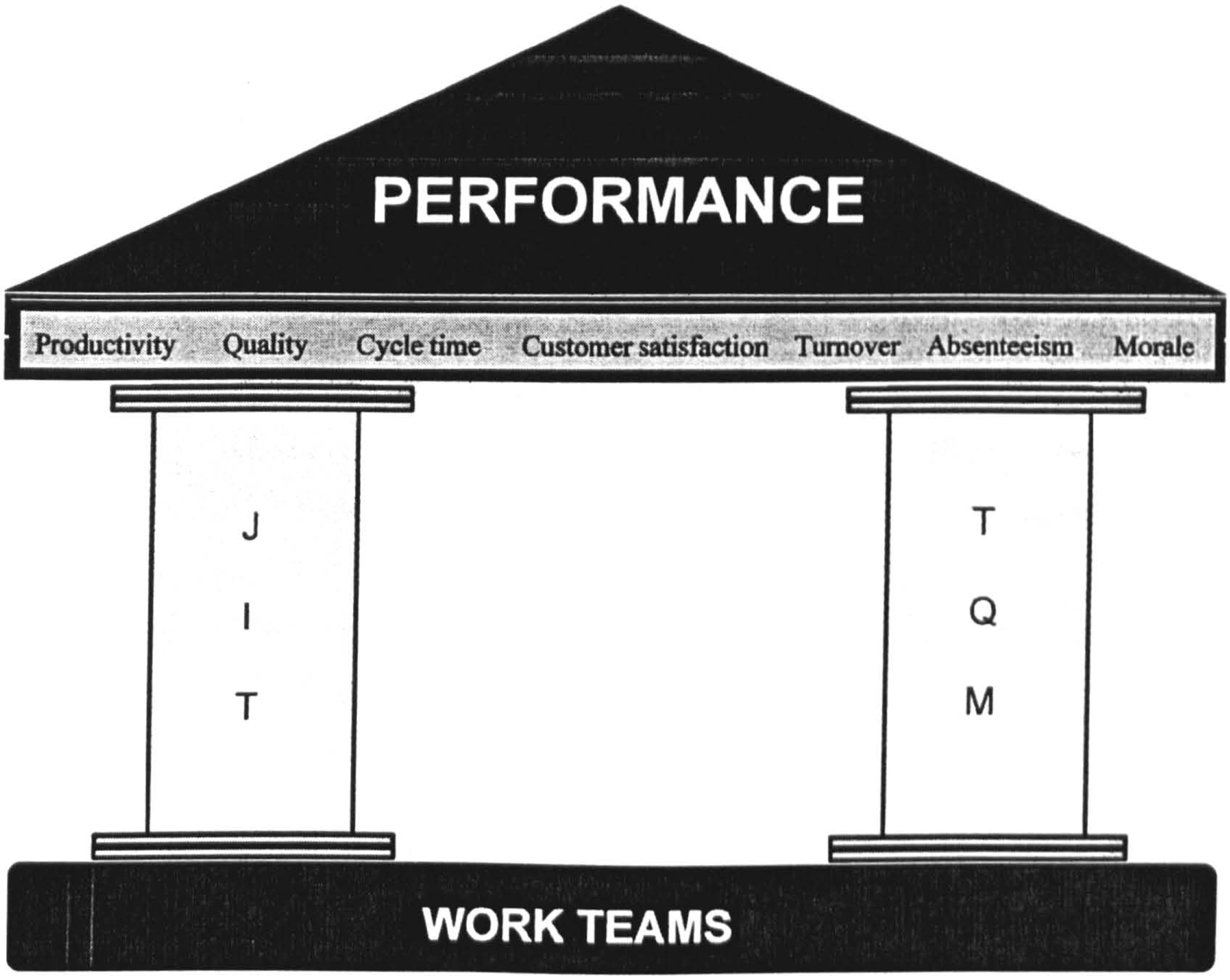


Figure 6.6: Model of the impact of TQM, WT, and JIT on performance

It shows that, TQM, WT, and JIT does not function in isolation, but their combination yields synergies that lead to further performance improvements. The effects of TQM, JIT, and WT practices were shown most saliently through their interactions. TQM practices interacted with common infrastructure practices , JIT practices to reduce cycle time, and WT practices to reduce absenteeism and increase employee morale. As JIT strives to produce in lots of one with minimum inventory, TQM practices help to provide the levels of quality that allow production to proceed with minimum safety stock inventory while remaining on schedule. In addition, TQM practices facilitate cycle time reductions through reducing the time required for rework of defective items and production of non-value-added scrap items. WT worked nicely with both TQM and JIT through problem solving and employee involvement.

JIT practices interacted with common infrastructure practices and TQM practices by exposing opportunities for process improvement and reducing the potential for spoilage and damage through the reduction of inventories. The plants with the best quality performance are given an added boost through JIT's ability to pinpoint problems for subsequent solution using TQM approaches through employee involvement in WT.

Snell and Dean (1992) argued that changes in human resource management are necessary to capture the full benefits of lean manufacturing, and in fact many successful organisations have made such changes (Sheridan, 1988). This implies that, simply implementing a new technology or quality programme will not materially influence performance (Hayes, et. al., 1988). In fact, firms that neglect such organisational and infrastructural changes may actually see their performance decline (Boddy and Buchanan, 1986; Majchrzak, 1988).

A profile emerges for the organisations as to what improvement techniques might be most useful depending on the size of the company. This approach to improvement also will vary depending upon the selected measure performance. This study is in agreement with the Baldrige finalists (US Department of Commerce, 1991), the American Quality Foundation and Ernst & Young (1992) report, and to those of Sluti (1992). This study provided a basis of support necessary to add to a small body of empirical knowledge on how best to improve performance in the firms.

6.5 Implications of the findings for Mexico

This study has significant implications for research and practice of TQM, WT, and JIT in Mexican firms. It shows that, TQM, WT, and JIT does not function in isolation, but their combination yields synergies that lead to further performance improvements. The effects of TQM, JIT, and WT practices were shown most saliently through their interactions. The industrial model to which firms should look to improve their performance is clearly defined in terms of TQM/WT/JIT. Clearly there are many aspects to introducing this model. Wholesale commitment to TQM/WT/JIT principles involve changes in many areas. Labour is just one issue, but an important one. Ebrahimpour and Schonberger (1984) had identified employee training as the only obstacle for implementing these techniques for many developing countries. But firms in Mexico may face additional obstacles.

Employee participation and involvement in problem solving, decision making, and continuous improvement is critical for the model to work. Achieving employee involvement requires a company's commitment to employee training, but the low entry-level of Mexican workers require firms to make even greater commitments to training. Education in Mexico is compulsory through the sixth grade, and is free through the ninth grade. Although Mexican educational levels are among the highest in Latin America, and Latin American educational levels are near the top in the third world, education has not enjoyed as high a priority in Mexico as it has in East Asia (Grunwald, 1991).

Mexican culture is very hierarchical, promoting the creation of well defined lines of responsibility and authority (Kras, 1989), though, could be seen as an obstacle to achieving employee involvement.

Low Mexican wages may also present an obstacle because they make labour based material handling, inspection, and rework look cheap. Mexican unions can present another obstacle. Unions in Mexico are quite strong, benefiting form the Mexican Labour Law and from the official relationship with PRI, the dominant political party in Mexico (Doing Business in Mexico, 1991). Given the high unemployment in Mexico, job creation and job security are important objectives of Mexican unions. These types of objectives have been found to cause conflict with focus on waste elimination in unionised firms (Inman, and Mehra, 1989)

Maquiladoras in Mexico obtain almost 98 percent of their purchases from suppliers located outside Mexico. This reliance on international suppliers creates many obstacles to JIT production. International suppliers are frequently far from the Mexican facility, and several studies (Ansari, and Heckel, 1987; Freeland, 1991; Vickery, 1989) have found that large distances between firms and their JIT suppliers limit the benefits that firms can achieve from JIT operations. The distance increases transportation costs and times, making it harder to justify small-lot deliveries. In addition, the poor infrastructure within Mexico makes transportation times more variable than in developed countries. Border crossing frequently creates additional delays, which further increases costs. All these problems forced companies in the study attempting to use JIT to keep large levels of inventories of their JIT parts.

The Maquiladora industry is now one of the Mexico's most dynamic sector. Despite the jobs created and foreign exchange generated, Maquiladoras have remained on the fringes of the Mexican economy and have contributed little or nothing to advancing industrialisation, technological growth, or international competitiveness (Grunwald, 1991). The assembly plants in the newly industrialised countries (NIC's) of Taiwan, Singapore, Korea, and Hong Kong on which the Mexican Maquiladoras are modelled, have not only led the East Asian countries drive to create a manufacturing industry. They have become a springboard for industrialisation, international competitiveness, and an engine for economic growth.

The situation was quite different in East Asia, where assembly plants quickly emerged from export processing zones to become a part of the national economies. No restriction limited selling output within the country. From the beginning, local firms in the four tigers were involved in assembly industries as subcontractors, in joint ventures, or as suppliers doing assembly work and production for the home market and for export under the same roof. Entrepreneurs, managers, and workers learned technologies and know-how from US parent companies and applied them to production. Soon, local firms supplied most components previously imported from the United States. It did not take long for four tiger firms to make these products from beginning to end. Nor did it take long for them to begin to export their wares (Echeverri-Carrol, 1994).

The NIC governments have clearly perceived that healthy economic development through international competition demands increasing technology, and that technology is transferred through human beings, not sophisticated machines. Only a well-trained work force can absorb new technology, adapt it to local conditions, and improve upon it through innovation. Because technology is ever rising, the work force must be continually upgraded. In East Asia, education has been a top priority. By conveying to the Mexican government the need to train unskilled labour and retrain skilled labour to develop the managerial and engineering skills specific to the Maquiladora industry, to make English a priority in the educational system, and to develop plans jointly to accomplish these objectives, the Maquiladora industry can initiate strategies that have worked well in Asia. The continuing development of the border region relies on the Maquiladora industry taking a proactive, rather than a reactive, role in the process of change.

6.6 Contribution of the study

The current knowledge regarding the impacts of quality and productivity improvement techniques such as Total Quality Management (TQM), Work Teams (WT), and Just In Time (JIT) on performance of the Mexican firms has been advanced as a result of this study. The focus of the study addresses several gaps in the literature. The study uses statistical analysis methods such as factor analysis and canonical correlation analysis, and large sample of empirical evidence from large, medium, small, and Maquiladora firms to investigate the extent to which the quality and productivity improvement techniques impact on selected dimensions of the performance of the companies.

The study focuses on assessment of reliability and validity of the instrument. It is important to conduct a thorough analysis on measurement instrument which are used for the research, for several reasons. First, measurement analysis provides the audience with the assurance that the findings reflect an accurate measure of underlying constructs and that results are believable. This is particularly important when dealing with measures of nonobservable constructs, rather than objective data. Second, publication of complete instruments and their measurement analysis allows other researchers to use the same instruments with different populations, permitting development of the body of knowledge about a particular field. Third, reliable and valid instruments provide a tool for self assessment, benchmarking and longitudinal evaluation of continuous improvement.

The canonical correlation analysis provides an insight into the significance and magnitude of the relationships which facilitates the study of interrelationships among sets of multiple criterion variables and multiple predictors.

The findings of this study indicate the emerging view of the complementary relationships among Total Quality Management (TQM), Work Teams (WT), and Just In Time (JIT) and their impact on the performance and a profile emerges for the organisations as to what improvement techniques might be most useful depending on the size of the company. This study provided a basis of support necessary to add to a small body of empirical knowledge on how best to improve performance in the firms.

6.7 Consideration of limitations to the findings of the study

Different considerations which might have limited the findings of the study will be discussed in this section.

6.7.1 Considerations associated with data and respondents

Subjective measures are used for all the quality management constructs. Using perceptual items measured on a Likert scale of 1 to 5, the constructs capture the perceived extent of quality efforts in a firm. One may argue that the findings based on such perceptual measures only reflect managerial perceptions. However, the information compiled from the perceptions of "key" participants is often closer to reality than an artificial reconstruction of the objective reality based on a focused and limited collection of incomplete objective data gathered independently by researchers themselves (Meredith, 1995). In this study, we used plant managers as "key respondents" to elicit the information. Based on similar studies, we feel that plant managers are one of the most appropriate subjects for such a study.

6.7.2 Considerations associated with Canonical Correlation study

The following limitations should be considered when interpreting Canonical Correlation results: a) the canonical correlation reflects the variance shared by the linear composites of the sets of variables, not the variance extracted from the variables; b) canonical weights derived in computing canonical functions are subject to a great deal of instability; c) canonical weights are derived to maximise the correlation between linear composites, not the variance extracted; and d) it is difficult to identify meaningful relationships between the subsets of independent and dependent variables because precise statistics have not yet been developed to interpret canonical analysis and we must rely on measures such as loadings or cross-loadings (Lambert and Durand, 1975).

6.7.3 Considerations associated with the interpretation of the findings

In this study more emphasis was put on Canonical Cross Loadings than on Canonical Weights or Loadings, although all three were considered when interpreting the Canonical functions. The issue arises about the adequate coefficient value of the Canonical Correlations. Just as with Factor Analysis, these coefficients reflect the importance of the original variables in deriving the Canonical variates. Thus the larger the coefficient, the more important it is in deriving the Canonical variate. The criteria used in this study in interpreting the Factor analysis and Canonical Correlation was that loadings should have value of at least 0.4 to be interpretable. In some cases, especially in Canonical Correlation, values of less than 0.4 were used. This could be considered low but acceptable considering that so many factors influence quality, productivity, cycle time, customer satisfaction, employee turnover, absenteeism, and morale in the measurement of the performance of a company that low Canonical coefficients are almost inevitable in a study such as this.

6.8 Directions for further Research

The directions for further research are based on the objectives, methods, findings and limitations of this study. In this study, a model is derived stating which elements of performance are expected to change as a result of changes in other elements. Data is gathered from a body of manufacturing plants. The sample is comprised of data which represents change over three to five years. Questions ask, what have the plants been doing, what have their outcomes been and are these outcomes associated with the actions.

Replication of the study using a larger sample will allow the inclusion of refined measures to further illuminate the impact of the quality improvement techniques on the performance.

Further research needs to work on continuing to improve the reliability of the scales. Although the Cronbatch's Alpha values were considered encouraging for newly developed scales, Nunnally (1978) suggests that frequently used scales should have a minimum Alpha value of 0.80, and many established scales consistently reflect Alpha values of 0.90 and above. This can be accomplished by continuing to add and modify items, based on feedback obtained by testing the scales in various samples. It is important to test these scales using samples from other populations, in order to enhance their generalisability.

Further work improving these scales and the underlying model should serve to further demonstrate and improve their reliability and validity. Reliable and valid scales are an important means of self-assessment for an organisation, and should provide a key input into planning efforts, providing a factual basis for making decisions in areas which are often difficult to quantify. The use of reliable and valid measurement scales may be a vital part of benchmarking an organisation's performance against referent organisations.

SEM (Structural Equation Modelling) methodology could be used in the future studies because of the additional insights provided in SEM findings. This methodology provides a high potential for improving research on management issues. Studies by Rohrer (1990) and Miller (1991) testify to the growing use of SEM in business research.

Multiple regression analysis could be used in the future research to study the impact of the improvement techniques on a single dimension of the performance. This methodology depends on observed variables to evaluate associations between one dependent (criterion) variable and a set of multiple independent (predictor) variables. In this study, Canonical Correlation analysis was used, since the interest was in finding interrelationships among sets of multiple criterion (dependent) variables and multiple predictor (independent) variables.

Despite the care taken to identify the respondents, the perceptions data on subjective measures may be ambiguous. In future, these subjective measures may be complemented by objective data on the constructs whenever possible to improve the reliability of the findings. Also, when one collects data from managers about their own organisations, and specifically about managerial issues with which they are closely associated, there is a potential for self-reporting bias. Future research should seek multiple responses from each firm to reduce this bias. However, identification of respondents with appropriate functional background and management level represents a challenge in this regard. Also, simply a firm may not necessarily reflect the true status of quality efforts in that firm and care should be taken while aggregating them.

APPENDICES

APPENDIX 1: STATISTICAL ANALYSIS METHODS

Reliability and Validity Analysis

Factor Analysis

Cattell's Salient Similarity Index

Canonical Correlation Analysis

STATISTICAL ANALYSIS METHODS

In this section the statistical analysis methods used in this research such as Factor Analysis, Cattell's Salient Similarity Index for group comparison, and canonical Correlation analysis will be described. This section defines the manner of parameter selection, use, analysis, and interpretation of each statistical analysis methods.

A.1 Reliability and Validity Analysis

Measurement analysis begins with assessing the instrument's reliability, or the ability of its scales to consistently yield the same response. Collecting data with an unreliable scale is like taking measurements with an elastic tape measure, the same thing can be measured a number of times, but it will yield a different length each time (Flynn, et. al, 1990). Individual measurements will differ, although the dimension being measured has not changed. One of those measurements may, indeed, be correct, but it is impossible to tell which it is. Once a scale has been determined to be reliable, its validity can be assessed. Validity is a scale's ability to measure what it sets out to measure.

A.1.1 Unidimensionality analysis

Unidimensionality is a necessary condition for reliability analysis and construct validation (Anderson and Gerbing, 1991). Items in a unidimensional scale estimate one single construct. In the absence of unidimensionality, a single number cannot be used to represent the value of a scale (Venkatraman, 1989). Factor Analysis was used to assess the unidimensionality of a scale (Ahire, Golhar, and Waller, 1996).

A.1.2. Reliability analysis

The reliability analysis of a measurement instrument determines its ability to yield consistent measurements. Reliability was operationalised as internal consistency, which is the degree of inter-correlation among the items which comprise a scale (Nannally, 1978) is evaluated through the use of Cronbach's coefficient Alpha which is a common indicator used to assess the reliability of measurement instruments (Peter, 1979).

In order initially to assess the internal consistency of the scales, Coefficient Alpha was calculated for each scale (Cronbach, 1951). Although an Alpha value of 0.70 is often considered the criterion for internally consistent established scales , Nunnally (1978) states that permissible Alpha values can be lower for new scales, suggesting the use of a minimum Alpha value of 0.60. Because in this study we are concerned with new scales, we used a criterion Alpha value of 0.60.

SAS calculations provided the correlation matrix of responses which was used for calculation of coefficient Alpha.

A.1.3 Validity analysis

Content validity represents the adequacy with which a specific domain of content has been sampled (Nunnally, 1978), in other words, whether the instrument is truly representative of the "defined universe". The two standards for ensuring content validity described by Nunnally are whether the instrument contains a representative collection of items and whether "sensible" methods of test construction were used.

Construct validity is concerned with the questionnaire as a measurement of an underlying construct. A high degree of correlation between the questionnaire and other scales that measure the same constructs provides evidence of construct validity. This validity can also be evaluated by a low correlation between the questionnaire and other scales that measure a different construct.

Construct validity was established by assessing *convergent* and *discriminant validities* by using Principal Component Factor Analysis (PCA) on each predefined variable (Churchill, 1979) and discriminant validity is verified through a joint domain PCA (Kerlinger, 1978). In both cases, the three decision rules commonly employed for factor identification which are 1) minimum eigenvalue of 1, or a minimum cumulative variance explained of 70 percent, 2) minimum factor loading of 0.4 for each indicator item, and 3) simplicity of factor structure (Nunnally, 1978), were used.

A.2 Factor Analysis

Factor analysis is a generic name given to a class of multivariate statistical method whose primary purpose is data reduction and summarisation. It addresses itself to the problem of analysing the interrelationships among a large number of variables (such as questionnaire responses) and then explaining these variables in terms of their common underlying dimensions (factors).

A.2.1 Purposes of Factor Analysis

The general purpose of factor analysis techniques is to find a way of condensing and summarising the information contained in a number of original variables into a smaller set of new composite dimensions (factors) with a minimum loss of information. More specifically it can perform the following functions:

1. Identify a set of dimensions that are latent in a large set of variables (considered as R factor analysis).
2. Devise a method of combining or condensing large numbers of people into distinctly different groups within a larger population (referred to as Q factor analysis).
3. Identify appropriate variables for subsequent regression, correlation or discriminant analysis from a much larger set of variables.
4. Create an entirely new set of a smaller number of variables to partially or completely replace the original set of variables for inclusion in subsequent regression, correlation or discriminant analysis.

A.2.2 Factor Analysis Decision Diagram

Figure A.1 shows the general steps followed in any application of factor analysis techniques.

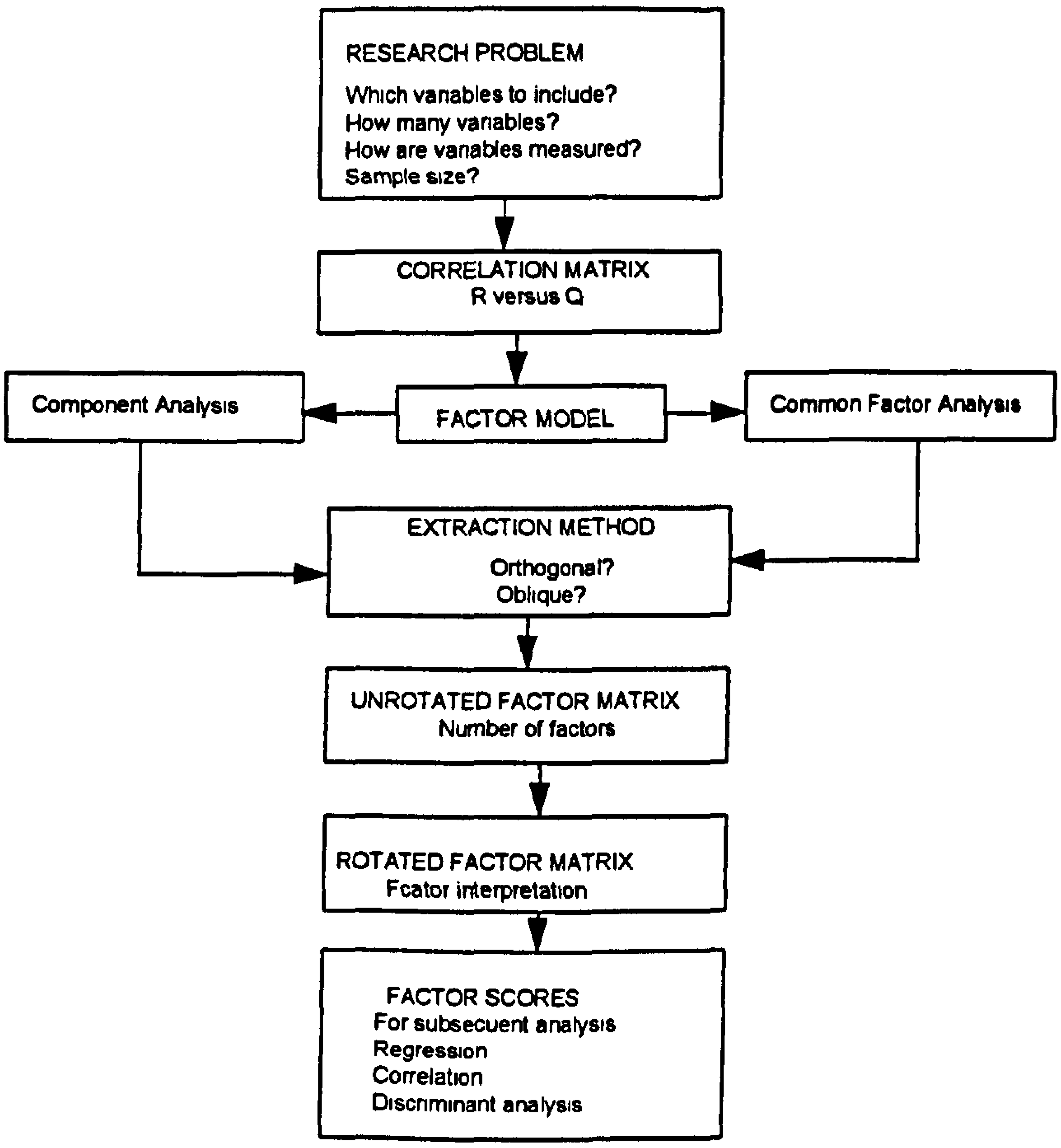


Figure A.1: General steps of factor analysis techniques

One of the first decisions in the application of factor analysis involves the calculation of a correlation matrix. Based upon the research problem, the analyst must define the relevant universe for analysis. The alternative would be to examine either the correlation between the variables or the correlation between the respondents. If the objective of the research is to summarise the characteristics, the factor analysis would be applied to a correlation matrix of the variables. This is referred to as *R factor analysis.* Factor analysis also may be applied to a correlation matrix of individual respondents. This type is called *R factor analysis.*

The two most frequent variations of the general factor model are (principal) component analysis and common factor analysis. Selection of the factor model depends upon the objective of the research. The component model is used when the objective is to summarise most of the original information (variance) in a minimum number of factors for prediction purposes. In contrast, common factor analysis is used primarily to identify underlying factors or dimensions not easily recognised.

There are two options available for extracting factors: orthogonal factors and oblique factors. In an orthogonal solution, the factors are extracted in such a way that factor axes are maintained at 90 degrees, meaning that each factor is independent of all other factors. Therefore, the correlation between factors is arbitrarily determined to be zero. As the term *oblique* implies, the factor solution is computed so that the extracted factors are correlated. Oblique solutions assume that the original variables or characteristics are correlated to some extent; therefore, the underlying factors must be similarly correlated. If the goal of the research is to reduce a large number of variables to a smaller set of uncorrelated variables for subsequent use in a regression or other prediction technique, an orthogonal solution is the best. However, if the ultimate goal is to obtain several meaningful factors or constructs, an oblique solution is appropriate.

By examining the unrotated factor matrix, one can explore the data reduction possibilities for a set of variables and obtain a preliminary estimate of number of factors to extract. Final determination of the number of factors is reached after the factor matrix is rotated and the factors are interpreted.

A.2.3 Common Factors and Component Analysis

To select the appropriate model, one must understand something about the types of variance. For the purpose of factor analysis, total variance consists of three kinds: 1) common, 2) specific, and 3) error. Common variance is defined as the variance in a variable that is shared with all other variables in the analysis. Specific variance is that variance associated with only a specific variable. Error variance is that due to unreliability in the data gathering process or a random component in a measured phenomenon. When using component analysis, the total variance is considered and hybrid factors are derived that contain small portions of unique and in some instances error variance, but not enough in the first few factors to distort the overall factor structure. Specifically, with component analysis, unities are inserted in the diagonal of the correlation matrix. Conversely, with the common factor analysis, Communalities are inserted in the diagonal, and the factors are derived based only on the common variance.

The selection of one model over the other is based upon two criteria: 1) the objective of the research and 2) the amount of prior knowledge about the variance in the variables.

When the objective is about prediction, determining the minimum number of factors needed to account for the maximum portion of the variance represented in the original set of variables, and there is prior knowledge suggesting the unique and error variance represent a relatively small proportion of the total variance, the appropriate model is the component analysis model. In contrast, when the primary objective is to identify the latent dimensions or constructs represented in the original variables, and there is little knowledge available about the amount of unique or error variance, and therefore to eliminate this variance, the appropriate model is common factor analysis.

A.2.4 The Rotation of Factors

As was pointed out in the decision diagram, there are two stages involved in the derivation of a final factor solution. First, the initial unrotated factor matrix is computed to assist in obtaining a preliminary indication of the number of factors to extract. In computing the unrotated matrix, the best linear combination of variables is of interest- best in the sense that the particular combination of original variables would account for more of the variance in the data as a whole than any other linear combination of variables. Therefore, the first factor may be viewed as the single best summary of linear relationships exhibited in the data. The second factor is defined as the second best linear combination of variables. Subsequent factors are defined similarly until all the variance in the data is exhausted.

The unrotated factor solution may or may not provide a meaningful patterning of variables. If the unrotated factors are expected to be meaningful, one may specify that no rotation be performed. Generally, rotation will be desirable because it simplifies the factor structure and because it is usually difficult to determine whether unrotated factors will be meaningful or not.

Figure A.2 illustrate the concept of factor rotation, in which five variables are depicted in a two-dimensional factor diagram.

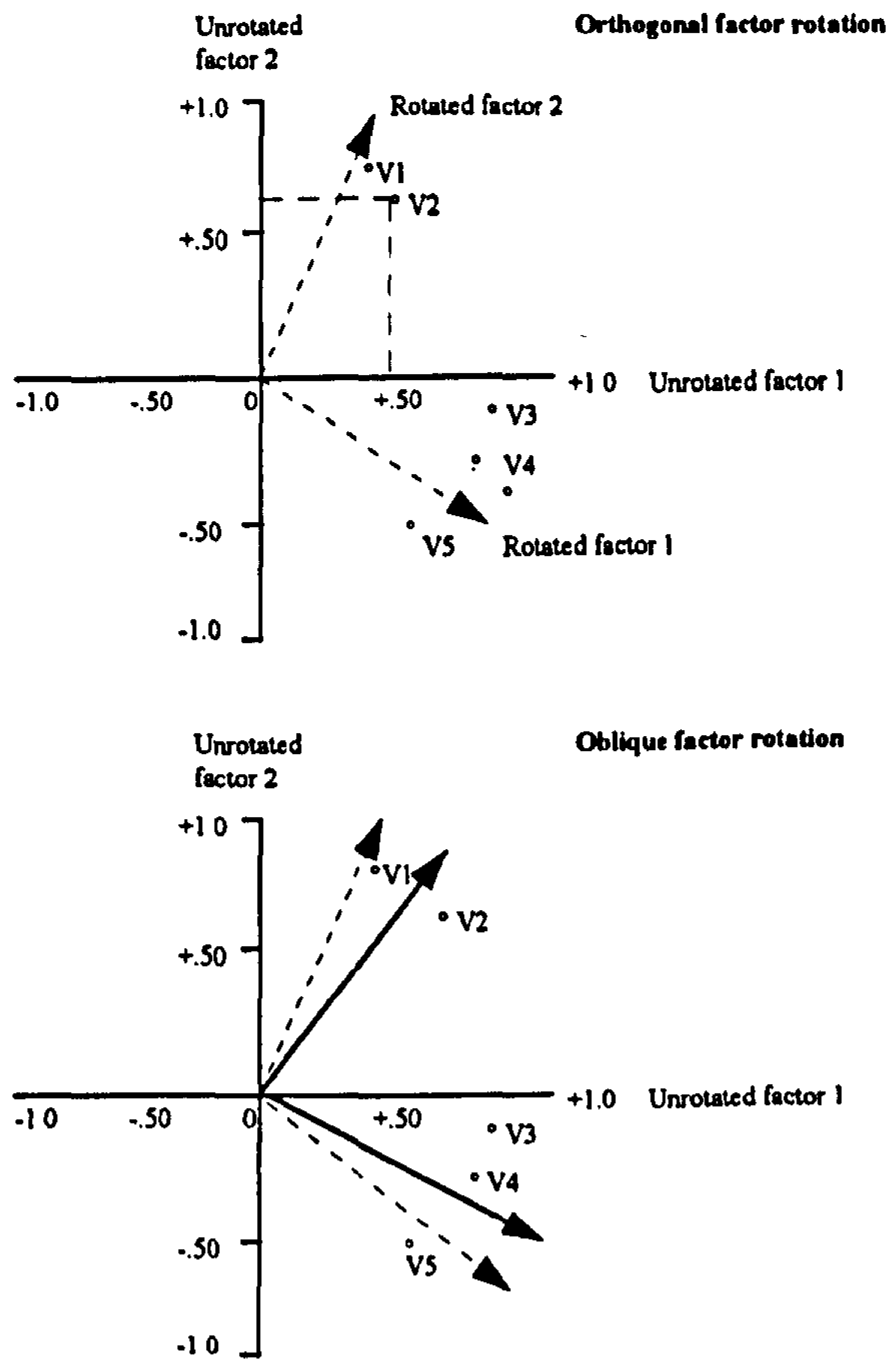


Figure A.2: Two-dimensional factor diagram (Hair, et. al., 1986)

The vertical axis represents the unrotated factor II and the horizontal axis represents unrotated factor I. The axes are labelled with a 0 at the origin and extending outwards up to a +1.0 or a -1.0. The numbers on the axes represent the factor loadings. The variables are labelled V_1, V_2, V_3, V_4, and V_5. The factor loading for variable 2 on the unrotated factor II would be determined by drawing a dashed line horizontally to the vertical axis for factor II. Similarly, a vertical would be drawn from variable 2 to the horizontal axis of the unrotated factor I in order to determine the loading of variable 2 on factor I. A similar procedure would be followed for the remaining variables until all the loadings are determined for all factor variables.

Most factor analysts agree that many direct unrotated solutions are not sufficient. That is, in most cases rotation will improve the interpretation by reducing some of the ambiguities that often accompany the preliminary analysis. The major option available for rotation is the orthogonal or oblique method. Orthogonal rotational approaches are more widely used because all computer packages performing factor analysis contain orthogonal rotation options, and also because the analytical procedures for performing oblique rotations are not as well developed and are subject to considerable controversy. When the objective is to utilise the factor results in a subsequent statistical analysis, an orthogonal rotation procedure should always be chosen.

There are three major orthogonal approaches available. They are QUARTIMAX, VARIMAX, and EQUIMAX. The goal of a QUARTIMAX rotation is to simplify the rows of a factor matrix. In contrast, the VARIMAX criterion centres on simplifying the columns of the factor matrix. As with EQUIMAX, rather than concentrating either on simplification of rows or columns, it tries to accomplish some of each.

The VARIMAX method has proven very successful as an analytic approach to obtaining an orthogonal rotation of factors. In most cases, the VARIMAX rotational option is used, which is a standard output of the computer programmes used.

A.2.5 Criteria for the Number of Factors to be Extracted

An exact quantitative basis for deciding the number of factors to extract has not been developed. However, the following stopping criteria for the number of factors to extract are currently being used.

Latent Root Criterion. This is the most commonly used technique. The rule is very simple to apply, but it varies depending on whether component analysis or common factor analysis has been chosen. In component analysis only the factors having latent roots (eigenvalues) greater than 1 are considered significant and all factors with latent roots less than 1 are considered insignificant and disregarded.

When the common factor model is chosen, any positive eigenvalue obtained indicates that the factor qualifies for examination.

A Priori Criterion. When applying this criterion, the analysts already knows how many factors to extract before undertaking the factor analysis. The analyst simply instructs the computer to stop the analysis when the desired number of factors has been extracted. This approach is useful if the analyst is testing a theory or hypothesis about the number of factors to be extracted.

Percentage of Variance Criterion. In this criterion, the cumulative percentages of the variance extracted by successive factors is used. In hard sciences the factoring procedure usually should not be stopped until the extracted factors account for at least 95 percent of the total variance. In contrast, the social sciences, where information is often less precise, it is common to consider a solution that accounts for 60 percent of the total variance.

Scree Test Criterion. This criterion is used to identify the optimum number of factors that can be extracted before the amount of unique variance begins to dominate the common variance structure. The scree test is derived by plotting the latent roots against the number of factors in their order of extraction, and the shape of the resulting curve is used to evaluate the cut-off point. The point at which the curve first begins to straighten out is considered to indicate the maximum number of factors to extract. As a general rule, scree test will result in one to three more factors being considered as significant than will be latent root criterion.

In practice, in most factor analysis studies, seldom is a single criterion used in determining how many factors to extract. Instead, initially a latent root criterion is used as a guideline for the first rotation. Then several additional trial rotations are undertaken, and by considering the initial criterion and comparing the factor interpretations for several different trial rotations, the number of factors to extract can be selected based upon the initial criterion and the factor structure that best represents the underlying relationship of the variables.

A.2.6 Criteria for the Significance of Factor Loading

In interpreting factors, a decision must be made regarding which factor loadings are worth considering.

1. A rule of thumb that is often used is: factor loadings greater than ±0.30 are considered significant. Loadings ±0.40 are considered more important, and if the loadings are ±0.50 or

greater, they are considered very significant. Thus, the larger the absolute size of the factor loading, the more significant the loading is in interpreting the factor matrix.

2. A similar approach to that of interpreting correlation coefficients can be used. Specifically, loadings of at least ±0.19 and ±0.26 are recommended for the 5 and 1 percent levels, respectively, when the sample size is 100. When the sample size is 200, ±0.14 and ±0.18 are recommended, and when the sample size is at least 300, loadings of ±0.11 and ±0.15 are recommended.

The criteria for the significance of factor loading can be summarised in the following way: (1) the larger the sample size, the smaller the loading to be considered significant; (2) the larger the number of variables being analysed, the smaller the loading to be considered significant; (3) the larger the number of factors, the larger the size of the loading on later factors to be considered significant for interpretation.

A.2.7 Interpreting a Factor Matrix

To begin the interpretation, one should start with the first variable on the first factor and move horizontally from left to right, looking for the highest loadings for that variable on any factor. When the highest loading (absolute) is identified, if it is significant the analyst should underline it. This procedure should continue for each variable until all variables have been underlined once for their highest loading on a factor.

It is possible that some variables may have several moderate-sized loadings, all of which are significant, and the job of interpreting is much more difficult. This is because a variable with several significant loadings must be considered in interpreting (labelling) all the factors on which it has a significant loading. The analyst should try to minimise the number of significant loadings on each row of the factor matrix (loadings associated with one variable) and to maximise the number of loadings with negligible values.

Once all the variables have been underlined on their respective factors, the analyst should examine the factor matrix to identify variables that do not load on any factor. In this case the variable(s) should be ignored.

When a factor solution has been obtained in which all significant variables are loading on a factor, the analyst attempts to assign some meaning to the pattern of factor loadings. Variables with higher loadings are considered more important in factor interpretation. They greatly influence the name or label selected to represent a factor. The analyst should assign a name or label to a factor that accurately reflects to the greatest extent possible what the several variable loading on that factor represent.

The signs are interpreted just as with any other correlation coefficients. On each factor, like signs mean that the variables are positively related and opposite signs mean that the variables are negatively related, although, this rule can be totally reverted. In orthogonal solutions, the factors are independent of each other. Therefore, the signs for a factor loading relate only to the factor that they appear on not to other factors in the solution.

A.2.8 Adequacy of Extraction and Number of Factors

When using principal component as the method of extraction, the more factors one permits, the better the fit and the greater the percent of variance in the data "explained" by the factor solution. However, the greater the number of factors included, the less parsimonious the solution.

Eigenvalues represent variance. Because the variance that each standardised observed variable contributes is 1 (or less), any factor with an eigenvalue less than 1 is not as important, from a variance perspective, as an observed variable. The number of factors with eigenvalues greater than 1 is an estimate of the maximum number of factors.

As a second estimate, the Scree test on the percent of variance accounted for each of the factors in the solution can be used.

A.2.9 Estimate of Communalities

Communality values are used in an effort to produce a solution in which factor structure is uncontaminated by the unique and error variabilities associated with each observed variable.

Communality represents the proportion of variance in a variable that is predicted from the factors underlying it.

The loadings in the rows of a factor matrix can be squared and summed. The sum of squares for each row indicates the proportion of variance in each variable which the factors can explain. This is known as h^2, the communality. The higher the communality the more the particular set of factors explain the variance of the variable.

A.2.10 Importance and Internal Consistency of Factors

The importance of a factor (or a set of factors) is probably best evaluated by the proportion (or percent) of variance or covariance explained by the factor after rotation.

The proportion of variance accounted for by a factor indicates the amount of variance in the original variables (where each has contributed a unit of variance) that has been condensed into a factor. The proportion of covariance accounted for by a factor indicates the relative importance of the factor to the total variance accounted for by all factors combined. All factors combined are likely to account for only a fraction of the total variance in the original solution.

An estimate of the internal consistency of the solution- the certainty with which common factor axes are fixed in the variable space- is given by the Squared Multiple Correlations (SMC) of the factors predicted from scores on the observed variables. The larger the SMCs, the more stable the factors and the greater the confidence with which interpretations may be assigned to them.

A.2.11 Interpretation of Factors

To interpret a factor, one tries to understand the underlying dimension that unifies the group of variables defining it.

After the orthogonal rotations, the values in the loading matrix are correlations between the variables and the factor, the weighted combination of variables which best explains the variance. The squared factor loading of variables indicate the percentage of variance of that variable explained by the factor.

As a rule of thumb, loadings in excess of ±0.30 indicates at least a 9% overlap in variance between the variable and the factor. The greater the overlap between a variable and a factor, the more that variable is a pure measure of that factor. Comrey (1970) suggests that loadings in excess of ±0.71 (50% variance) are considered excellent, ±0.63 (40%) very good, ±0.55 (30%) good, ±0.45 (20%) fair, and ±0.32 (10% of variance) poor.

Because the size of loadings reflects, to some extent, the homogeneity of scores in the sample, if homogeneity is suspected, interpretation of lower loadings may be warranted.

1. In most cases the first factor explains far more variance than the other components.

2. If most of the correlations in the correlation matrix are positive, the first principal component has large positive loadings on most of the variables. This is called general factor.
3. Subsequent factors are usually bipolar, that is they have both negative and positive loadings. They often are interpreted in terms of two quite different aspects at opposite poles of the underlying factor.

A.3 Cattell's Salient Similarity Index

Frequently a researcher is interested in deciding whether or not two groups that differ in experience or characteristics share the same latent structure. These comparisons may involve the *pattern* of the correlations between variables and factors, or both the *pattern and magnitude* of the correlations between them.

The first step in comparing factors from two different samples is to generate them. For purposes of comparison, it is critical that similar procedures to be employed at the various stages of analysis with the data sets to be compared. Similar variables should be included during data collection. Similar procedures for handling missing data and outliers should be employed. Variable transformation, if used, should be applied toward goals with the same variables in both data sets. Extractional and rotational techniques should be the same, as should be the criterion for determining number of factors. If factor scores are to be compared, they should be generated by the same procedures.

After the data set has been factor analysed, a careful inspection of the loading matrices for both groups may reveal similarities or differences in factor structure sufficiently obvious as to dispel the need for more formal procedure. When the same criteria were used, did both groups generate the same number of factors? If not, there is a obvious difference in overall structure. Do almost the same variables load highly on the different factors for the two groups? Could you reasonably use the same labels to name factors for both groups? If all three questions are answered in the affirmative, it may be unnecessary to proceed to statistical comparisons.

Most of the more formal numerical comparisons are performed on either the loading matrix or the pattern matrix. The magnitude of loadings may be influenced by extraneous features of data collection (such as homogeneity of a sample for factors being compared). *Cattell's salient similarity index, s,* is sensitive to pattern of loadings, while the *Pearson correlation coefficient, r,* is sensitive to both pattern and magnitude of loadings.

In calculating s, the first step is to construct a two-way frequency table with pairs of loadings for each variable on each factor contributing a single tally to the table according to whether the loadings are positively salient (PS)- coincidence of positive significant loadings in the same variable, negatively salient (NS)- coincidence of negative significant loadings in the same variable, or neither (hyperplane or HP) on each of the factors being compared. Cattell used a cut of 0.10 for determining salience; loadings at or above 0.10 were salient while lower ones were not. A cut of 0.40 in loadings will be employed in this study. Once the frequency table in constructed, *s*, is calculated as follows:

$$s = \frac{C_{11} + C_{33} - C_{13} - C_{31}}{C_{11} + C_{33} + C_{13} + C_{31} + 0.5(C_{12} + C_{21} + C_{23} + C_{32})}$$

The C values in the equation represent frequency counts in cells in the frequency table.

		Set 1		
		PS	HP	NS
Set 2	PS	C11	C12	C13
	HP	C21	C22	C23
	NS	C31	C32	C33

Probabilities must be assessed with respect to both the number of variables *p*, and the percentage of cases that fall into the hyperplane of the pair of factors being compared: 60%, 70%, 80%, or 90%. If a value of *s* exceeds that of *vs* for some hyperplane percentage and number of variables, then the factors are similar at the corresponding level of probability.

A.4 Canonical Correlation

Canonical correlation analysis is a multivariate statistical model that facilitates the study of interrelationships among sets of multiple criterion (dependent) variables and multiple predictor (independent) variables. That is, whereas multiple regression predicts a single dependent variable from a set of multiple independent variables, canonical correlation predicts multiple dependent variables from multiple independent variables.

A.4.1 Objectives of Canonical Analysis

Canonical correlation analysis is the most generalised member of the family of multivariate statistical techniques (which includes multiple correlation, regression, and discriminant analysis) and is directly related to principal components-type factor analytic models. The goal of canonical correlation is to determine the primary independent dimensions that relate one set of variables to another. In particular, the objectives may be any or all of the following:

1. Determining whether two sets of variables (measurements made on the same objects) are independent of one another or, conversely, determining the magnitude of the relationships that may exist between the two sets.
2. Deriving a set of weights for each set of criterion and predictor variables such that the linear combinations themselves are maximally correlated.
3. Deriving additional linear functions that maximise the remaining correlation, subject to being independent of the preceding set (or sets) of linear compounds.
4. Explaining the nature of whatever relationships exist between the sets of criterion and predictor variables, generally by measuring the relative contribution of each variable to the canonical functions (relationships) that are extracted.

As noted from the preceding description, canonical analysis is a method for dealing mainly with composite association between sets of multiple criterion and predictor variables. By using this technique, it is possible to develop a number of independent **canonical functions** that maximise the correlation between the linear composites of sets of criterion and predictor variables.

A.4.2 Deriving the Canonical Functions

The basic input data for canonical correlation analysis are two sets of variables. One set could be defined as the independent variable and the other as the dependent variable. The logic of canonical correlation involves the derivation of a linear combination of variables from each of the two sets of variables so that the correlation between the two linear combinations is maximised.

The application of canonical correlation does not stop with the derivation of a single relationship between the sets of variables. Instead, a number of pairs of linear combinations- referred to as **canonical variates**- may be derived. The maximum number of canonical variates (functions) that can be extracted from the sets of variables equals the number of variables in the smallest data set, independent or dependent.

The derivation of successive canonical variates is similar to the procedure used with unrotated factor analysis. That is, the first factor extracted accounts for the maximum amount of variance in the set of variables. Then the second factor is computed so that it accounts for as much as possible of the variance not accounted for by the first factor, and so forth, until all factors are extracted. Therefore, successive factors are derived from residual or leftover variance from earlier factors. Canonical correlation analysis follows a similar procedure but focuses on accounting for the maximum amount of the relationship between the two sets of variables rather than within a single set of variables. The result is that the first pair of canonical variates is derived so as to have the highest intercorrelation possible between the two sets of variables. The second pair of canonical variates is then derived so that it exhibits the maximum relationship between the two sets of variables (variates) that was not accounted for by the first pair of variates. The successive pairs of canonical variates are based on residual variance, and their respective canonical correlations (which reflect the interrelationships between the variates) become smaller as each additional function is extracted. As the successive pairs of canonical variates are based on residual variance, therefore, each of the pairs of variates is orthogonally independent of all other variates derived from the same set of data.

A.4.3 Information Available from Canonical Analysis

The four most important types of information derived through canonical correlation analysis are (1) the canonical variates, (2) the canonical correlation between the variates,

(3) the statistical significance of the canonical correlations, and (4) the redundancy measure of shared variance for the canonical functions.

Each canonical function consists of a pair of variates, one for each of the subsets of variables entered into the analysis. In other words, each canonical function has two variates, one representing the independent variables and the other the dependent variables. The canonical variates are interpreted on the basis of a set of correlation coefficients, usually referred to as **canonical loadings** or **canonical structure correlation.** Just as with factor analysis, these coefficients reflect the importance of the original variables in deriving the canonical variates. Thus the larger the coefficient, the more important it is in deriving the canonical variate. Also, the criteria for determining the significance of canonical structure correlations are the same as with factor loadings.

The two other types of information provided by a canonical analysis are the canonical correlations and their perspective levels of statistical significance. The strength of the relationship between the pairs of variates is reflected by the canonical correlation. When squared, the canonical correlation represents the amount of variance in one canonical variate that is accounted for by the other canonical variate. This also may be referred to as a shared variance between the two canonical variates. Squared canonical correlations are referred to as canonical roots or eigenvalues. As with all correlation coefficients, canonical or otherwise, various statistics can be utilised to assess their level of significance -usually expected to be at or beyond the 0.05 level to be considered significant.

The last type of information of concern is the redundancy measure of shared variance. Using the canonical root as the only measure of shared variance may lead to some misinterpretation. As a result, a redundancy measure can be computed to provide additional information concerning the variance shared by the two sets of variables.

A.4.4 Typical output

Typical output used examining the results of canonical correlation includes (1) the corrected sums-of-squares and cross-products matrix for group 1 (criterion variables); (2) the corrected sums-of-squares and cross-products matrix for group 2 (predictor variables); (3) the corrected between cross-products matrix; (4) means of canonical variables for groups 1 and 2; (5) canonical correlations; (6) Wilks' lambda, Pillai's criterion, Hotelling's trace, and Roy's greatest root; (7) error degrees of freedom for each Rao's approximate F statistic; (8) canonical loadings; (9) canonical cross-loadings; (10) canonical weights; and (11) canonical R-square.

A.4.5 Interpretation of Canonical Functions

As with research using other statistical techniques, the most common practice is to analyse those functions whose canonical correlation coefficients are statistically significant beyond some level, typically **0.05** or above. Thus variables in each set that contribute heavily to shared variances for these functions are considered to be related to each other. The other independent functions are deemed insignificant, and the relationships among the variables are not interpreted.

It is recommended that three criteria should be interpreted instead of using a single criterion such as the level of significance which could be too superficial. The three criteria are (1) the **level of statistical significance** of the function, (2) the magnitude of the **canonical correlation**, and (3) the **redundancy measure** for the percentage of variance accounted for from the two data sets. Finally, interpretation requires examination of the canonical loadings to determine how the original variables from the two data sets are related.

A.4.5.1 Level of Significance

The level of significance of a canonical correlation that is generally considered to be the minimum for interpretation is the 0.05 level. The 0.05 level (along with the 0.01 level) has become the generally accepted level for considering a correlation coefficient statistically insignificant. This consensus has developed largely because of the availability of tables for these levels, borrowed from other disciplines where higher confidence levels are desired. These levels are not necessarily required in all situations, however, and researchers from various disciplines frequently must rely on results based on lower levels of significance.

Several statistics can be used for evaluating the significance of canonical roots. The most widely used test, and the one normally provided by computer packages, is the F statistic based on Rao's approximation (Hair, et. al., 1986)

The only potential source of confusion is the meaning of the chain of significance tests: The first test is for all pairs taken together and essentially tests for independence between the two sets of variables; the second test is for all pairs of variates with the first and most important pair of canonical variates removed; the third is done with the first two pairs removed, and so forth. If the first test, but not the second, reaches significance, then only the first pair of canonical variates should be interpreted. If the first and second tests are significant but the third is not, then the first two pairs of variates are interpreted, and so on. Because canonical correlations are reported in descending order of importance, usually only the first few pairs of variates are significant.

The level of significance of a canonical correlation is generally applied when either the data are normally distributed or when dealing with large sample together with an extreme p-value.

A.4.5.2 Magnitude of the Canonical Relationships

Once significance is established, amount of variance accounted for is of critical importance. Because there are two sets of variables, several assessment of variance are relevant. The first, and easiest, is the variance overlap between each pair of significant variates. Overlapping variance for a pair is the eigenvalue, or the squared canonical correlation, for the pair. Because canonical correlation values of 0.30 or less represent , squared, less than 10% of the variance, most researchers do not interpret pairs with a canonical correlation lower than 0.30 even if significant (Tabachnick and Fidell, 1989). The size of the canonical correlations also should be considered in deciding which functions to interpret. It seems logical that the guidelines suggested for significant factor loadings might be useful with canonical correlations. This is particularly true when one considers the fact that canonical correlations refer to the variance explained in the canonical variates (linear composites), not the original variables.

A.4.5.3 Redundancy Measure of Shared Variance

Recall that squared canonical correlations (roots) provide an estimate of the shared variance between the canonical variates. Although this is a simple and appealing measure of the shared variance, it may lead to some misinterpretation, because the squared canonical correlations represent the variance shared by the linear composites of the sets of criterion and predictor variables, and not the variance extracted from the sets of variables (Alper and Peterson, 1972). Thus a relatively strong canonical correlation may be obtained between two linear composites (canonical variates) even though these linear composites may not extract significant portions of variance from their respective sets of variables (SAS Institute, 1990).

To overcome the uncertainty in using canonical roots (squared canonical correlations) as a measure of shared variance, a redundancy index has been proposed (Stewart and Love, 1968). The redundancy index is the equivalent of computing the squared multiple correlation coefficient between the total predictor set and each variable in the criterion set, and then averaging these squared coefficients to arrive at an average R^2. It provides a summary measure of the ability of a set of predictor variables to explain variation in the criterion variables. As such, the redundancy measure is perfectly analogous to multiple regression's R^2 statistic. The R^2 measures the amount of variance in the dependent (criterion) variable explained by the regression function of the independent (predictor) variables.

In the regression cases, the total variance in the dependent variable is equal to 1 or 100 percent. Canonical correlation is different from the multiple regression in that it does not deal with a single criterion variable. It has a criterion set that is a composite of several variables, and this composite has only a portion of each dependent variable's total variance. For this reason, we cannot assume that 100 percent of the variance in the criterion set is available to be explained by the predictor set. The calculation of the redundancy index is a two-step process. The first step involves calculating the amount of variance in the criterion set of variables that is included in the criterion canonical variate. The second step involves calculating the amount of variance in the criterion canonical variate that can be explained by the predictor set canonical variate. The redundancy index is then found by multiplying these two components.

To calculate the amount of shared variance in the criterion set that is included in the criterion canonical variate, is important to consider how the regression R^2 statistic is calculated. The R^2 is the square of the correlation coefficient R, which represents the correlation between the actual dependent variable and the predicted value. In the canonical case, we are concerned with the correlation between the criterion canonical variate and each of the criterion variables. Such information can be obtained from the canonical structure, which includes canonical loadings (L_1), which represent the correlation between each input variable and its own canonical variate. By squaring each of the criterion loadings (L_1^2), one may obtain a measure of the amount of variation in each of the criterion variables that is explained by the criterion canonical variate. To calculate the amount of shared variance that is explained by the canonical variate, a simple average of the squared loadings is used.

The second step of the redundancy process involves the percentage of variance in the criterion canonical variate that can be explained by the predictor canonical variate. This is the squared correlation between the predictor canonical variate and the criterion canonical variate, which is otherwise known as the canonical correlation. The squared canonical correlation is commonly called the canonical R^2. This information can be directly taken from the results of the SAS package.

Just as with canonical correlations, no general accepted guidelines have been established as to what is the minimum acceptable redundancy index needed to justify the interpretation of canonical functions. The analyst must judge each canonical function in light of its theoretical and practical significance to the research problem being investigated to determine whether the redundancy index is sufficient to justify interpretation (Alper, et. al., 1975).

A.4.6 Interpretation Methods for Canonical Functions

If the canonical relationship is statistically significant and the magnitude of the canonical root and the redundancy index is acceptable, the analysis still needs to make substantive interpretations of the results. Making these interpretations involves examining the canonical functions to determine the relative importance of each of the original variables in deriving the canonical relationships. Three methods have been proposed: (1) canonical weights (standardised coefficients), (2) canonical loadings (structure correlations), and (3) canonical cross-loadings.

A.4.6.1 Canonical Weights

The traditional approach to interpreting canonical functions involves examining the sign and magnitude of the canonical weight assigned to each variable in computing the canonical functions. Variables with relatively larger weights contribute more to the functions, and vice versa. Similarly, variables whose weights have opposite signs exhibit an inverse relationship with each other, and those with the same sign exhibit a direct relationship. However, interpreting the relative importance or contribution of a variable by its canonical weight is subject to some criticisms. A small weight may mean either that its corresponding variable is irrelevant in determining a relationship or that it has been partialed out of the relationship because of a high degree of multicollinearity. Another problem is that these weights are subject to considerable instability (variability) from one sample to another. This instability occurs because the computational procedure for canonical analysis yields weights that maximise the canonical correlations for a particular sample of observed dependent and independent variable sets (Lambert, and Durand, 1975).

A.4.6.2 Canonical Loadings

Canonical loadings have been increasingly used as a basis for interpretation because of the deficiencies in utilising weights. Canonical loadings, referred to as structure correlations, measure the simple linear correlation between an original observed variable in the dependent or independent set and the set's canonical variates. The methodology considers each independent canonical function separately and computes the within-set variable variate correlation (SAS Institute, 1990). That is, for each set of variables, dependent and independent, the correlation is computed between each original observed variable and its respective canonical variates. Thus the canonical loading reflects the variance that the observed variable shares with the canonical variate and can be interpreted like a factor loading in assessing the relative contribution of each variable to each canonical function.

A.4.6.3 Canonical Cross-Loadings

The computation of canonical cross-loadings has been suggested as an alternative to conventional loadings (Dilon, and Goldstein, 1984). This procedure involves correlating each of the original observed dependent variables directly with the independent canonical variate. Conventional loadings correlate the original observed variables with their respective variates after the two canonical variates (dependent and independent) are maximally correlated with each other. Thus cross-loadings provide a more direct measure of the dependent-independent variable relationships by eliminating an intermediate step involved in conventional loadings.

The use of cross-loadings is the preferred approach and is provided by many computer programmes such as SAS. The SPSS package provides canonical loadings, while the BMD package provides canonical weights. The canonical loadings approach is somewhat more valid than the use of weights. Therefore, whenever possible, it is recommended that the loadings approach be a second alternative to the canonical cross-loadings method.

A.5 Summary

This chapter describes the methodology for the analysis of the impact of TQM, JIT, and WT on performance using multivariate methods such as factor analysis, comparison among groups, and canonical correlation analysis.

Measurement analysis begins with assessing the instrument's reliability, or the ability of its scales to consistently yield the same response. Once a scale has been determined to be reliable, its validity can be assessed. Validity is a scale's ability to measure what it sets out to measure.

Factor analysis is used for analysing the interrelationships among a large number of variables (such as questionnaire responses) and then explaining these variables in terms of their common underlying dimensions (factors).

Comparison among groups is used because frequently a researcher is interested in deciding whether or not two groups that differ in experience or characteristics share the same latent structure. These comparisons may involve the *pattern* of the correlations between variables and factors, or both the *pattern and magnitude* of the correlations between them.

Canonical correlation analysis is a multivariate statistical model that facilitates the study of interrelationships among sets of multiple criterion (dependent) variables and multiple predictor (independent) variables.

APPENDIX 2: QUESTIONNAIRE

English Version

Spanish Version

Questionnaire in English

1.- Have all of the executives of your organisation received training in quality concepts and tools?

2.- Are all the executives visibly involved in creation of an effective quality culture?

3.- Do all executives practice the principles of quality promotioned by the organisation?

4.- Is there any written quality policy, as well as quality goals in long terms? (If the answer is no, go to the question 7)

5.- Has this policy been communicated to all levels of employees in the organisation?

6.- Does this policy emphasise the necessity of continuous improvement and involvement of all the functions of the organisation?

7.- Has the responsibility of the quality management and improvement been clearly defined and communicated to all the levels of the organisation?

8.- Are all employees trained to personally take control and make decisions for problem solving and customer satisfaction (Empowerment) ?

9.- Does your company diffuse its leadership in quality to external community, through integration of responsibilities for health, security and environment protection?

10.- How much resource (financial, time, people, and equipment) do your executives dedicate to quality improvement process?

11.- Does the organisation obtain quantificable data of all the dimensions of the quality of its products and services?

12.- Does the organisation obtain and report quality data on all functions and departments (including accounting, marketing, etc.)?

13.- Does the company employ periodic methods for obtaining and analysing data of clients point of view on quality of its products and services?

14.- Does the company report all factors in relation with quality costs such as internal failure, external failure, prevention and appraisal costs?

15.- Is your organisation involved in systematic analysis of quality data, in order to identify the causes of the problems?

16.- Is your organisation involved in systematic analysis of quality data, in order to create strategies of quality improvement?

17.- Does your company obtain key data on clients, competitors, suppliers, etc. to be used in the quality planning process?

18.- Does your company demonstrate its priority towards quality in the process of decision making?

19- Does your company utilise world class standards (benchmarking)?

20.- Does your company obtain data with relation to the quality of its competitors?

21.- Does your company have operational (1-2 years) and strategic (3-5 years) plans describing global quality goals and strategies to achieve these goals?

22.- Do your employees, clients and suppliers participate in the quality planning process?

23.- How achievable are your short and long term goals, taking into account the environment and other restrictions?

24.- Does your company have specific plans for quality improvements and methods for monitoring the progress?

25.- Do the plans for quality improvement include all functions of the organisation?

26.- Does your company have plans for assuring that its suppliers are capable of achieving their quality requirements?

27.- Does your organisation use a systematic process like Quality Function Deployment (QFD) to define the requirements and expectations of the clients?

28.- Does your organisation use a systematic and effective process to translate the requirements of the clients to the planning process in order to improve products and services?

29.- Are the staff responsible for creating new products and services kept informed on quality objectives and clients requirements?

30.- Is there any evidence of the use of analytical techniques such as Pareto, Taguchi methods, Failure analysis mode, etc. for creating new products and services?

31.- Does your organisation employ physical/chemical and destructive tests to measure all the important quality characteristics of products and services?

32.- Does your company use measurement instruments and technology which are "State of the Art" in order to achieve an excellent performance in quality?

33.- Is there an auditing process being used to evaluate periodically the effectiveness of your quality management system?

34.- Does your organisation employ adequate methods of evaluation to determine how much do your suppliers and external distributors of goods and services achieve your quality requirements?

35.- Does your company work in collaboration with their suppliers in order to improve quality?

36.- Does your company apply quality assurance techniques in supporting departments such as, Research and Development, Accounting, Human Resources , Marketing , etc.?

37.- Has your organisation a system in place to document the information concerning products and services and to maintain these documents?

38.- Are these documents up to date and are they easy to use?

39.- Is there any system to evaluate the performance of the products and services before their use?

40.- Is there any system to evaluate the performance of the products and services after their use?

41.- Has there been a correlation of the wastes and rework data against the quality requirements to identify appropriate corrective actions?

42.- Do your customers believe that your products and services satisfy their specifications, and they are getting value for money?

43.- Are the customer satisfaction measures exact, objective, complete and reliable?

44.-Are the customer satisfaction measures related to their requirements and expectations?

45.- Do your clients believe that your company has an effective and efficient system to handle their problems and complaints?

46.- Does your company have any policy or procedure whereby your customers could contact easily the employees in order to solve their complaints?

47.- Does your organisation employ a unique or innovative system to reach customer satisfaction?

48.- Is there a corporate plan to involve everyone in relation to quality improvement process?

49.- Are there any quality criteria connected to the process of personnel selection?

50.- Are there any quality criteria in measuring the performance of each employee in the organisation?

51.- Does your company utilise effective methods for communicating the quality goals and progress to all employees?

52.- Is there any effective system for communicating quality related ideas and suggestions to the management, and allowing the management to give feedback on these ideas?

53.- Is there any defined system for involving all employees in the quality improvement process?

54.- Do all levels of employees (including management) dedicate sufficient time to learn the principles and techniques of quality improvement? (how many hours per year)

55.- Are the employees capable of applying the knowledge and skills learned in training to their work?

56.- Does the organisation have an incentive or recognition programme to reward the effort of employees toward quality improvement?

57.- How many times per month do the members of the work unit participate in problem solving sessions?

58.- How often is performance discussed with employees?

59.- How closely is pay tied to team performance?

60.- How closely is pay tied to problem solving and suggestions on improvements?

61.- What percentage of people receive training during a typical year?

62.- How many different kinds of training programmes are available for members of your work unit to attend?

How much has each of the following changed in the last 3-5 years?

63.- Number of your suppliers

64.- Size of their deliveries

65.- Length of product runs

66.- Length of set-ups

67.- Number of total parts

68.- Amount of buffer stock

Measurement of the Outcome

I.- Operational Results

1.- Productivity (measured as value added per employee)

2.- Quality (measured as reduction of wastes and defects)

3.- Cycle (lead) time

II.- Customer Satisfaction

4. How satisfied are your customers with your services and products?

III.- Organisational Climate

5.- Turnover of the employees

6.- Absenteeism of the employees

7.- Morale of the employees

Quetionnaire in Spanish

1.- ¿ Han recibido todos los ejecutivos en su organización entrenamiento en conceptos y herramientas de calidad?

2.- ¿ Están todos los ejecutivos involucrados en el desarrollo de una cultura efectiva de calidad?

3.- ¿ Practican los ejecutivos de su organización los principios de calidad promovidos por la organización?

4.- ¿ Se ha escrito una política de calidad que incluya metas de calidad a largo plazo? (Si la respuesta en negativa, pasar a la pregunta 7).

5.- ¿ Se ha comunicado esta política a todos los niveles de empleados en la organización?

6.- ¿ Enfatiza dicha política la necesidad de mejora continua e involucramiento de todas las funciones de la organización?

7.- ¿ Han sido claramente definidas y comunicadas a todos los niveles de la organización las responsibilidades de administración y mejoramiento de la calidad?

8.- ¿ Están los empleados entrenados para tomar decisiones personalmente para la solución de problemas y la satisfacción de los clientes (Empowerment)?

9.- ¿ Difunde la compañía su liderazgo en calidad a la comunidad externa, a través de integrar responsabilidades para la salud, seguridad y protección del medio ambiente?

10.- ¿ Dedican los ejecutivos de su organización suficientes recursos (financieros, tiempo, gente, equipo, etc.) al proceso de mejoramiento de calidad?

11.- ¿ Obtiene su organización datos cuantificables de todas las dimensiones de calidad de sus productos y servicios?

12.- ¿ Se obtienen y reportan los datos de calidad en todas las funciones y departamentos de la organización (incluyendo las funciones de soporte como contabilidad, mercadotecnia, etc.)?

13.- ¿ Emplea la compañía métodos periódicos de obtención y análisis del punto de vista de los clientes acerca de la calidad de sus productos y servicios?

14.- ¿ Da su compañía seguimiento y reporta todos los factores relacionados con los costos de calidad (costos de fallas internas, externas; prevención y evaluación)?

15.- ¿ Se realiza en su compañía un análisis sistemático de datos de calidad, con el fin de identificar las causas de los problemas?

16.- ¿ Se realiza en su compañía un análisis sistemático de datos de calidad, con el fin de crear estrategias para el mejoramiento de la calidad?

17.- ¿ Obtiene su organización datos de clientes, competidores, proveedores, etc. para usarla en el proceso de planeación de la calidad?

18.- ¿ Muestra su organización una prioridad hacia la calidad en las decisiones que toma?

19.- ¿ Utiliza su compañía estándares de clase mundial (Benchmarking)?

20.- ¿ Obtiene su compañía datos relacionados con la calidad de sus competidores?

21.- ¿ Tiene su organización planes operacionales (1-2 años) y estratégicos (3-5 años) que describan metas de calidad globales y estrategias que contribuyen al logro de dichas metas?

22.- ¿ Participan sus empleados, clientes y proveedores en el proceso de planeación de la calidad?

23.- ¿ Son sus metas de corto y largo plazo retadoras pero alcanzables, dado el medio ambiente y otras restricciones?

24.- ¿ Tiene su compañía planes especificos de mejoramiento de calidad, y métodos para monitorear el avance dentro de las metas fijadas en estos planes?

25.- ¿ Incluyen los planes de mejoramiento de calidad todas las funciones de su organización?

26.-¿ Tiene su organización planes para asegurar que sus proveedores son capaces de cumplir sus requerimientos de calidad?

27.- ¿ Utiliza su organización un proceso sistemático tal como Funcion de Despliegue de la Calidad (QFD) para definir los requerimientos y expectativas de los clientes?

28.- ¿ Utiliza su organización un proceso sistemático y efectivo para traducir los requerimientos de los clientes al proceso de planeación para mejorar productos y servicios existentes?

29.- ¿ Mantiene su compañía informado al staff responsable del desarrollo de nuevos productos y servicios sobre los objetivos de calidad y requerimientos de los clientes?

30.- ¿ Existe evidencia del uso de técnicas analíticas tales como Análisis de Pareto, Método de Taguchi, Análisis de Fallas, etc. para el desarrollo de nuevos productos y servicios?

31.- ¿ Utiliza su organización pruebas destructivas y fisico-químicos, para medir todas las características importantes de calidad de los productos y servicios?

32.- ¿ Emplea su compañía equipo y tecnología de medición avanzada (tecnología de punta) con el fin de lograr un buen desempeño en calidad?

33.- ¿ Existe un proceso de auditoría que se utilice para evaluar periódicamente la efectividad de su sistema de administración de calidad?

34.- ¿ Emplea su organización medios adecuados de evaluación para determinar que tan bien cumplen sus requerimientos de calidad los proveedores, distribuidores y todo lo externo que le proporciona bienes y servicios?

35.- ¿ Trabaja su compañía en un marco de colaboración con los proveedores para el mejoramiento de la calidad?

36.- ¿ Aplica su compañía técnicas de Aseguramiento de Calidad en departamentos de soporte tales como: Investigación y Desarrollo, Contabilidad, Recursos Humanos, Mercadotecnia y otros?

37.- ¿ Tiene su organización un sistema para documentar toda la información relativa a productos y servicios?

38.- ¿ Están estos documentos actualizados y son de facíl uso?

39.- ¿ Existe un sistema para evaluar el desempeño de productos antes de que sean puestos en uso en el mercado o en la producción?

40.- ¿ Existe un sistema para evaluar el desempeño de productos después de que son puestos en uso en el mercado o en la producción?

41.- ¿ Se han correlacionado los datos de desperdicio y retrabajo con requerimientos de calidad para identificar acciones correctivas apropiadas?

42.- ¿ Creen los clientes que sus productos y servicios satisfacen sus especificaciones, y que estan recibiendo valor por su dinero?

43.- ¿ Son las mediciones de satisfacción de los clientes exactas, objetivas, confiables y completas?

44.- ¿ Están las mediciones de satisfacción de los clientes relacionadas con sus requerimientos y expectativas?

45.- ¿ Creen sus clientes que la compañía tiene un sistema efectivo para manejar sus problemas y quejas?

46.- ¿ Tiene su compañía políticas y procedimientos para que los clientes puedan contactar facílmente a sus empleados para resolver sus problemas y quejas?

47.- ¿ Utiliza su empresa algún sistema efectivo para lograr la satisfacción de los clientes?

48.- ¿ Existe un plan corporativo para involucrar a todo el personal en relación al proceso de mejoramiento de calidad?

49.- ¿ Existe algún criterio de calidad integrado al proceso de selección de personal?

50.- ¿ Existen criterios de calidad en la medición del desempeño de cada empleado en la organización?

51.- ¿ Utiliza su organización métodos efectivos y oportunos para comunicar las metas de calidad y los avances en esta materia a todos los niveles de empleados?

52.- ¿ Existe un sistema efectivo para comunicar a la alta administración ideas y sugerencias relacionadas a la calidad, y proporcionle retroalimentación significativa y oportuna a dichas sugerencias?

53.- ¿ Existe algún sistema definido para involucrar a todos los empleados en el proceso de mejoramiento de calidad?

54.- ¿ Cuántas horas por año dedica cada empleado (incluyendo la administración) en promedio en el entrenamiento de principios y tecnicas de mejoramiento de calidad?

55.- ¿ Son los empleados de su organización capaces de aplicar los conocimientos y habilidades aprendidos durante el entrenamiento en su trabajo?

56.- ¿ Tiene su organización un programa de incentivos y/o reconocimientos para premiar a empleados y operarios por sus esfuerzos hacia el mejoramiento de calidad?

57.- ¿ Cuantas veces al mes se juntan los miembros de equipos de trabajo para sesiones de resolución de problemas?

58.- ¿ Qué tan frecuentemente (veces al año) discute la alta administración el desempeño con los empleados de su organización?

59.- ¿ Qué relación tiene el pago con el desempeño de los empleados en equipos de trabajo?

60.- ¿ Qué relación tiene el pago con la solución de problemas y sugerencias sobre las mejoras?

61.- ¿ Qué porcentaje de los empleados recibe entrenamiento en conceptos y tecnicas de calidad durante el año (un año típico)?

62.- ¿ Cuantos tipos de programas de entrenamiento existen en su organización para que los empleados puedan asistir?

Favor de medir los siguientes cambios durante los ultimos 3 a 5 años:

63.- Número de proveedores

64.- Tamaño de sus entregas

65.- Longitud (tamaño) de las corridas de producción

66.- Tiempo de Set-Up (cambio de corrida)

67.- Número de partes

68.- Nivel de inventario

Medición de resultados

Favor de medir en una escala de 1 a 5, los siguientes resultados en su organización durante los ultimos 3 años:

I.- Resultados Operacionales

1.- Productividad (valor agregado por empleado)

2.- Calidad (reducción de defectos y rechazos)

3.- Tiempo de ciclo de los productos

II.- Satisfacción de los clientes

4.- ¿ Qué tan satisfechos están los clientes de los productos y servicios que ofrece su organización?

III.- Clima Organizacional

5.- Rotación de personal

6.- Ausentismo

7.- Moral de los empleados

Hoja de respuesta

		1 2 3 4 5	
1.	pocos	□□□□□	Muchos
2.	pocos	□□□□□	Muchos
3.	pocos	□□□□□	Muchos
4.	poco	□□□□□	Mucho
5.	poco	□□□□□	Mucho
6.	poco	□□□□□	Mucho
7.	poco	□□□□□	Mucho
8.	poco	□□□□□	Mucho
9.	poco	□□□□□	Mucho
10.	poco	□□□□□	Mucho
11.	poco	□□□□□	Mucho
12.	poco	□□□□□	Mucho
13.	poco	□□□□□	Mucho
14.	poco	□□□□□	Mucho
15.	poco	□□□□□	Mucho
16.	poco	□□□□□	Mucho
17.	poco	□□□□□	Mucho
18.	poco	□□□□□	Mucho
19.	poco	□□□□□	Mucho
20.	poco	□□□□□	Mucho
21.	poco	□□□□□	Mucho
22.	poco	□□□□□	Mucho
23.	poco	□□□□□	Mucho
24.	poco	□□□□□	Mucho
25.	poco	□□□□□	Mucho
26.	poco	□□□□□	Mucho
27.	poco	□□□□□	Mucho
28.	poco	□□□□□	Mucho
29.	poco	□□□□□	Mucho
30.	poco	□□□□□	Mucho
31.	poco	□□□□□	Mucho
32.	poco	□□□□□	Mucho
33.	poco	□□□□□	Mucho
34.	poco	□□□□□	Mucho
35.	poco	□□□□□	Mucho

		1 2 3 4 5	
36.	poco	□□□□□	Mucho
37.	poco	□□□□□	Mucho
38.	poco	□□□□□	Mucho
39.	poco	□□□□□	Mucho
40.	poco	□□□□□	Mucho
41.	poco	□□□□□	Mucho
42.	poco	□□□□□	Mucho
43.	poco	□□□□□	Mucho
44.	poco	□□□□□	Mucho
45.	poco	□□□□□	Mucho
46.	poco	□□□□□	Mucho
47.	poco	□□□□□	Mucho
48.	poco	□□□□□	Mucho
49.	poco	□□□□□	Mucho
50.	poco	□□□□□	Mucho
51.	poco	□□□□□	Mucho
52.	poco	□□□□□	Mucho
53.	poco	□□□□□	Mucho
54.	≤ 10	□□□□□	≥ 50
55.	poco	□□□□□	Mucho
56.	poco	□□□□□	Mucho
57.	≤ 4	□□□□□	≥ 8
58.	≤ 1	□□□□□	≥ 5
59.	poco	□□□□□	Mucho
60.	poco	□□□□□	Mucho
61.	$\leq 20\%$	□□□□□	$\geq 60\%$
62.	≤ 1	□□□□□	≥ 5
63.	Aumentado	□□□□□	Disminuido
64.	Aumentado	□□□□□	Disminuido
65.	Aumentado	□□□□□	Disminuido
66.	Aumentado	□□□□□	Disminuido
67.	Aumentado	□□□□□	Disminuido
68.	Aumentado	□□□□□	Disminuido

Medición de resultados

I.- Resultados Operacionales

		1 2 3 4 5	
1.	Disminuido	□□□□□	Aumentado
2.	Disminuido	□□□□□	Aumentado
3.	Aumentado	□□□□□	Disminuido

II.- Satisfacción de los clientes

4.	Disminuido	□□□□□	Aumentado

III.- Clima Organizacional

5.	Aumentado	□□□□□	Disminuido
6.	Aumentado	□□□□□	Disminuido
7.	Disminuido	□□□□□	Aumentado

FAX

A: Mohammad R. Azarang

I.T.E.S.M. Campus MTy.

Tel. y Fax: (8) 328-41-53 y (8) 347-68-50

De:

CIA.:

Ciudad:

Tel:

Fecha:

APPENDIX 3: DATABASE OF THE RESPONSES TO QUESTIONNAIRE

Large companies

Medium companies

Small companies

Maquiladoras

LARGE COMPANIES

FIRMS (Large)	State	Size	Name	Position	Type
Alimentos de Baja California, S.A.de C.V.	BC	Large	Gilberto Ramirez	Ger.Cal.	Alimentos
Grupo Tropicana, S.A.	BC	Large	Hector Padilla	Dir.Gen.	Prod.Jugos de fruta
Productos Hola, S.A.	BC	Large	Olga Guajardo	Dir.Cal.	Fabricantes de dulces
Sabritas, S.A. de C.V.	BC	Large	Humberto Delgadillo	Ger. Cal.	Alimentos
Exportadora de Sal	BC	Large	Ma. Elena Mijares		Mineria
AHMSA	Coah	Large	Oscar Puente	Sub-Dir.Cal.	Siderurgia
CINSA, S.A.de C.V.	Coah	Large	Gerardo Garza	Jefe Cal.	Prod. Metalicos
Met-Mex Peñoles, S.A. de C.V.	Coah	Large	Alejandro Alvarez	Ger.Insp.	Mineria
Vitromex, S.A.de C.V.	Coah	Large	Jesus Farias	Dir. Cal.	Industria cerámica
American Refrigeration	DF	Large	Raúl Tejada Román		Maq.y Eq. Elect.
Bayer de Mexico, S.A. de C.V.	DF	Large	Ruben Salazar	Ger. Cal.	Farmaceutica
PYN, S.A. de C.V.	DF	Large	Alberto Rodriguez	Ger.Gen.	Prod. Plásticos
Schneider Electric (Square D de Mex.)	DF	Large	Salvador Santillan	Dir.Prod.	Maq.y Eq. Elect.
Servicios Industriales Peñoles	DF	Large	Miguel C. Olmedo	Ger.Corp.Cal.	Minero-Metalúrgica
Singer Mexicana, S.A. de C.V.	DF	Large	M.J. McGuiness	Dir.Gen.	Maq.y Eq. Elect.
Embotelladora Duranguense, S.A.	Dgo.	Large	Hernan Menchaca	Ger.Gen.	Embotelladora
Grupo Industrial Lala, S.A. de C.V.	Dgo.	Large	Everardo Hernandez	Ger.Prod.	Bebida
Calidata	Ed.Mex	Large	Tomás Martinez Juárez		Imprenta y Editorial
Cerveceria Cuauhtemoc	Ed.Mex	Large	Luis D. Maldonado		Cerveza
Hidromex S.A.	Ed.Mex	Large	Julián Landeros		Maq.y Eq. no Elect.
Tapetes Luxor, S.A.de C.V.	Ed.Mex	Large	Leopoldo Peña	Dir.Admon.	Textil
Vidriera Los Reyes, S.A.de C.V.	Ed.Mex	Large	Salvador Martinez		Vidrios
Dina	Hgo.	Large	Edgar Baca		Automotriz
Compañía Industrial de Atenquique S.A. de C.V.	Jal.	Large	Oscar Martinez O.		Papel y prod.de Papel
Laboratorios Pisa, S.A. de C.V.	Jal.	Large	Alfonso Alvarez P.	Dir. Gen.	Farmaceutica
Urrea Herramientas Profesionales	Jal.	Large	Roberto Urrea Rosas	Dir. Gen.	Prod. Metalic.
Aralmex SA de CV	Jal.	Large	Ignacio Moreno		Autopartes
Valvulas Urrea S.A. de C.V.	Jal.	Large	Juan Carlos Ramirez	Ger.Cal.	Prod. Metalic.
Embotelladora los Altos S.A.	Jal.	Large	Fernando Gonzalez L.		Bebidas
Acumuladores Mexicanos	NL	Large	Francisco Landeros	Jefe Cal.	Acumulador y acces.
Alen del Norte, S.A.	NL	Large	Vicente Vicencio	Jefe Planta	Ind. Quimica
Bebidas Purificadas del centro, S.A.de C.V.	NL	Large			Bebidas- Embotelladora
Carrier de México S.A. de C.V.	NL	Large	Nazario Garza	Ger. Cal.	Aire acondicionado
Carrier de Mexico, S.A. de C.V.	NL	Large	Roger A. Duarte	Presidente	Aire acondicionado
Casa Guajardo, S.A.	NL	Large	Arnulfo Elizondo	Ger.Gen.	Bebidas
Celulosa Y Derivados,S.A.de C.V.	NL	Large	Jesús González	Ger.Op.	Textil
Cementos Mexicanos S.A. de C.V.	NL	Large	Simón González		Cemento
Cemex Mexicanos, S.A. de C.V.	NL	Large	Francisco Diaz	Asesor Mant.	Cementos
Cerveceria Cuauhtemoc Moctezuma	NL	Large	Reynold Montemayor Z.	Dir.Oper.	Cervezas
Cerveceria Cuauhtemoc Moctezuma	NL	Large	Luis Chavez	Dir.Cal.	Bebidas
Cerveceria Cuauhtemoc Moctezuma	NL	Large	Hector Nájera	Dir. Logística	Bebidas
Cerveceria Cuauhtemoc Moctezuma	NL	Large	Teofilo Garza	Dir.Cal.y Clie	Bebidas
Cigarrera La Moderna, S.A.de C.V.	NL	Large	Héctor M.Osorno	Sup.Cal.	Tabaco
COPAMEX (Papelera Maldonado, S.A. de C.V.)	NL	Large	Roberto Maldonado	Dir.Gen.	Papel
Corporativo básico, S.A.	NL	Large	José Ignacio Cárdenas	Dir.Finanzas	Embotelladora
Cuprum	NL	Large	Enrique Ruiz	Jefe Calidad	Productos metálicos
Cydsa (Masterpak)	NL	Large	Eliseo Arellano	Jefe Cal.	Resinas y Fibras Sint.
Cydsa-Celorey, S.A.	NL	Large	Eliseo Arellano	Sup.Cal.	Resinas y Fibras Sint.
Cydsa-Propirey,S.A.	NL	Large	Ramón Ramos Reyes	Sup.Cal.	Resinas y Fibras Sint.
Cydsa-Rey Print. S.A.	NL	Large	Rolando Bosque	Ger.Planta	Resinas y Fibras Sint.
Dirona, S.A.	NL	Large	Luis Castro	Ger.Cal.	Ind. automotriz
Editora El Sol	NL	Large	Adolfo Torres	Ger. Prod.	Publicaciones
Electrodos Monterrey	NL	Large	Alfredo Rodriguez	Coord.Cal.	Ind. eléctrica y sold.
Empaques. de Cartón TITAN, S.A.	NL	Large	Antonio Alvarez	Analista Plan.	Papel
Empaques. de Cartón TITAN, S.A.	NL	Large	Juan Manuel Ortiz	Ger. Acabado	Papel
Fabricaciones y Representaciones Industriales, S.A.	NL	Large	Eduardo Garza T.	Dir.Gen.	Metalmecanica
Fabricaciones y Representaciones Industriales, S.A.	NL	Large	Luis Lauro Gonzalez	Dir. R.H.	Metalmecanica
Fabricas Monterrey, S.A. de C.V.	NL	Large	Ernesto Silva	Gr.Gen.	Prod. Metal.
Fadsa (Interlav)	NL	Large	Eduardo Elizondo	Ger.Manuf.	Electrodomesticos
Fadsa (Interlav)	NL	Large	Herlinda Guzman	Ger.Ing.Ind.	Electrodomesticos
Fibras Quimicas, S.A	NL	Large	Oscar Reynoso Gzz	Ger. Admon.	Resinas y Fibras Sint.

Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1	3	2	5	3	3	2	3	3	3	5	4	5	5	5	5	5	4	1	5	5	3	5	5	5	5	3	3	3	1	5	3	1	4	5
3	4	3	0	0	0	2	3	1	1	4	4	2	4	5	4	4	4	2	2	2	3	4	4	3	4	3	3	2	4	4	4	2	3	3
4	4	4	3	3	0	3	3	4	4	3	3	3	3	3	4	4	4	4	4	3	3	4	4	4	4	3	3	4	4	4	4	5	4	4
4	4	5	5	3	5	2	3	4	4	4	3	5	3	4	4	5	5	5	5	5	3	5	5	3	3	4	3	4	5	5	5	5	5	3
3	3	3	4	1	2	3	4	4	4	5	2	2	3	4	5	2	5	5	1	4	2	5	5	4	3	1	5	5	3	5	4	1	1	2
4	4	4	5	5	4	4	4	5	3	3	4	4	3	4	4	4	4	3	3	4	3	4	4	4	3	4	4	4	3	3	4	4	4	4
4	3	3	4	4	4	3	3	2	4	4	4	3	2	4	4	5	4	5	3	4	3	5	4	3	4	2	3	4	2	5	4	5	3	4
5	5	5	5	5	5	4	4	5	3	5	4	5	3	4	4	5	5	5	5	5	4	4	5	5	4	4	4	5	5	5	5	4	4	5
5	5	5	5	5	5	5	5	4	5	5	4	5	3	4	4	4	5	5	4	5	3	5	5	5	5	3	4	4	3	5	5	5	5	5
2	2	2	5	3	5	3	2	5	4	4	3	2	3	4	4	4	4	2	2	5	3	4	5	5	5	2	2	3	2	4	5	2	4	5
3	3	4	0	0	0	3	4	5	5	5	4	4	4	4	4	4	5	5	5	5	3	5	4	5	5	1	5	5	5	5	5	5	4	4
4	4	3	3	2	4	3	2	2	2	4	2	3	4	4	4	3	4	5	5	3	4	3	4	3	4	4	5	5	5	5	5	5	5	4
2	2	2	3	3	3	2	3	2	3	3	3	2	3	3	3	2	3	2	4	4	4	4	3	4	4	2	3	4	2	2	4	4	5	3
5	4	4	4	5	4	3	2	4	3	4	3	3	1	4	3	2	3	1	1	5	2	5	3	5	4	1	4	4	2	5	4	3	2	4
3	3	3	2	3	2	3	3	3	3	3	3	3	3	3	3	5	4	4	4	5	4	3	3	3	3	3	4	4	3	4	4	3	4	4
4	3	2	1	0	0	3	1	3	2	4	3	2	2	2	2	3	3	4	4	3	2	4	4	4	2	1	2	3	2	1	2	1	3	2
2	3	2	1	0	0	1	3	2	2	2	1	1	1	2	1	1	2	1	2	2	1	3	2	1	3	1	1	2	1	3	3	1	2	2
5	4	4	5	5	5	5	3	3	4	5	2	1	2	5	5	3	4	4	4	5	4	4	5	4	4	4	4	3	5	5	3	1	3	4
5	5	5	5	5	5	5	3	5	4	5	3	5	5	5	5	3	5	4	4	5	4	5	5	5	4	5	5	5	3	5	5	5	5	4
4	4	4	4	4	4	3	4	4	4	4	3	5	5	5	5	4	4	3	4	4	3	4	4	4	3	3	4	4	3	3	3	3	3	4
4	4	4	4	4	4	4	4	4	4	5	4	5	4	5	5	5	5	5	5	4	3	4	4	4	5	4	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	3	4	4	4	5	5	4	4	4	5	4	3	3	4	4	4	5	5	5	4	3	3	3	4	4	5	5	5
4	5	4	1	1	1	5	4	5	4	3	2	2	4	3	4	5	4	1	5	4	4	5	4	4	5	4	4	4	5	1	1	4	5	5
2	1	1	0	0	0	1	2	1	1	3	3	2	3	3	2	1	2	1	1	1	3	4	1	1	2	1	2	3	1	5	3	1	1	2
4	5	5	5	4	5	3	2	1	4	2	1	3	3	4	4	4	4	5	4	5	3	5	4	3	4	1	3	4	1	4	4	3	4	2
4	4	3	5	4	5	4	3	3	3	4	2	2	2	3	3	2	3	4	4	3	3	3	4	4	3	2	2	2	3	4	3	3	3	3
3	3	4	4	4	4	2	3	1	4	4	3	4	4	4	4	4	4	4	2	2	3	3	4	2	2	4	3	3	4	4	4	4	3	3
3	2	2	0	0	0	2	2	1	2	3	1	1	1	5	4	1	1	2	3	3	1	4	3	1	1	2	1	3	1	1	1	2	2	1
5	4	4	5	5	5	4	4	3	5	3	4	5	4	5	5	1	5	0	1	2	4	5	5	5	5	0	3	4	0	5	4	5	3	3
5	4	4	5	5	5	5	4	5	5	4	2	4	4	5	5	3	5	5	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	4
5	5	3	0	0	0	4	3	1	3	2	1	4	1	4	3	1	5	4	2	3	1	4	3	1	5	2	4	5	5	5	3	3	3	4
4	3	3	4	3	3	3	4	4	4	5	2	3	2	4	4	3	4	5	4	5	3	3	3	4	3	4	4	3	5	5	3	3	4	4
4	5	5	5	5	5	5	4	4	4	4	4	4	5	4	5	4	5	5	5	5	4	4	5	5	5	5	5	5	5	5	4	5	5	5
5	5	5	5	5	5	4	4	5	4	3	3	5	4	4	3	3	4	4	4	4	3	4	4	3	2	3	3	3	4	3	5	5	3	2
3	3	2	4	3	3	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	1	1	2	1	4	2	1	2	3
5	5	5	5	5	5	4	4	5	5	5	3	4	5	5	5	4	5	4	4	4	3	5	5	5	3	3	3	5	5	5	5	5	3	3
3	4	4	3	3	4	3	5	4	4	4	3	4	3	4	4	4	4	4	4	4	3	4	4	3	3	4	4	4	4	4	4	4	3	3
4	4	4	5	4	4	3	3	4	5	5	5	4	4	4	4	5	5	5	5	4	4	4	5	4	3	3	3	4	4	5	5	3	3	3
4	4	4	4	4	4	4	4	5	5	4	3	4	3	3	4	4	4	5	4	5	4	5	4	4	4	3	4	4	4	4	5	4	4	4
5	5	4	4	4	5	4	4	5	4	4	4	5	3	5	4	4	4	5	5	4	3	5	4	3	4	4	4	4	4	5	5	4	5	4
5	5	5	5	5	4	5	4	3	4	5	4	5	3	4	5	5	4	5	3	5	4	5	3	4	5	4	5	4	5	4	4	4	4	3
4	5	5	5	4	5	4	4	5	4	5	5	5	4	5	5	5	5	5	5	5	4	4	5	4	5	5	4	4	4	5	4	5	5	5
5	5	5	5	5	5	5	4	5	5	5	3	3	5	5	5	5	5	4	5	4	3	4	5	4	5	4	4	5	4	4	4	3	4	4
4	5	5	5	5	5	5	4	4	4	4	4	4	4	5	5	4	5	1	4	4	4	4	4	4	4	4	4	5	4	5	5	5	5	5
2	3	3	4	5	5	5	3	2	1	4	2	2	4	4	5	5	4	1	2	3	1	4	4	5	5	4	5	4	5	4	3	5	5	5
5	5	4	2	0	0	4	3	5	5	4	3	5	3	5	5	5	5	5	5	5	5	5	5	4	4	4	4	5	5	5	4	4	4	5
5	5	4	5	5	5	4	3	5	5	5	3	3	5	5	4	4	4	5	5	5	4	5	5	5	5	2	2	4	3	5	5	5	4	5
5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	4	5	5	5	5	5	5	5	5	5	4	4	3	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
5	5	4	5	5	5	4	4	4	5	4	3	3	2	4	3	3	4	5	4	5	4	5	5	5	3	1	3	4	4	5	5	4	2	2
5	3	4	5	3	5	4	2	2	4	4	3	3	4	4	4	4	4	3	3	4	3	4	4	3	4	2	3	4	5	5	5	2	4	5
4	4	4	0	0	0	4	3	1	2	4	3	4	4	3	3	3	2	2	2	3	2	3	3	3	3	1	2	2	2	3	4	3	3	4
5	5	5	5	5	5	5	4	3	4	5	4	2	5	4	4	4	4	3	4	5	4	5	4	4	5	2	2	3	3	5	3	5	5	4
3	3	4	4	4	3	5	3	5	4	4	3	4	4	5	5	5	4	5	5	4	4	4	3	4	5	3	3	2	3	5	5	5	4	4
5	5	5	4	4	4	5	4	5	4	5	4	5	5	5	5	5	5	4	4	4	4	4	4	4	5	4	5	5	5	5	5	5	5	5
4	5	4	5	5	5	5	4	4	4	5	5	5	3	4	5	5	5	5	5	4	4	5	5	4	3	4	5	5	4	5	4	5	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5
5	5	4	5	5	5	5	4	4	5	3	3	4	1	4	4	4	5	3	4	4	3	5	4	5	4	3	3	5	3	5	5	5	4	4
4	4	3	4	4	4	3	2	2	4	4	2	4	4	4	4	3	4	3	2	4	4	3	4	3	2	2	2	4	2	5	4	3	3	2
5	3	3	3	3	4	2	4	2	3	4	3	4	4	3	3	3	3	3	2	4	3	3	3	5	3	4	3	4	4	5	4	3	3	3
5	5	4	5	5	5	5	4	4	4	4	4	4	3	4	4	4	4	4	5	4	3	4	4	4	4	4	4	5	5	4	4	4	4	4

Questions

36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	R1	R2	R3	R4	R5	R6	R7
1	3	3	5	5	5	5	3	4	2	2	2	1	1	1	1	4	1	1	3	1	5	1	5	1	1	2	1	1	1	5	3	4	5	2	5	5	5	5	3
2	3	3	3	3	3	4	3	2	3	3	3	2	2	2	2	3	2	1	2	2	4	5	2	2	3	2	3	2	3	3	4	4	4	2	4	3	4	4	3
4	5	5	3	3	4	5	4	4	4	4	4	4	4	4	3	3	4	3	5	5	1	2	3	3	5	4	4	4	4	2	2	2	4	4	4	4	4	4	4
2	4	3	4	5	4	5	4	4	3	4	4	5	5	5	3	3	4	3	5	4	2	2	1	2	5	3	3	4	2	5	5	5	5	5	4	4	5	5	5
2	5	4	5	5	5	5	5	5	5	5	5	4	4	4	3	2	3	5	5	5	1	3	5	3	4	5	1	1	1	4	4	4	4	5	2	5	2	2	5
3	3	4	4	4	4	4	5	4	3	4	4	4	5	5	4	4	4	4	4	4	4	4	4	4	3	3	4	3	2	3	3	4	4	4	4	4	4	4	4
2	2	3	2	3	4	4	3	3	3	4	3	4	4	3	4	3	4	4	4	2	2	1	2	4	3	5	3	3	4	5	5	5	4	4	4	4	4	4	5
5	4	4	5	4	5	5	4	5	5	5	4	5	4	5	4	5	5	4	5	3	1	1	2	1	3	5	5	5	5	5	4	5	5	5	5	4	5	4	5
4	5	5	5	2	3	5	5	5	5	5	5	5	5	5	4	2	5	5	5	4	4	5	1	1	5	5	4	5	5	4	3	5	4	5	4	5	4	4	5
2	4	4	4	2	4	4	2	3	3	2	4	5	2	2	3	3	4	3	3	5	5	3	4	4	2	2	3	3	3	4	2	2	3	4	4	4	4	2	3
5	5	3	5	5	5	5	5	5	5	5	5	4	5	5	5	5	3	4	5	3	5	5	5	3	3	5	4	4	1	4	4	5	5	3	5	4	3	5	4
4	5	5	3	3	4	4	4	4	4	4	4	3	2	3	2	3	4	3	4	2	5	3	2	2	4	3	4	2	2	2	2	4	4	3	2	4	4	4	3
3	4	4	2	2	3	4	3	4	3	3	3	4	3	3	4	2	3	2	3	2	3	3	2	2	3	4	4	4	3	3	4	4	2	3	2	4	4	3	2
2	3	4	2	3	2	4	3	5	3	3	4	5	4	5	2	3	5	4	4	4	3	1	2	3	5	5	3	3	3	4	3	3	4	4	4	4	4	4	4
4	3	4	4	3	3	3	5	3	4	3	3	3	3	3	3	3	4	3	3	3	3	3	3	3	4	4	4	5	3	3	3	3	4	4	4	4	4	4	4
2	3	3	3	4	3	3	2	2	2	2	2	3	2	3	3	2	3	1	3	1	1	2	3	1	1	2	4	5	5	5	5	5	3	2	1	4	2	2	3
1	3	2	1	1	2	4	2	1	1	2	2	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	3	2	2	4	3	4	4	4	3	4	3	4	4
3	5	5	4	1	4	4	4	4	4	5	5	5	5	5	4	3	2	1	4	4	3	3	4	4	1	1	4	4	4	3	3	3	4	4	4	4	3	2	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3	3	4	5	5	1	1	1	4	2	2	5	4	4	5	4	5	4
3	3	3	3	3	4	4	3	3	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	5	5	5	5	5	5	2	4	4	4	3	3	1
4	5	5	5	5	5	4	3	4	4	5	5	4	5	5	4	4	4	5	5	5	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	5	4	5	4	3	4	4	3	4	3	3	5	5	5	5	3	4	3	5	5	5	4	3	2	3	3	4	4	3	3	3	4	4	4	5	4	2	2	5
5	5	5	5	5	2	5	4	4	5	5	5	4	4	5	4	3	3	5	5	5	5	5	5	5	5	5	1	5	5	5	5	5	1	5	5	5	5	5	5
1	3	4	5	4	2	3	3	4	2	4	3	1	1	1	2	1	1	1	2	1	3	1	4	3	1	2	2	2	2	4	3	3	4	4	3	4	3	2	2
4	4	4	3	4	3	3	2	3	3	4	2	2	3	2	3	2	3	2	4	2	2	1	2	1	2	3	2	2	1	4	4	4	4	4	4	4	4	4	4
2	2	3	3	2	4	3	2	2	2	2	2	3	3	3	3	3	2	4	3	3	4	4	3	2	5	4	4	4	5	5	2	5	5	4	4	5	4	3	3
2	3	3	4	4	4	4	2	4	4	3	3	1	2	3	3	2	3	2	3	1	1	1	2	2	2	1	1	1	5	4	1	5	5	5	3	3	4	4	4
1	2	1	4	1	1	5	1	2	3	2	3	1	2	1	1	1	2	1	3	1	3	2	1	1	1	1	2	4	5	5	4	5	4	4	5	3	4	4	3
4	4	4	5	1	2	4	4	4	5	5	5	5	3	4	4	5	4	2	4	3	4	1	1	1	4	1	3	2	2	3	0	3	4	4	3	4	4	4	4
1	5	5	5	5	4	5	5	5	4	4	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	2	1	3	3	1	2	5	5	5	5	3	5	5
1	3	3	5	3	5	5	4	4	3	2	4	5	4	5	4	3	4	5	4	2	2	2	3	2	2	4	5	5	4	4	2	5	4	3	5	4	4	4	3
5	3	4	5	4	4	5	4	4	5	4	5	4	4	5	3	5	3	4	4	4	2	4	4	4	4	3	3	4	1	1	5	5	5	5	5	5	4	4	4
5	4	3	5	5	5	4	4	5	5	5	5	5	5	5	5	5	0	5	5	5	5	5	5	5	5	5	4	4	3	4	4	5	4	4	5	4	4	4	4
3	5	3	5	4	3	3	3	3	2	3	4	4	4	4	4	4	3	3	3	5	4	3	3	3	3	4	5	5	5	5	5	5	5	5	5	5	5	4	5
2	2	2	4	3	3	3	2	2	2	2	2	3	2	2	2	2	2	2	3	2	2	2	1	1	2	2	3	3	3	3	1	3	4	3	4	4	4	4	3
2	4	4	5	5	5	4	4	4	4	5	4	5	5	5	5	4	5	5	5	5	4	4	3	3	5	5	5	5	5	5	5	5	5	5	3	4	5	4	5
3	4	4	4	4	3	4	4	4	3	4	4	3	3	3	3	4	3	3	4	3	4	4	3	3	3	4	4	4	3	3	3	3	4	4	3	4	5	5	3
3	3	5	2	2	5	4	4	3	3	3	4	4	4	3	4	4	4	4	2	4	4	3	2	3	4	3	4	4	4	3	5	5	5	4	4	4	3	5	4
5	5	3	5	5	4	4	3	4	2	3	3	4	4	4	3	4	4	2	3	3	4	4	4	3	5	5	3	2	2	2	3	3	4	4	4	4	4	4	4
4	4	4	5	5	4	4	4	4	4	4	4	5	5	5	4	5	4	3	4	5	5	4	3	3	4	4	3	4	3	5	3	5	5	5	3	4	4	4	4
4	5	5	5	5	4	5	4	5	5	4	4	4	5	3	4	4	5	4	4	4	4	3	3	4	2	5	4	4	3	4	5	4	4	3	4	4	5	4	4
4	5	5	5	4	4	5	4	4	4	4	4	5	5	5	4	4	4	4	4	5	3	3	3	3	5	4	4	4	3	4	3	4	4	4	3	4	4	4	4
3	5	4	5	4	4	5	3	5	3	4	3	4	4	5	5	3	3	4	4	4	4	5	1	1	5	4	2	3	1	2	3	3	5	5	2	4	3	4	4
5	5	5	5	4	4	5	4	4	5	5	5	5	5	5	5	5	5	4	4	5	4	5	5	5	5	3	5	5	1	1	1	1	5	5	5	5	5	5	5
5	5	5	5	4	3	5	5	3	4	3	4	5	3	3	3	5	3	5	4	3	1	5	3	2	1	1	2	2	3	3	3	4	3	4	3	4	3	3	3
3	5	5	5	5	5	4	4	5	5	4	5	5	4	4	4	5	5	4	5	2	3	5	2	3	5	2	4	3	4	4	3	4	4	4	4	4	4	4	4
3	5	5	4	3	5	5	3	4	4	5	5	5	4	4	5	5	5	4	5	5	5	5	1	1	5	4	3	3	4	3	4	4	3	3	3	3	2	3	3
4	5	5	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	1	2	4	5	3	4	5	3	3	5	5	5	4	5	3	3	3
5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	4	5	5	5	5	4	4	5	5	5	2	2	2	2	5	5	2	3	2	5	5	5
1	3	2	3	2	4	4	3	3	3	4	3	4	5	4	4	5	4	4	4	3	5	5	1	1	5	4	5	5	5	5	3	5	5	5	5	4	4	4	3
2	4	2	5	5	4	3	4	4	3	3	4	4	4	2	4	2	2	5	5	5	1	5	5	2	3	4	5	1	4	5	3	4	4	4	4	4	4	4	4
2	1	1	2	3	4	4	4	4	4	3	3	2	2	2	1	2	2	2	4	3	4	4	4	3	2	2	3	2	2	4	4	3	4	3	3	3	3	3	3
2	5	5	4	3	4	5	3	3	4	4	3	5	4	2	3	3	5	3	4	1	1	4	1	1	3	4	2	3	3	3	2	3	5	5	4	5	3	4	5
3	4	4	5	4	4	5	4	4	3	2	3	4	3	3	4	3	3	3	4	4	3	3	2	2	2	2	2	2	2	3	2	3	4	4	3	3	4	4	4
4	5	5	4	4	5	5	5	5	5	5	5	5	4	4	4	4	5	4	4	5	4	4	4	4	5	4	4	3	3	4	3	4	5	5	3	5	4	4	5
4	5	5	5	3	5	5	4	4	5	5	4	5	3	3	5	4	4	5	4	5	5	5	1	1	5	5	3	4	4	4	1	3	5	5	4	4	4	4	5
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	1	5	3	3	5	5	4	1	1	1	2	3	5	5	2	5	3	5	5
3	3	3	5	4	4	5	3	4	5	4	5	5	5	4	4	3	5	4	5	5	4	5	5	1	5	3	5	4	4	5	5	4	5	5	4	5	5	5	5
2	3	2	5	4	3	3	4	4	4	4	4	5	2	2	3	2	3	4	4	2	3	2	1	2	3	1	5	5	4	4	1	4	4	3	4	4	3	3	3
2	4	4	5	5	2	4	3	4	4	4	4	3	2	2	3	2	3	2	4	1	4	2	1	1	2	2	3	4	5	5	2	5	4	3	4	3	4	4	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	5	4	5	5	5	3	4	4	2	4	3	4	4	4	4	4	4	4	4

FIRMS (Large)	State	Size	Name	Position	Type
Galvak, S.A.de C.V.	NL	Large	René Garza		Prod. Metal.
Gonhermex, S.A. de C.V.	NL	Large	Trinidad Rangel Guevara	Coord. Cal.	Filtros para autos
Graforegia, S.A.de C.V.	NL	Large	Juan A. Rodriguez	Ger. Logistica	Ind. gráfica
Graforegia. S.A.de C.V.	NL	Large	Gabriel Garza Rangel	Dir.Gen.	Ind. gráfica
Grupo Cemex, S.A.	NL	Large	Raul Ramos		Cementos
Grupo Industrial Maseca, S.A.de C.V.	NL	Large	Juan Manuel Perales		Alimentos
Grupo Industrial Maseca, S.A.de C.V.	NL	Large	Leonel Garza	Ger. Gen.	Alimentos
Grupo Lamosa, S.A.	NL	Large	Alfredo Flores	Jefe Cal.	Prod. Min.no metal.
Grupo Lamosa, S.A.	NL	Large	Alfredo Flores	Ger.Cal.	Industria cerámica
Grupo Orión	NL	Large	Gilberto Cavazos	Ger. Trafic.	Industria cerámica
Grupo Protexa	NL	Large	Alonso García	Ger. de Proy.	Asfalto Liq.
Hylsa Division Alambres y Derivados, S.A.de C.V.	NL	Large	Gishlain Labie Dekocker	Ger. Oper.	Siderurgia y alambre de acero
Hylsa, S.A.	NL	Large	Luis C.Cantu		Siderurgia
Impregnadora la reforma, S.A.	NL	Large	Rodrigo Elizondo	Ger. Oper.	Madera
Impulsora de mercados de México	NL	Large	Raúl M. Montemayor Z.		productos alimenticios
Industria Automotriz, S.A.	NL	Large	Raul Gonzalez Valdes	Dir. Negocio	Metalmecanica
Industrias Frigoríficas, S.A.	NL	Large	Fernando Garcia		Refrigeradores, aire ac.
Industrias Frigoríficas, S.A.	NL	Large	Javier Iglesias	Ger.Planta	Refrigeración comercial
Industrias John Deere	NL	Large	Candelario de la Garza		Equipo Agrícola
Industrias John Deere	NL	Large	Luis Sada	Dir.Gen.	Equipo Agrícola
Industrias Monterrey, S.A.	NL	Large	Cesar Fernando Jarero		Siderurgia
Industrias Monterrey, S.A.	NL	Large	Santiago Clariond	Presidente	Siderurgia
Materiales Cerámicos, S.A.	NL	Large	Concepción Ballí	Ger.Cal.	Esmaltes y refrectario
Materias primas Monterrey, S.A. de C.V.	NL	Large	Hortensia Ortiz		Resinas y Fibras Sint.
Materias Primas Monterrey, S.A. de C.V.	NL	Large	Fernando Garcia	Ger.Planta	Silice y arena silice
Metalsa	NL	Large	Enrique Garza	Dir. Negocio	Chasis para autos
Mixco Internacional, S.A.de C.V.	NL	Large	Patricio Morales	Ger.Prod.	Panificación
Molinos Azteca S.A de C.V.	NL	Large	Gerardo Gómez	Ger. Gen.	Alimentos
Molinos Azteca, S.A.de C.V.	NL	Large	Elsa Montemayor	Ger.Cal.	Alimentos
Mosaicos Rivero, S.A.	NL	Large	Raul Lopez	Ger.Cal.	Industria cerámica
Nacional de Alimentos y Helados, S.A.	NL	Large	Felipe de Jesús Sánchez	Dir.Cal.	Alimentos
Nemak, S.A. de C.V.	NL	Large	Jorge de la Rosa		Cabezas de autos
Nylon de Mexico, S.A. de C.V.	NL	Large	Ramiro Martinez	Ger.Planta	Resinas y Fibras Sint.
Papelera Maldonado, S.A.	NL	Large	Jesús Julian B.	Dir.Proyectos	Fabrica de papel
Pasteurizadora Nazas, S.A.de C.V.	NL	Large	Joel Rodriguez	Ger.Cal.	Alimentos
Pepsicola Mexicana Mexicana, S.A.de C.V.	NL	Large			Bebidas- Embotelladora
Plasticel S.A. de C.V.	NL	Large	Alberto Elizondo	Jefe Cal.	Sacos de plástico
Protexa, S.A.	NL	Large	Edmundo Torres	Jefe Ing.Ind.	
Pyosa, S.A.de C.V.	NL	Large	Gilberto Colom	Ger. Admon.	Productos químicos
Pyosa, S.A.de C.V.	NL	Large	Germán López	Ger.Cal.	Productos quimicos
Sanitarios Azteca,S.A.	NL	Large	Donato Lozano Mtz.	Dir. Cal.	Industria cerámica
Sigma Alimentos, S.A.	NL	Large	Hernan Gomez Almague	Ger. oper.	Alimentos
Supermatic, S.A.de C.V.	NL	Large	Jaime Ortiz	Jefe Cal.	Electrodomesticos
Supermatic, S.A.de C.V.	NL	Large	Rafael Espinosa	Dir.Cal.	Electrodomesticos
UCAR Carbón Mexicana, S.A.	NL	Large	Juan M. Liñan	Ger. R.H.	Quimica
Vidriera Monterrey, S.A. de C.V.	NL	Large	Alejandro Hernández	Ger. Cal.	Vidrio
Vitro Corporativp, S.A.	NL	Large	Antonio Silva	Dir. Ing.Ind.	Vidrio
Vitro Crisa	NL	Large	Felix Rodriguez	Ger. Cal.	Vidrio
Vitro Vidrio Plano, S.A. de C.V.	NL	Large	Eduardo Portillo	Ger.planta	Vidrio
Ind. BACHOCO S.A de C.V.	PUE	Large	E. Barrera	Ger.Gen.	Alimentos
Grupo HYTT S.A. de C. V.	Quer	Large	Elizabeth Rojas	Ger.	Textiles
Cigarrera la Moderna, S.A. de C.V.	SLP	Large	Jesus Leal Macias	Ger. Planta	
Conductores Latincasa, S.A. de C.V.	SLP	Large	B.Centeno	Dir.Cal.	Maq. y Eq. Elect.
Cotesa	Ver	Large	Enrique Prado	Ger.Planta	Hermetapas
Sivesa	Ver	Large	Gabriel Camara	Ger.Cal.	
Hewlett Packard		Large	Juan Manuel Cantú		Computadoras
Pedro Domecq		Large			Elaboración de licores
Siliconados SA. CV.	Ed.Mex	Large	Rodolfo Hurtado		
Acero Porcelanizado	NL	Large	Juan Carlos Guajardo		
Arensa	NL	Large	Humberto Saldaña		
Kir Alimentos SA CV.	NL	Large	Cesar M. Ortiz Berlanga		Alimentos

Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
4	4	4	5	5	5	5	4	4	4	4	5	5	4	4	4	5	4	5	5	5	4	5	5	3	4	2	4	4	3	5	4	5	3	4
4	5	5	5	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	4	5	5	5	5	5	5	5
5	4	5	5	4	5	3	4	3	4	3	3	3	2	3	3	4	4	3	4	4	3	4	4	3	3	4	3	4	4	4	3	2	3	4
5	5	5	5	2	5	2	3	4	5	3	2	2	2	3	3	3	3	2	2	3	2	4	3	3	1	1	2	5	3	5	3	1	2	3
5	5	5	5	5	5	5	4	5	4	4	5	5	4	4	4	5	4	5	5	5	5	5	5	4	5	4	4	5	5	4	5	5	5	4
5	5	5	5	5	5	5	3	5	5	5	5	5	2	4	5	5	5	4	5	5	4	5	5	5	4	4	5	5	4	5	4	5	4	4
5	5	5	5	5	5	4	3	4	5	4	4	5	4	4	4	5	4	4	4	4	5	3	4	5	5	3	4	4	3	5	5	5	4	4
5	5	5	5	5	5	5	4	4	4	4	4	4	4	5	4	4	5	3	4	4	4	5	4	4	5	3	3	5	5	4	4	5	5	4
5	5	5	5	5	5	5	4	3	5	5	5	4	4	4	4	4	5	4	4	5	4	4	5	4	5	2	4	5	4	5	5	5	5	4
4	3	2	2	0	0	4	2	2	3	2	4	3	4	4	2	2	4	2	3	1	2	2	2	2	2	1	3	2	3	1	1	1	1	2
3	5	3	5	5	5	4	3	4	3	4	4	4	3	4	4	5	5	5	5	4	4	5	4	4	5	4	4	3	3	3	5	5	4	4
4	4	2	0	0	0	2	3	3	4	2	2	1	1	2	2	3	4	4	4	4	2	4	4	4	2	0	0	1	3	5	5	0	1	1
5	4	4	5	5	5	5	4	4	4	5	4	5	3	5	5	5	4	5	4	5	4	5	5	4	4	3	5	5	4	5	5	4	4	4
3	3	3	3	3	3	4	3	4	4	4	3	4	3	3	3	3	4	4	4	4	3	4	4	4	4	3	4	4	2	4	4	4	4	4
3	4	3	0	0	0	2	2	4	4	3	2	4	2	1	1	2	4	3	2	4	3	5	3	2	3	2	3	3	2	1	2	2	2	4
5	5	4	4	3	4	3	4	3	4	5	5	4	4	4	4	3	4	4	3	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4
5	5	4	5	5	5	5	3	5	4	3	3	3	5	4	5	3	4	1	1	4	3	5	5	4	4	1	1	1	1	3	4	4	3	5
3	2	4	1	0	0	5	2	2	4	3	3	2	4	3	2	2	3	2	1	2	2	3	3	2	2	1	1	1	1	1	4	2	2	3
5	5	4	5	5	5	4	3	4	5	5	5	5	5	4	4	4	5	5	3	5	5	4	5	5	5	4	4	5	5	5	5	4	5	5
5	5	5	5	5	5	5	4	5	5	4	4	4	5	5	5	4	5	5	4	5	4	5	5	5	5	4	4	5	5	5	5	5	5	4
5	5	5	5	5	5	5	4	5	5	5	3	5	4	4	4	5	5	4	4	4	4	5	5	4	4	3	4	5	5	5	5	5	5	4
5	5	5	5	5	5	5	4	5	5	4	3	5	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5
5	5	5	5	5	5	4	4	5	5	4	5	5	2	5	5	2	4	2	4	5	3	5	5	5	5	5	5	4	1	3	2	5	3	4
5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	3	3	2	0	0	5	2	5	4	4	5	3	4	1	3	4	5	3	2	3	1	4	2	3	4	4	3	5	2	5	3	4	5	3
4	5	5	4	5	5	4	4	4	4	4	3	5	4	4	4	4	5	4	4	4	3	4	4	4	3	3	3	3	4	5	5	4	4	4
4	4	4	3	3	4	2	3	5	5	4	4	5	4	4	4	5	5	4	4	3	3	4	4	5	4	4	4	4	4	5	4	5	4	4
5	5	5	5	5	5	5	2	1	5	4	4	5	3	4	4	4	4	4	4	5	4	5	4	5	3	4	4	4	5	4	4	3	4	3
5	5	4	4	5	5	4	3	3	3	3	3	5	3	3	3	4	5	3	4	5	5	5	4	4	5	3	3	5	3	5	5	5	4	4
3	3	3	1	0	0	2	2	2	3	2	2	3	2	3	2	3	2	1	4	3	2	3	2	3	3	1	2	3	1	4	3	2	3	3
5	5	4	5	5	5	4	4	4	4	4	4	3	4	4	4	5	5	5	4	3	4	5	4	4	4	3	4	4	4	3	4	3	3	4
5	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	3	4	5	5	5	1	5	5	5	4	5	3	5	5
4	4	3	5	3	4	3	4	5	4	2	3	4	4	1	4	5	5	5	3	5	3	4	4	3	5	2	4	5	3	4	5	4	4	3
4	4	5	2	2	3	3	1	4	3	3	2	4	5	5	5	5	5	1	5	4	4	4	4	4	4	4	4	3	4	4	5	3	5	5
5	5	4	4	5	5	4	3	4	4	4	4	4	4	3	3	4	4	1	5	4	3	5	4	5	4	4	5	5	5	4	4	3	3	4
4	4	5	3	4	5	4	3	3	4	4	4	5	4	5	4	5	4	3	4	4	5	4	4	3	4	3	5	5	4	4	3	5	4	4
4	3	3	3	3	4	3	2	3	4	3	3	4	4	3	3	4	3	4	4	4	3	4	4	4	4	3	3	4	2	4	3	3	3	4
3	1	1	2	0	0	3	3	2	2	1	1	4	2	3	2	5	2	1	4	2	3	4	4	3	1	1	1	2	3	5	3	1	2	2
5	5	5	5	5	5	4	4	5	4	4	4	4	3	5	5	4	5	3	4	5	4	5	5	5	4	3	4	5	4	4	5	5	4	4
4	5	5	4	4	5	4	3	4	5	5	4	3	2	4	4	3	5	2	4	4	2	5	5	5	2	3	3	5	3	4	2	3	1	1
4	5	4	5	5	5	4	3	5	4	4	3	3	3	4	4	3	5	5	3	3	4	4	4	5	4	3	3	4	3	5	5	4	4	4
3	3	3	3	3	4	3	2	2	2	3	2	3	3	2	2	2	2	2	2	1	2	3	2	1	3	2	2	2	3	4	3	2	3	2
4	4	4	4	3	5	4	4	5	4	5	4	4	2	5	5	3	4	4	3	5	4	4	4	5	5	4	5	5	5	5	5	5	5	5
2	2	2	1	0	0	2	2	4	2	2	2	4	2	3	1	4	2	1	4	2	2	3	2	2	2	3	2	4	2	5	4	4	3	3
5	5	4	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	4	5	5	5	5	4	4	4	4	5	4	5	5	5
5	5	3	5	5	5	3	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	4	5	4	4	5	5
5	5	4	5	5	5	4	4	5	5	5	4	4	4	5	5	5	5	5	5	5	4	4	5	4	5	5	4	4	4	5	5	5	5	5
3	3	2	3	3	3	2	3	2	3	3	2	3	2	2	3	3	4	3	4	4	3	4	4	3	5	2	3	4	3	3	2	3	3	3
5	5	5	5	5	5	5	4	5	5	5	5	4	5	5	5	5	3	2	4	5	5	5	5	3	5	2	5	5	5	5	5	5	3	5
3	2	2	3	2	3	4	5	4	3	4	5	5	5	1	3	4	5	5	5	2	2	2	3	3	3	1	1	1	3	5	4	2	2	2
4	3	3	4	5	4	4	3	4	4	3	3	4	3	4	4	4	4	3	3	2	4	4	4	3	3	3	4	4	4	4	4	2	3	4
5	5	5	5	5	5	5	3	3	4	3	2	3	5	4	4	3	5	4	4	4	3	4	5	5	5	2	3	4	4	5	5	5	4	4
4	3	3	5	4	4	3	3	3	4	3	3	3	4	4	3	3	3	2	2	3	3	3	4	4	4	1	4	4	2	4	4	4	2	2
4	5	4	5	5	5	3	3	5	4	3	2	2	3	3	4	4	3	3	3	4	3	4	3	2	3	2	2	4	2	4	3	3	3	3
4	4	4	5	4	5	4	4	5	5	5	4	4	3	5	5	4	5	3	4	4	3	5	5	4	4	3	3	5	5	5	4	4	4	4
5	3	4	4	4	5	5	3	2	4	3	2	3	4	4	3	4	4	5	5	4	3	3	4	3	3	4	3	4	4	3	5	5	4	4
3	3	3	4	4	5	3	3	2	2	3	3	2	2	4	3	3	4	2	5	4	2	2	3	4	5	3	2	3	4	5	5	2	2	4
3	3	3	4	3	3	3	3	3	3	3	2	3	4	4	4	4	3	1	1	4	4	4	4	4	2	3	4	4	3	3	3	4	3	4
4	4	3	4	5	5	3	3	3	4	4	2	2	2	3	4	3	3	4	3	3	4	4	5	4	4	4	4	3	1	5	1	4	0	0
3	5	5	0	0	0	5	2	1	3	5	5	5	1	5	5	5	5	5	1	1	5	5	5	5	3	1	5	5	5	3	1	1	5	5
5	5	4	5	5	4	4	3	5	4	4	3	2	3	5	4	3	4	3	4	4	3	4	4	4	2	2	3	4	5	4	4	2	2	2

Questions

36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	R1	R2	R3	R4	R5	R6	R7
3	4	4	4	4	5	4	4	4	4	4	4	4	4	3	4	4	4	3	4	3	5	3	4	4	5	4	4	4	3	3	5	3	5	4	3	4	5	5	4
5	5	5	5	5	5	5	4	5	5	5	4	3	4	5	4	4	5	5	5	5	5	1	5	5	4	3	2	1	1	1	1	4	4	5	4	5	3	4	4
3	4	3	4	3	4	5	4	4	3	3	4	3	3	3	4	2	3	2	4	2	2	3	2	2	3	3	4	4	4	4	3	5	4	4	4	5	4	4	4
3	2	2	3	3	5	4	1	1	3	3	3	4	5	3	4	5	4	2	3	1	2	2	1	1	2	1	3	3	2	3	3	2	5	5	5	5	5	5	5
5	5	5	5	5	4	5	4	4	5	5	4	4	3	5	5	5	5	5	4	5	4	4	4	3	5	4	4	4	4	4	3	5	5	4	4	4	4	4	4
5	5	5	5	4	4	4	4	5	4	4	3	5	5	5	5	5	5	4	4	5	3	5	4	4	5	4	3	1	4	4	0	5	4	4	4	4	4	4	4
4	4	3	5	5	5	4	4	4	5	5	4	5	5	5	5	4	5	3	4	4	4	4	3	3	5	3	3	4	1	3	5	5	4	4	3	4	3	3	4
4	5	5	5	4	5	4	4	4	5	5	3	5	5	5	4	3	5	4	4	5	2	4	4	4	5	3	3	3	3	4	3	3	3	3	3	4	3	4	4
4	5	5	5	5	5	4	4	4	5	5	4	5	5	5	5	5	5	3	4	5	4	4	3	4	5	2	4	4	3	4	4	4	4	4	3	4	4	4	4
1	3	2	2	2	2	2	2	2	2	2	3	2	2	1	1	1	1	3	2	2	4	4	2	2	1	1	3	4	4	4	2	4	2	4	4	3	4	4	2
4	4	4	4	4	4	5	4	4	4	4	4	4	3	4	4	3	5	5	4	3	1	5	3	4	5	3	1	4	5	4	5	1	5	4	2	5	4	4	4
0	1	2	1	0	3	4	3	4	4	1	4	5	1	0	1	1	5	4	4	1	1	2	0	0	5	2	1	4	4	3	5	5	4	4	4	4	4	4	4
4	5	5	5	4	5	5	5	5	4	5	5	5	5	4	5	4	5	4	5	4	4	2	3	4	3	3	5	1	1	5	2	3	5	5	5	4	2	5	4
3	4	4	5	4	4	4	4	4	5	5	5	3	4	4	3	4	3	3	5	3	3	3	3	3	3	2	3	4	4	4	4	4	4	2	3	4	3	4	4
2	2	2	3	3	1	4	4	5	2	3	3	2	2	4	2	4	5	4	4	3	1	2	2	2	2	2	3	2	4	4	4	4	4	4	4	4	5	4	4
4	4	4	5	4	4	5	5	4	5	4	4	4	4	4	4	4	4	3	4	3	4	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	3	4	4
4	3	3	2	2	5	2	1	1	2	4	3	5	0	5	5	5	5	4	4	5	4	4	4	1	3	3	4	4	4	3	4	4	4	4	3	3	4	4	4
2	4	3	2	3	4	2	2	2	2	2	2	4	1	2	2	4	1	1	4	3	3	1	1	1	2	2	4	4	3	3	3	2	4	2	4	3	4	4	3
4	5	5	5	5	5	4	3	4	4	5	5	5	4	5	5	5	5	5	4	5	3	3	4	1	5	4	5	4	4	4	2	5	4	5	4	4	3	4	4
5	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	5	5	5	5	3	5	5	1	5	5	5	4	0	5	1	4	5	5	5	5	5	5	5
3	4	4	3	4	4	4	5	5	4	4	4	4	3	3	4	4	4	4	4	4	3	3	1	1	3	3	3	4	2	4	4	3	5	5	4	5	3	5	4
3	5	5	5	5	4	4	4	5	5	5	5	5	4	4	4	5	4	5	5	5	4	4	4	3	4	5	5	5	5	5	5	5	5	4	5	4	5	5	4
2	3	3	3	1	5	4	3	3	4	4	3	5	3	2	4	4	5	2	4	2	5	3	1	1	2	2	3	5	3	4	3	5	5	5	4	4	4	4	4
4	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	4	5	5	5	5	5	5	4	4	5	5	1	1	1	1	1	5	5	5	5	4	5	5	5
2	4	5	3	4	2	4	5	3	3	3	2	4	4	3	3	3	3	3	4	2	4	2	3	3	4	2	4	3	2	4	1	2	4	3	2	4	3	5	3
3	4	4	4	4	4	4	4	4	4	4	4	5	3	4	4	4	4	5	4	5	5	5	5	1	5	5	5	4	4	4	3	5	3	5	3	4	3	4	4
4	5	5	5	5	5	4	3	5	4	5	5	4	3	3	3	3	3	3	4	3	3	3	3	3	3	3	5	5	5	4	5	5	4	4	4	5	5	4	4
3	4	5	5	4	5	4	5	4	4	4	4	5	3	3	5	4	5	4	3	3	4	1	1	4	5	5	4	3	4	5	4	4	4	4	4	4	4	4	4
4	3	4	4	4	5	5	5	5	5	5	4	5	3	3	5	5	5	5	3	4	1	5	5	5	5	3	2	3	3	3	3	4	4	4	3	4	4	4	4
3	3	2	3	3	3	3	2	2	3	3	3	2	3	2	3	2	2	2	2	1	2	2	2	2	2	1	3	4	4	4	4	5	3	3	3	3	4	4	3
4	4	4	4	3	5	5	4	4	4	4	4	5	4	4	4	4	4	4	4	5	3	4	4	4	5	5	3	2	2	4	3	3	4	4	3	4	4	3	4
5	5	4	1	1	5	5	4	5	5	5	5	5	5	3	5	4	5	4	5	5	5	1	3	3	5	5	1	1	1	3	1	3	5	5	5	5	4	4	5
2	3	4	3	4	2	4	3	4	3	4	4	3	2	3	2	3	1	4	4	1	3	4	3	2	4	3	3	2	1	3	2	3	3	4	2	4	4	3	3
3	5	4	4	5	5	5	4	4	5	5	4	3	5	1	2	4	3	4	5	1	3	3	2	2	3	3	1	2	3	4	2	2	5	5	5	4	5	5	3
4	5	5	5	4	4	4	4	4	4	5	4	5	4	4	4	5	4	4	4	4	5	4	4	3	5	1	1	1	1	1	5	5	5	5	5	5	5	5	5
5	4	4	5	5	5	4	4	4	3	5	4	5	4	4	4	5	4	3	5	1	3	4	4	3	5	3	3	3	1	2	3	2	4	5	4	4	5	5	5
3	2	2	4	4	3	4	3	4	3	3	4	4	3	3	3	4	3	2	3	3	1	3	3	3	2	4	4	3	2	2	2	1	3	3	3	4	4	4	4
2	1	1	3	2	1	4	2	2	2	3	2	1	2	1	1	2	2	2	3	1	2	1	1	2	3	1	2	2	1	4	4	4	3	2	4	4	5	4	2
5	4	4	4	4	4	5	5	4	4	4	4	5	5	4	5	4	4	4	4	5	5	4	1	2	4	3	3	3	3	4	3	4	5	5	4	5	5	5	3
4	3	3	4	3	4	4	3	4	3	3	3	5	4	1	4	1	5	3	4	3	3	3	1	1	4	5	4	2	4	3	3	4	5	4	3	4	5	5	5
3	4	4	4	3	4	4	3	4	3	3	3	4	3	3	3	3	3	4	4	4	4	3	3	3	3	3	2	2	4	4	2	4	4	4	4	5	3	3	4
1	1	2	4	2	2	3	2	3	2	3	3	3	2	2	2	2	2	3	3	3	1	2	2	2	2	2	4	4	3	4	2	4	4	2	4	4	4	4	3
3	5	5	5	5	5	4	4	4	4	5	4	5	4	4	4	5	4	2	4	3	5	5	3	3	2	2	3	2	4	4	3	2	4	4	4	3	4	3	3
2	2	2	5	5	4	4	4	4	4	3	4	4	4	4	4	4	3	3	3	2	1	2	1	1	2	2	1	5	4	3	4	4	4	3	4	4	3	4	3
5	5	4	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	4	4	5	4	4	4	2	5	5	3	5	4	4	4	5	5	4	5	4	5	5	4
4	5	5	5	4	5	4	5	5	3	5	5	5	5	5	5	5	5	5	4	5	4	5	5	5	5	5	2	3	2	2	3	3	5	4	3	4	5	5	4
4	4	4	5	5	5	5	4	4	5	5	5	5	4	4	4	4	4	4	5	4	4	4	4	4	4	5	3	3	3	3	3	3	4	4	4	4	5	5	4
3	3	2	4	4	4	3	3	3	3	3	2	5	4	3	4	4	4	3	3	4	4	3	1	1	5	5	4	4	3	4	3	3	5	4	5	4	5	5	3
2	5	5	5	4	5	5	4	4	5	5	4	5	4	3	4	4	4	5	5	5	1	5	4	4	5	5	3	1	5	5	3	4	5	3	5	4	4	5	2
3	3	2	5	5	1	5	4	5	5	5	4	3	5	5	4	1	3	1	2	5	4	4	2	2	2	4	5	5	3	1	1	1	4	2	4	4	5	5	5
4	3	3	5	3	3	4	3	4	4	4	3	3	4	3	3	3	4	4	4	3	4	3	3	3	4	4	3	3	2	2	3	4	4	2	3	4	4	4	3
5	5	5	5	4	5	5	2	4	3	2	2	5	4	5	5	4	5	4	4	4	3	4	2	2	5	3	3	3	4	5	4	4	5	4	4	4	4	5	4
4	4	4	4	3	4	4	3	3	3	4	3	2	3	3	3	3	3	1	3	1	2	2	2	1	3	3	3	4	4	3	2	4	3	2	4	4	4	4	3
2	4	4	3	3	3	4	3	4	3	4	4	5	5	5	5	3	4	4	3	4	2	2	1	1	3	4	1	1	4	5	1	1	5	2	4	4	4	4	4
2	4	3	4	4	4	5	5	5	4	5	5	5	4	4	4	4	4	3	4	3	3	4	1	1	5	4	4	4	4	5	4	4	4	4	4	4	5	4	4
4	3	4	5	5	3	3	4	5	3	3	3	3	5	4	4	4	3	3	3	4	3	4	3	3	3	5	3	3	3	3	4	3	4	4	4	4	3	4	5
2	5	5	5	4	4	3	5	5	2	5	3	5	4	3	3	5	2	1	2	2	1	3	1	1	1	2	5	3	3	4	2	4	3	3	4	4	5	5	2
4	3	3	4	4	4	4	2	3	3	4	4	3	3	3	4	3	4	3	3	3	2	4	4	5	4	3	1	1	1	3	2	1	4	4	3	3	3	4	3
0	0	0	4	2	3	4	3	4	2	4	2	4	3	2	5	2	4	4	3	1	3	5	2	2	5	5	3	4	4	3	3	4	4	3	4	4	5	5	4
3	5	3	5	1	5	5	5	5	5	5	5	1	1	2	2	2	2	2	3	1	3	3	3	3	2	2	3	2	2	2	2	3	3	4	4	4	4	3	4
3	3	3	4	4	3	4	2	3	2	2	3	2	1	2	2	2	2	4	4	4	5	4	2	2	5	1	3	3	3	4	3	3	4	3	5	3	3	4	5

MEDIUM COMPANIES

FIRMS (Medium))	State	Size	Name	Position	Type
Carrocerias de Baja California, S.A.	BC	Med.	Joaquin Luken	Ger.Gen.	Carrocerias p/camiones
Fabricantes de Vidrio (FEVISA), S.A.	BC	Med.	Diego Solis	Ger.Gen.	Fabricante de Vidrio
Industrias Hodoyan, S.A.de C.V.	BC	Med.	Armen Hodoyan	Ger.Gen.	Pan dulce
Zahori, S.A. de C.V.	BC	Med.	Alfredo Ramirez	Ger.Cal.	Materiales p/Techo
Exito S.A.	Coah	Med.	Luciano Lopez		Ind. Manufacturera
Ascomatica, S.A. de C.V.	DF	Med.	Jorge Paniagua	Dir.Cal.	Maq.y Eq. Elect.
Carrocerias Preconstruidas	DF	Med.	Gabriel Zavala	Ger. Prod.	Carrocerias
Eaton Ejes, S.A.de C.V.	DF	Med.	José Medina	Ger.Cal.	Partes Automotrices
Industrias Kirkwood, S.A.	DF	Med.	Rogelio Guzman	Ger.Cal.	Motores Electricos
Latinoamericana de concretos	DF	Med.	Christopher Rabiet	Ger.Cal.	Concretos
Embotelladora Cristall	Dgo.	Med.	Domingo Rodriguez	Ger. Cal.	Embotelladora
Envases Especializados de la laguna, S.A.de C.V.	Dgo.	Med.	Hector Guerrero Herrera	Ger.Gen.	Envases
Embotelladora La Minera	Hgo.	Med.	Fernando Romero		Bebidas
Fábrica San Luis	Hgo.	Med.	A. Castelan		
Industrial de productos de.... norte de B.C.	Hgo.	Med.	Ma. del Consuelo Mtz.	Jefe Cal.	
Sopromafo	Hgo.	Med.	José Antonio Espinoza		
Textiles	Hgo.	Med.	Francisco Brass		
Ceramica Buena Vista, S.A.	Jal.	Med.	Victor Fimbrej	Ger. Cal.	Ceramica
Pasteurizadora Laguna	Jal.	Med.	Nora Rodriguez	Jefe Cal.	Pasteurización
Asgrow Co.	Mich.	Med.	Jesús Galvan	Ger. Desarroll	
Embotelladora de Nayarit, S.A.de C.V.	Nay.	Med.	Noé Xamargo	Ger.prod.	Bebidas
Tabacos Azateca, S.A.	Nay.	Med.	Juan Amezcua	Ger. Planta	Tabaco
Aceros R.G.C.	NL	Med.	Marco A. Coronado	Jefe Cal.	Proc. Acero
Auto Templex, S.A.de C.V.	NL	Med.	Victor Ocegueda C.	Ger.Cal.	Ind. Vidrio
Berel, S.A.	NL	Med.	Héctor Gorena Morales	Dir.Gen.	Fabricación de pinturas
Botes y Envases	NL	Med.	Joaquin Colomer	Ger.Gen.	Envases
Coprporación Santa Rosa, S.A.de C.V.	NL	Med.	Fernando Castro	Ger. Rel.	Alfombras y tapetes
Crest,S.A.	NL	Med.	Jorge Aldape L.	Dir.Gen.	Cementos
Dolorey, S.A. de C.V.	NL	Med.	Sergio Robles	Ger.Cal.	Prod. Min.no metal.
Empaques Flexibles S.A. de C.V.	NL	Med.	Raúl Maldonado	Dir. Gen.	Resinas y Fibras Sint.
Escencias y Concentrados, S.A.	NL	Med.	Mauro Hernandez J.	Ger.Prod.	Bebidas
Escobera la Reynera, S.A. de C.V.	NL	Med.	Félix Cantu	Ger. Gen.	Escoba
Fabricaciones y Representaciones Industriales, S.A.	NL	Med.	Carlos Martinez	Ger. Cal.	Metalmecanica
Filtros y Mallas Industriales, S.A. de C.V.	NL	Med.	Carlos Piña Cruz	Jefe Prod.	Purificación de aire
Fordath, S.A. de C.V.	NL	Med.	Griselda palafox	Jefe Cal.	Resinas y Fibras Sint.
Forja Rey, S.A.de C.V.	NL	Med.	Blacna Lozano	Jefe Prod.	Ataudes
IXTLERA de Santa Catarina, S.A. de C.V.	NL	Med.	Miguel Schwarz	Ger.Gen.	Industria Textil
Mecanismos Ensamblados S.A.	NL	Med.			Productos metálicos
Mega Alimentos, S.A.	NL	Med.	Juan Pablo Treviño	Ger. Oper.	Alimentos
Niples del Norte	NL	Med.	Fco.Javier Alvarado	Jefe Cap.	Tuberias
Perfiles de Mexico, S.A. de C.V.	NL	Med.	Guillermo Gonzalez	Dir. Gen.	Ind. Metalurgica
Plásticos Rex S.A. de C.V.	NL	Med.	Enrique A. Pérez R.		Tubos de Polietileno
Quimobásicos, S.A. de C.V.	NL	Med.	José A. Flores	Jefe Lab.	Productos quimicos
Quimobásicos, S.A.de C.V.	NL	Med.	Mateo Rojas Díaz	Sup.Cal.	Productos químicos
Spirax Sarco Mexicana, S.A.de C.V.	NL	Med.	Fernando Olivares	Ger.Cal.	Válvulas y regulador
Vege de México, S.A. de C.V.	NL	Med.	Jorge Pemado	Ger. Cal.	Motores
Viplasticos	NL	Med.	Victor	Ger.Cal.	Arts. de plastico
Vitro Monterrey, S.A. de C.V.	NL	Med.	Ernesto Villareal C.	Dir. Cal.	Vidrio
Zinc Nacional, S.A.	NL	Med.	Eduardo C. Webster III	Dir. Admon.	Productos minerales
Cementos Cruz Azul	Oax	Med.	Antonio A.Gonzalez	Ger.Prod.	Cementos
Crolls Mexicana, S.A. de C.V.	PUE	Med.	Sergio Gonzalez	Ger. Cal.	Electrodomesticos
Agroequipos del Valle, S.A. de C.V.	SIN	Med.	César Angulo Inzunza	Ger. Gen.	Equipo Agricola
Embotelladora Moderna Tabasco	Tab.	Med.	Oswaldo Martinez	Ger. Gen.	Embotelladora
Aloe Gonzalez	Tamps.	Med.	Jose Gonzalez	Dir. Gen.	
Sociedad de Motores	Tamps.	Med.	M. Flores		
Telmag (Axa)	Tlax	Med.	Salvador Arcos T.		Maq.y Eq. Elect.
Telmag. S.A. de C.V.	Tlax.	Med.	Pablo Garcia G.	Ger. Cal.	Maq. y Eq. Elect.
Huevo Cóndor		Med.	Ricardo Javier Garza V.		productos alimenticios
Protec		Med.	A.Fuentes G.	Ger.Gen.	
Parch, SA de CV.	Hgo.	Med	Angel Gutierrez		
Botellas de Plastico Monterrey	NL	Med.	Humberto Villanueva		

Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
4	3	4	0	0	0	2	3	1	4	3	2	5	2	3	3	5	3	2	5	2	4	5	2	3	2	2	5	4	2	1	3	1	1	1
4	3	4	1	0	0	4	4	1	3	3	4	3	1	5	3	4	5	4	3	4	3	4	4	4	4	1	4	4	2	4	4	2	2	3
1	3	3	1	0	0	4	5	2	3	1	1	3	3	1	1	4	4	4	4	3	2	3	3	4	2	1	1	3	1	3	2	2	2	3
4	4	3	3	3	3	4	3	4	4	4	3	4	3	4	4	4	5	4	4	3	3	4	4	3	3	3	3	4	2	4	3	3	3	4
3	2	2	0	0	0	3	4	2	2	3	3	4	3	4	4	3	3	2	4	3	2	4	4	3	4	3	5	4	2	3	4	3	3	4
1	1	2	1	0	0	1	3	3	2	1	1	2	2	1	1	1	1	1	2	1	1	2	1	1	1	1	2	1	1	1	1	1	1	2
4	2	3	1	0	0	2	1	1	1	3	1	1	3	3	2	3	3	1	4	1	2	3	1	1	1	1	1	3	2	4	3	1	1	3
4	4	4	4	4	4	4	4	4	3	4	3	4	4	4	4	3	4	3	3	3	3	3	4	4	4	3	3	3	4	4	4	3	4	4
2	3	3	3	4	4	4	2	1	3	5	4	4	3	4	3	3	3	3	3	2	3	3	4	3	4	4	4	4	4	4	4	4	3	4
2	2	4	1	1	1	2	3	1	1	4	2	1	2	1	3	2	2	1	2	1	2	1	4	4	3	1	5	5	3	5	3	1	4	3
3	4	4	5	4	4	5	3	5	4	5	3	4	2	5	5	2	4	3	3	4	4	4	5	4	4	3	3	3	3	2	5	5	4	3
5	5	5	5	3	5	3	3	4	4	4	5	3	2	5	5	3	5	3	4	3	4	5	5	5	3	3	3	4	5	5	5	3	4	5
3	3	3	0	0	0	3	4	4	4	3	2	3	2	4	4	3	4	4	3	3	2	3	4	3	4	3	3	4	3	2	4	3	4	4
3	4	3	4	4	4	3	4	3	3	4	3	3	3	5	4	4	4	3	2	4	4	4	5	5	4	3	4	4	4	4	3	5	3	4
3	2	2	2	2	1	2	3	2	3	3	1	2	3	2	2	3	4	2	3	3	3	3	3	2	2	2	1	3	1	4	1	1	3	2
4	5	5	1	4	5	4	4	1	1	4	4	2	1	1	1	1	4	1	3	3	1	4	1	4	3	3	4	4	2	1	1	5	2	3
4	5	4	5	5	5	4	4	3	4	5	3	3	3	5	4	4	4	5	2	5	4	5	5	5	5	3	4	3	5	5	4	5	3	4
1	5	4	1	3	3	2	1	2	3	2	3	2	3	3	2	1	4	1	2	2	3	4	5	5	3	1	2	2	1	3	1	1	3	3
5	5	4	4	3	4	4	4	3	3	4	4	4	3	3	3	3	3	5	5	5	4	5	5	4	4	4	5	5	4	5	5	5	5	5
5	5	4	5	4	5	4	4	4	4	5	4	4	4	5	5	5	5	5	4	5	4	5	5	4	4	4	5	5	5	5	5	5	4	4
4	3	4	0	0	0	3	3	4	3	3	3	4	3	3	3	3	4	4	3	3	3	3	3	3	3	3	4	4	2	1	4	2	3	4
3	4	3	4	4	5	5	3	2	4	3	3	3	3	2	3	3	4	2	1	3	3	3	3	4	3	1	3	3	4	3	2	1	2	4
3	3	2	0	0	0	1	1	1	5	3	1	4	3	4	4	1	4	4	1	2	2	3	3	5	3	2	4	2	4	5	4	1	3	3
5	5	4	5	3	5	3	3	1	4	5	3	5	4	4	3	3	4	2	2	5	4	5	4	4	5	4	4	5	4	5	5	5	4	4
5	5	4	4	4	4	3	3	4	5	3	3	5	4	3	4	5	5	3	5	5	4	5	5	5	5	4	5	5	5	5	5	3	3	5
4	4	3	2	0	0	4	4	4	4	3	3	2	4	4	4	3	4	4	5	4	4	5	5	3	4	2	3	5	2	3	3	2	3	4
3	3	4	0	0	0	3	2	3	3	4	3	3	4	4	4	4	4	4	4	2	2	3	3	3	4	3	3	4	4	4	4	3	4	3
4	4	3	5	5	5	4	3	1	3	5	3	4	4	5	5	4	4	5	5	4	4	4	5	4	5	2	2	4	3	5	3	5	5	5
2	4	5	5	5	5	5	4	1	5	2	2	5	4	3	4	3	5	5	1	5	5	4	3	5	4	4	4	5	1	5	3	5	4	5
4	5	4	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	4	5	3	5	5	5	3	5	3	4	5	5	5	5	4	5	5
4	4	4	2	2	3	2	3	4	3	2	2	3	2	3	3	4	4	4	4	4	3	4	4	3	4	2	2	5	1	5	4	5	5	4
5	5	5	5	3	5	3	4	3	4	3	3	5	2	3	4	5	4	5	5	3	2	5	5	3	3	1	3	5	5	5	2	1	5	3
5	5	4	5	5	5	4	4	3	5	5	5	5	4	4	4	4	5	4	4	5	5	5	5	5	5	5	5	5	4	5	4	5	5	4
2	4	4	0	0	0	2	4	1	2	3	2	1	1	1	3	3	3	2	3	4	4	4	2	4	3	1	1	3	1	1	1	1	1	3
5	3	2	3	3	4	3	2	3	2	3	3	3	2	3	3	3	3	2	4	2	2	2	3	3	3	1	1	1	1	4	3	4	4	4
3	5	4	5	5	5	4	3	4	4	3	3	5	4	4	4	5	5	4	5	3	4	4	5	4	4	5	4	4	3	4	2	3	3	4
4	5	4	2	4	5	4	3	3	3	3	4	3	3	4	4	4	5	3	4	2	2	4	3	4	3	2	4	3	1	1	3	2	2	2
3	2	3	2	1	2	1	3	3	2	4	3	3	2	3	2	3	4	2	3	3	2	3	4	4	3	3	2	4	3	3	2	3	3	3
2	2	2	1	0	0	2	4	2	2	3	1	4	1	1	1	3	4	1	4	3	2	2	3	1	2	1	3	3	1	2	2	1	3	2
4	5	5	5	4	4	4	4	4	5	4	4	4	3	4	4	4	4	4	3	5	4	5	5	4	4	3	3	3	4	3	3	3	3	4
4	4	4	0	0	0	3	4	2	4	5	4	4	3	4	4	4	4	2	5	2	3	3	4	4	4	1	4	4	1	3	3	3	4	4
4	3	3	0	0	0	4	3	5	4	4	3	2	4	3	3	4	4	4	2	4	3	4	4	3	5	2	2	3	4	5	3	3	3	4
4	3	4	3	1	5	3	2	5	4	2	2	3	2	2	2	3	3	4	4	3	3	5	3	5	4	1	2	3	4	5	5	1	3	3
4	5	4	3	4	3	3	4	3	4	5	4	5	3	3	3	4	4	3	4	4	4	4	4	5	4	4	4	4	4	5	4	3	3	3
3	5	5	5	5	5	5	4	5	4	5	4	3	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	4	3	5	5	5
4	5	4	5	3	5	3	4	4	4	5	4	5	4	5	5	5	5	5	5	5	4	5	5	5	4	4	4	5	5	5	5	5	4	4
5	4	3	4	5	5	3	3	2	4	4	4	5	4	4	5	4	4	4	3	4	3	4	4	4	5	3	4	4	4	5	4	5	4	5
3	2	3	0	0	0	4	2	5	4	3	3	4	2	3	3	3	4	5	4	5	4	5	5	5	4	5	5	5	1	4	3	2	3	4
4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	2	5	5	5	5	1	5	5	5	3
5	4	3	5	5	5	4	3	4	4	5	4	3	4	3	3	4	3	3	5	4	2	5	4	5	5	2	2	2	2	4	5	3	5	4
4	5	3	5	5	5	2	2	4	3	4	3	5	1	5	5	4	5	3	1	5	1	4	5	2	3	1	1	5	5	5	1	4	4	3
3	4	3	3	4	4	3	4	3	3	3	3	4	3	4	3	4	4	4	4	2	3	4	3	3	3	3	3	3	2	2	2	3	3	3
5	5	5	5	4	5	4	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	3	4	4	4	3	4	3	3	3	4	4	4	3	4	4	3	4	4	3	3	3	4	4	3	4	3	3	4	4	3	4	4	3	4
2	4	2	4	4	4	3	4	4	4	5	5	5	4	5	4	5	4	5	5	4	4	4	5	4	5	4	4	5	4	1	5	5	5	4
5	4	4	5	5	5	5	3	3	5	5	4	5	5	5	5	3	5	3	3	5	2	2	4	4	5	3	3	3	5	5	5	4	5	4
5	4	4	5	5	5	5	4	2	4	4	4	3	1	4	4	2	2	4	1	5	2	4	4	3	4	1	1	3	4	5	5	5	4	2
2	3	3	4	4	4	4	3	5	4	3	3	4	3	3	3	4	4	2	5	2	3	5	3	5	5	5	5	5	0	5	5	3	5	5
3	2	2	0	0	0	4	4	2	2	3	3	3	2	2	2	3	3	3	4	2	2	4	4	2	2	2	2	3	2	5	4	3	2	2
3	3	3	0	5	5	5	3	4	4	0	0	0	0	2	0	3	4	5	5	0	0	0	1	2	2	0	0	3	0	1	0	0	0	2
2	2	1	4	3	3	3	4	2	2	1	1	3	2	5	4	2	3	1	1	1	2	5	5	2	1	4	3	2	3	3	2	3	2	2

Questions

36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	R1	R2	R3	R4	R5	R6	R7
2	2	3	3	5	2	5	5	5	5	5	5	3	2	2	3	3	3	2	3	3	3	3	3	3	2	1	4	4	4	3	3	4	3	3	3	4	4	5	4
1	4	4	4	4	4	5	4	4	5	5	5	1	5	4	3	3	3	3	5	1	2	3	4	3	2	5	3	0	4	4	4	2	4	4	4	4	4	4	4
1	3	2	3	3	1	3	1	4	3	5	4	3	4	4	3	5	4	3	4	4	1	5	2	2	5	1	1	3	2	5	0	1	5	3	4	4	5	4	3
4	3	3	4	4	4	4	3	4	4	4	4	3	4	4	4	4	4	2	4	5	1	4	4	4	1	4	2	1	2	4	2	4	4	4	4	4	3	3	4
4	4	4	3	3	2	4	4	4	3	4	4	3	3	3	2	3	3	2	4	1	1	5	5	5	1	1	1	1	1	1	1	1	4	3	4	4	5	5	2
1	1	1	5	1	5	5	3	3	4	4	1	1	1	1	1	1	1	1	5	1	1	1	1	3	1	1	4	5	5	3	4	2	3	4	4	3	4	3	2
1	3	3	3	1	3	3	1	1	2	2	2	1	3	2	1	1	1	1	1	1	1	5	5	1	1	1	4	4	3	4	3	3	3	4	3	4	3	3	3
3	4	3	4	4	4	3	4	4	4	4	4	4	4	3	3	3	4	3	4	3	4	3	3	3	4	3	4	3	3	4	2	4	4	3	4	4	4	3	3
3	3	3	4	4	4	3	4	4	4	4	4	3	2	3	4	2	3	2	4	4	3	1	4	4	2	5	5	1	5	3	1	5	4	4	5	4	4	5	5
4	3	2	1	5	3	4	2	5	5	4	4	1	2	3	2	3	2	2	3	3	1	5	3	1	1	1	3	3	0	0	2	5	5	4	4	4	5	5	2
4	4	4	4	4	4	4	4	4	3	3	4	5	4	5	5	4	4	3	4	5	1	4	4	4	3	4	3	2	2	4	2	2	4	4	4	4	4	4	4
5	4	4	5	5	4	5	3	4	4	5	5	2	3	3	3	4	3	5	4	4	4	5	2	2	4	5	4	2	2	5	3	5	4	4	4	5	5	5	5
4	4	4	4	4	3	5	4	4	4	5	5	3	3	4	3	0	3	3	3	4	2	3	3	3	3	2	2	4	2	3	3	3	4	4	3	4	4	4	4
3	4	4	5	3	3	5	4	4	4	4	4	5	4	4	4	4	5	3	3	3	3	3	3	2	3	2	2	3	3	3	2	3	3	3	3	3	3	4	3
2	2	2	3	3	1	3	3	3	3	3	3	4	2	2	1	3	2	1	3	2	1	3	3	1	1	2	3	2	2	2	4	4	3	3	4	4	4	3	3
3	3	2	4	2	1	2	3	3	2	1	1	4	4	4	1	1	3	3	4	1	1	4	1	1	3	2	2	3	3	3	3	3	4	2	4	2	5	3	3
3	4	4	5	3	3	5	4	4	4	4	4	5	4	3	4	3	5	3	3	3	3	3	2	2	4	3	2	3	4	3	2	4	4	4	3	4	3	3	3
2	4	3	5	1	3	5	4	5	5	4	5	3	4	4	3	3	2	1	2	4	1	5	5	5	2	2	1	1	1	3	3	2	4	4	4	3	3	5	4
4	5	4	5	5	4	5	4	4	4	5	5	4	4	4	4	4	4	3	2	3	2	1	2	2	1	3	1	2	1	1	3	1	5	3	3	5	4	4	4
5	4	4	5	5	5	5	5	5	5	5	5	5	4	5	4	4	5	4	4	5	3	2	3	5	4	2	3	3	3	3	5	5	4	5	4	5	5	5	5
4	4	3	2	2	2	4	4	4	4	5	4	3	3	3	3	3	3	3	4	4	2	3	3	2	3	4	3	4	3	4	4	4	3	2	3	4	4	4	3
2	4	4	3	2	3	3	4	4	3	4	3	4	3	3	3	3	4	2	2	2	3	2	3	1	2	1	3	3	3	3	3	3	4	3	3	4	3	3	3
1	3	3	3	1	4	3	3	3	3	4	3	4	2	1	3	2	4	1	4	2	1	3	3	3	1	1	3	4	5	3	3	5	2	3	3	3	3	3	3
2	4	3	5	5	4	4	5	5	4	4	5	5	3	3	3	5	5	5	5	4	3	2	2	2	5	2	3	4	4	4	3	4	4	4	4	4	4	4	4
5	4	4	5	5	5	5	4	4	5	5	5	5	4	5	5	5	5	4	5	5	3	5	4	5	4	4	3	3	3	5	3	4	4	2	3	5	3	4	3
3	3	3	3	3	4	4	4	4	4	4	4	3	2	3	3	3	2	3	5	3	1	4	2	3	3	3	4	3	5	4	3	4	4	4	3	4	4	5	4
3	3	4	4	3	4	4	4	4	4	4	4	3	4	4	4	3	4	3	4	4	3	3	2	2	3	2	3	4	4	4	3	4	4	2	3	3	4	4	4
3	5	5	3	4	3	5	4	3	4	4	2	5	4	2	4	5	3	2	4	3	1	2	3	2	5	3	3	4	3	3	3	5	4	2	4	5	5	4	5
4	5	5	5	5	4	5	5	5	5	5	5	5	4	5	3	4	5	5	4	3	1	3	1	1	5	5	1	1	1	1	1	2	5	1	1	5	3	5	5
5	4	5	5	3	5	5	3	3	4	4	4	4	4	5	4	5	5	3	4	5	5	5	3	3	5	2	1	1	1	5	3	5	5	5	5	5	5	5	5
2	4	4	5	4	4	4	4	2	2	2	3	4	4	4	3	4	2	2	4	3	1	1	1	1	2	2	1	4	4	1	2	4	4	4	4	3	4	3	2
1	5	5	1	1	5	5	4	3	2	5	1	2	1	1	3	1	3	3	4	5	1	5	1	1	5	2	1	1	1	5	3	1	4	5	4	4	4	3	5
4	5	5	4	4	4	5	5	5	5	5	5	5	4	4	5	5	5	5	4	5	4	5	4	4	5	5	3	5	4	4	3	3	5	5	4	5	5	5	5
1	2	2	1	1	3	4	2	1	1	1	1	3	2	1	1	2	1	1	2	1	3	1	1	4	2	1	3	2	2	5	4	5	5	4	3	5	4	4	4
4	3	3	3	3	3	4	2	2	3	3	4	3	2	2	2	2	2	2	3	1	1	1	1	1	2	1	2	4	3	4	2	4	4	3	2	3	3	2	3
3	3	3	2	3	3	5	5	5	4	4	5	4	3	4	3	3	3	2	3	1	1	5	2	2	2	2	2	4	2	3	3	4	5	4	3	4	3	4	4
3	5	5	4	4	5	4	3	3	4	4	4	4	3	2	3	4	4	3	4	3	2	5	2	2	2	3	3	2	2	3	3	3	3	2	3	3	3	3	3
4	3	3	2	3	2	3	3	4	3	3	2	2	2	3	2	3	3	2	3	2	3	2	3	2	2	2	3	4	4	3	2	4	3	2	3	3	2	4	3
1	1	1	1	3	1	3	3	3	4	4	3	2	2	3	1	2	2	1	2	1	1	2	2	2	1	2	4	2	1	3	4	4	4	4	3	4	4	2	2
3	3	3	3	3	4	4	3	3	3	3	3	4	3	4	3	3	4	3	3	4	5	4	5	4	5	3	3	3	3	3	3	4	3	3	4	4	3	4	4
3	4	4	3	2	3	4	3	5	5	5	4	2	2	3	3	4	3	2	3	4	1	5	2	2	1	1	1	1	2	4	2	5	4	5	4	5	3	3	4
2	4	2	3	2	5	5	4	4	4	4	4	4	5	5	5	3	3	4	3	4	2	3	4	3	5	4	4	2	4	5	4	4	4	4	4	3	4	4	4
1	4	3	5	0	4	5	3	4	4	3	3	5	5	5	3	3	4	4	4	5	4	2	5	4	2	4	2	1	1	0	0	5	5	5	4	4	4	4	4
3	3	2	0	0	4	4	4	5	4	5	4	3	4	4	4	2	3	3	4	3	2	2	1	1	5	5	3	2	2	2	3	4	4	4	3	4	2	4	4
4	5	5	5	4	5	5	4	5	5	5	5	5	5	5	5	3	4	4	5	2	2	3	1	2	2	3	3	3	4	4	0	0	5	5	5	5	5	5	5
3	5	5	5	5	5	4	4	5	4	5	5	4	3	4	4	5	4	5	3	4	1	3	3	4	5	5	4	4	4	2	1	4	4	4	3	4	3	3	4
3	5	4	5	5	4	3	4	4	4	5	4	5	3	4	3	1	2	2	3	4	3	2	2	2	3	5	3	3	4	4	4	5	4	3	4	3	4	4	3
3	4	4	5	5	4	5	5	5	5	5	5	5	3	4	4	5	4	5	4	5	5	5	4	4	5	5	1	1	1	4	2	1	4	4	3	4	4	2	4
5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	1	1	1	5	5	5	5	5	4	1	5	5
5	5	5	3	1	4	5	5	5	3	4	3	4	5	5	4	4	3	3	5	5	2	4	5	5	4	4	3	2	3	3	2	2	4	4	3	4	4	5	5
2	5	5	5	5	5	4	4	3	2	1	3	3	4	3	4	4	4	4	3	3	3	5	2	2	5	1	5	5	2	4	1	5	5	2	3	4	3	3	4
3	3	3	4	4	3	4	4	3	3	5	4	4	5	4	4	4	3	2	3	3	5	5	5	5	5	3	2	3	2	2	2	2	4	3	4	5	4	4	4
5	5	5	5	5	5	4	4	4	4	5	5	4	4	4	4	4	4	3	4	5	4	2	5	5	4	4	3	3	3	3	3	3	4	5	5	4	5	5	5
4	3	4	4	4	5	3	4	3	3	4	4	4	3	4	3	3	4	4	3	4	4	2	3	4	4	3	2	2	3	2	2	3	4	4	3	4	4	4	4
5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	4	3	4	3	1	3	4	3	3	3	1	1	1	1	1	4	4	4	2	4	3	3	3
3	3	5	5	2	5	4	4	5	4	5	5	5	4	4	5	4	5	5	4	2	1	2	2	2	5	4	5	2	3	4	2	4	4	4	4	5	4	4	4
3	5	4	4	1	4	5	4	3	4	5	5	5	4	4	5	1	5	5	4	1	5	0	2	1	5	5	5	5	5	3	3	5	2	2	2	4	4	1	2
3	3	3	5	5	5	5	5	5	5	5	3	3	3	3	4	3	0	5	5	5	2	5	4	5	1	5	1	1	1	1	1	5	5	5	5	5	5	5	3
3	0	4	4	1	2	4	5	4	4	4	4	3	2	2	2	4	3	2	3	3	4	3	4	2	2	2	1	2	2	4	1	4	4	4	4	4	4	4	3
0	0	0	1	0	0	0	5	5	5	0	5	3	3	4	4	0	3	2	4	3	2	4	4	4	5	3	3	3	4	4	1	1	2	3	3	3	3	3	3
4	2	2	4	1	5	5	3	4	4	5	5	2	2	1	1	3	1	2	4	4	1	4	3	1	1	1	4	4	4	4	4	4	4	3	4	2	4	4	3

SMALL COMPANIES

FIRMS (Small)	State	Size	Name	Position	Type
Fumosa	Coah	Small	Ramon Barajas	Jefe Proy.	
Trinitri Industries de Mexico	Coah	Small	Ramon Villareal	Ger. Cal.	Tanques Est. de acero
A&P	DF	Small	Laura martinez	Subger.Gen.	Productos de acero.
Portex, S.A.	DF	Small	Rosa María Herrejon	Subger.Gen.	Productos promocionales
BIC.	Ed.Mex	Small	Carlos Garza	Ger. Depto.	Plumas y encendedores
Quirelli, S.A.	Gto	Small	Fco. Mascarell	Dir. Gen.	Zapatos
Servicios Eden, S.A. de C.V.	Gto	Small	Fco. Mascarell	Dir. Gen.	Renta de serv.p/fiestas
Exportación de Tabacos Mexicanos, S.A.de C.V.	Nay.	Small	Rodolfo Bojorquez	Ger.R.H.	Tabaco
Acrílicos Procesados	NL	Small	Hector Peña	Dir.Gen.	
Chromite	NL	Small	Luis Moncayo	Ger. Distribuc	Valv. y acces. tubería
Dal-Tile México	NL	Small	Guillermo de los Santos	Ger.Cal.	
Danfoss Compresores, S.A.de C.V.	NL	Small	Carlos Ramirez		
Desarrollo de Excelencia Industrial, S.A. de C.V.	NL	Small	Nino L. Quintanilla	Ger.Gen.	
Desarrollo de Productividad Industrial, S.A.	NL	Small	J.Salvador Salinas	Ger. Gen.	
Editorial Oro S.A. de C.V.	NL	Small	Miguel Angel Leal	Dir. Gen.	
GEIMM	NL	Small	Armando Tovar	Ger.Prod.	
Industrias Cosal, S.A. de C.V.	NL	Small	Jesús Leal	Ger. Gen.	
Industrias NACESA, S.A.de C.V.	NL	Small	Héctor Acosta	Subger.planta	Prod. Min.no metal.
Ingeniería y Materiales Bermejo1	NL	Small	Gregorio Pérez	Ger. Gen.	
Interlien, S.A. de C.V.	NL	Small	Manuel Sala	Dir. Gen.	
Motorwheel	NL	Small	Alvaro Quiroga	Ing.Cal.	
Olimoda, S.A. de C.V.	NL	Small	Ramiro Olivares	Dir.Gen.	
Organización Orbis, S.A.	NL	Small	Juan José Loa	Ger. R.H.	
Pro ambiente	NL	Small	Roberto Herrera	Ger.Gen.	Tratam. de desechos
Quifloza, S.A.	NL	Small	Diana castillo	Ger. Admon.	Servicios arq. e ing.
Sada Garza Lorenzo Fco.	NL	Small	Reynaldo Rodriguez	Jefe Planta	
Seinpek, S.A.	NL	Small	Jose Luis Salinas	Dir. Gen.	Hornos Indusrtiales
SMMSA	NL	Small	Guillermo Ordoñe	Jefe Cal.	Malla de Alambre Acero
Tecnologia Quimica Avanzada	NL	Small	Gerardo Elizondo	Ger.Prod.	
TOLMEX, S.A. de C.V.	NL	Small	Raúl Ramos	Ger.Gen.	Cemento
Unisource Deppapel del Noreste S.A. de C.V.	NL	Small	Jorge Arguelles	Dir. Gen.	
Cal la Tehuana	Oax	Small	Josefat Hernandez	Dir.Gen.	
Arvin de México, S.A. de C.V.	Quer	Small	J.P. Moreno	Dir. Cal.	
Hiltex el Marques, S.A.	Quer	Small	Juan R. Sada	Ger.Gen.	
SEPROFIN S.A. de C.V.	SIN	Small	Aléxis Botacio	Dir. Admon.	
Cerma Automotriz, S.A. de C.V.	Ver	Small	Anastacio Cervantes	Dir. Gen.	
Promotora Ind. Juarez	Chih	Small	Pablo Ramos A.	Ger. Cal.	
Acabados Automotrices	NL	Small	Arturo Vazquez	Ger.Gen.	Fab. de pintura
Accesorios Automotrices Atlas	NL	Small	Manuel Garza	Ger.Planta	Ind. Automotiz
Administración Automatizada, S.A.	NL	Small	Ruben Soto	Dir. Desarrol	
Alumetales SA. CV.	NL	Small	Jesus A. Rodriguez		Lingotes de aluminum
Automotivos, S.A. de C.V.	NL	Small	Arturo Vazquez	Ger.Gen.	Prod. Limpieza
Bolsas Delta	NL	Small	José A. Luna C.	Jefe Prod.	Bolsas de papel
Bueno Alimentos, S.A. de C.V.	NL	Small	Carlos Vazquez F.	Ger.Cal.	
Ceramica Aljesa	NL	Small	Alfonso Sada	Dir. Gen.	Ceramica
Ceramosa	NL	Small	Luis E. Gutierrez	Ger.Gen.	Ceramica
Compañia Selmec. S.A.	NL	Small	Ricardo Garza	Ger. Prod.	Calderas y Radiadores
CREASA	NL	Small	Carlos Famsod	Ger.Planta	Ind. Automotriz
Formatubos. S.A. de C.V.	NL	Small	Carlos Jerusalmi	Ger.Gen.	Muebles
Galvament.S.A.de C.V.	NL	Small	Pichardo		Prod. Metal.
Industrias Vago de México S.A. de C.V.	NL	Small	Oscar Vazquez	Ger. Desarrol	Sellos y empaques
Metales Atomizados. S.A.de C.V.	NL	Small	Armin Menchaca		Polvos y pastas de metal
Productos Cerámicos. S.A.	NL	Small	Raúl Rocha	Dir. Gen.	Industria cerámica nometalica
Tapetes Típicos. S.A. de C.V.	NL	Small	Abel Figueroa	Ger. Gen.	Textil
Tecnologia de Metales	NL	Small	Fidel Treviño	Jefe Planta	Metalurgia
Terramak. S.A. de C.V	NL	Small	Rodolfo Hernandez	Jefe Prod	Equipo Agricola

Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
2	5	2	5	5	5	3	3	2	3	5	4	3	3	4	4	3	2	4	3	4	2	4	4	4	4	2	2	4	4	5	5	5	3	2
4	5	4	4	5	4	4	3	4	4	4	4	4	3	4	4	2	4	4	3	4	3	4	4	4	2	4	3	3	4	5	5	5	3	2
4	3	3	0	0	0	2	3	2	2	4	3	4	4	4	4	5	4	1	5	2	2	5	4	2	5	2	4	4	1	1	1	1	4	5
3	4	4	0	0	0	3	3	4	4	5	3	4	3	4	3	3	4	1	4	4	3	2	4	4	3	2	3	4	1	1	1	4	4	5
5	5	5	5	3	5	3	5	5	5	5	5	4	5	4	4	5	5	5	5	5	4	5	5	1	5	3	3	4	4	5	5	5	4	4
2	3	2	4	4	4	4	2	1	3	4	3	4	3	4	4	4	4	4	2	3	3	4	3	3	4	4	4	4	2	4	2	3	4	4
2	2	3	0	0	0	1	3	3	2	1	1	1	2	1	2	3	1	1	3	1	1	2	1	2	3	1	1	3	1	1	1	1	1	2
4	4	4	3	2	4	2	2	1	3	3	2	3	4	4	4	3	3	3	3	2	2	3	3	3	3	2	3	2	3	1	2	2	1	2
4	2	3	5	5	5	5	4	2	2	3	3	5	2	2	2	5	5	1	5	1	4	5	2	5	3	1	4	5	2	5	1	1	1	5
2	4	2	0	0	0	2	4	3	3	2	1	2	1	3	3	2	3	3	3	2	1	1	3	2	2	1	2	2	2	2	2	1	1	2
3	4	4	2	0	0	2	5	4	4	4	2	3	2	4	4	4	4	2	3	4	3	4	4	2	4	1	3	4	4	5	5	2	4	4
5	4	4	4	3	4	3	3	2	4	4	4	1	4	4	4	3	3	3	3	3	3	3	4	3	2	2	3	3	3	4	3	4	2	2
3	2	2	1	3	3	2	3	3	1	1	2	4	2	2	3	2	1	1	1	1	2	2	1	2	1	1	4	4	1	1	1	2	3	4
2	1	1	0	0	0	1	2	4	2	2	1	3	1	1	2	1	1	1	1	1	2	2	1	2	1	2	3	3	1	1	1	2	2	3
2	4	2	5	5	5	3	4	3	3	3	2	4	3	3	2	4	4	2	1	2	4	4	4	2	3	2	3	4	3	2	2	3	2	4
3	3	2	2	3	3	3	2	4	4	3	3	2	3	4	4	2	4	5	3	4	3	3	3	2	2	2	3	2	4	2	2	2	4	3
3	3	4	0	0	0	3	2	4	4	2	3	3	3	4	4	3	5	2	4	2	3	3	2	3	2	2	3	3	2	4	4	2	2	4
3	2	3	2	0	0	2	4	4	3	3	4	2	3	3	4	4	3	4	3	4	3	4	5	5	4	3	4	5	4	5	3	3	4	4
1	1	1	0	0	0	3	3	3	3	1	1	4	4	3	3	4	2	1	4	1	3	3	1	4	4	1	3	4	1	1	1	2	3	3
4	5	4	0	0	0	4	4	4	5	5	4	3	4	5	5	5	5	4	5	3	3	5	4	5	4	3	3	5	2	4	3	2	4	5
4	4	4	4	1	5	3	2	4	5	4	3	5	1	5	4	3	4	4	4	5	4	5	4	3	4	3	4	2	4	5	5	3	3	4
1	3	2	1	0	0	4	3	2	3	4	2	4	5	5	4	4	3	1	2	1	1	5	2	2	5	1	4	4	1	1	1	4	4	5
4	5	4	0	0	0	3	4	4	4	5	4	5	4	4	4	5	5	5	5	4	4	4	4	5	5	5	4	5	4	5	5	4	5	5
3	5	3	3	4	4	3	3	2	3	3	3	4	2	3	3	3	4	2	3	4	4	5	4	4	3	4	4	4	5	5	5	2	2	3
2	3	2	1	2	3	2	2	2	1	1	2	3	1	1	2	2	1	1	1	1	2	2	1	2	1	1	3	3	1	1	1	2	2	3
3	1	5	5	5	5	5	3	4	5	4	3	4	5	5	5	5	5	4	5	4	3	4	5	4	3	4	4	4	3	1	4	4	4	5
2	5	5	4	5	5	4	3	5	3	4	2	5	1	4	4	5	5	4	5	4	5	3	4	3	3	1	4	2	1	1	1	3	2	1
1	3	4	4	4	4	2	1	1	2	5	3	5	1	4	3	4	4	4	1	1	1	1	2	2	2	2	2	2	5	1	5	5	1	1
3	3	2	0	0	0	2	4	4	3	2	3	2	1	3	2	3	5	3	5	1	3	5	3	3	1	1	2	5	3	4	5	1	2	4
5	5	5	5	5	4	3	3	5	4	5	5	3	4	2	3	4	4	5	3	5	4	4	5	5	4	5	4	5	3	5	5	4	5	5
3	4	4	4	4	3	3	4	1	3	3	3	3	4	4	4	3	4	5	3	4	4	4	3	4	4	4	3	3	1	1	4	3	3	3
4	3	3	4	4	3	3	3	4	3	3	3	1	3	3	2	4	3	2	4	3	2	4	3	4	4	1	2	2	1	2	4	3	4	2
5	5	5	5	5	5	5	3	3	4	5	5	3	5	5	5	3	4	4	2	5	3	4	4	5	4	1	1	3	1	4	4	5	4	4
3	4	5	3	4	4	3	3	4	4	3	3	5	3	4	4	3	4	2	3	4	4	4	3	4	4	5	4	3	3	1	4	4	3	4
3	3	3	0	2	3	3	4	2	3	4	4	1	3	2	2	2	2	1	1	1	1	4	3	3	3	1	1	1	1	1	1	2	2	3
4	4	4	0	0	0	3	3	2	4	4	3	5	4	2	2	4	3	3	3	2	1	4	2	3	1	2	2	2	1	1	2	3	2	1
3	3	3	3	3	3	3	3	3	3	4	1	3	3	3	4	5	5	4	3	3	4	4	4	2	5	4	5	5	5	5	4	2	4	5
4	4	4	0	0	0	5	5	5	2	1	1	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	5	3	5
2	0	3	5	5	5	0	2	3	2	5	3	4	5	5	5	0	2	3	1	1	0	1	3	0	5	0	1	0	4	5	3	5	5	5
3	5	4	4	4	4	3	3	1	3	1	1	1	1	3	5	2	5	1	2	3	1	4	5	5	2	1	1	5	1	5	4	4	4	1
4	3	3	4	5	5	5	3	3	2	2	3	4	5	5	5	4	5	5	3	3	2	4	5	4	4	3	3	0	0	0	5	4	4	2
5	4	5	1	0	0	5	4	5	2	1	1	3	4	5	4	5	5	5	5	4	5	5	4	5	5	4	5	5	4	5	3	4	3	5
4	4	5	3	5	5	5	5	3	3	3	3	3	4	3	4	1	3	1	1	5	5	5	4	3	5	5	3	3	4	5	3	5	5	5
4	4	3	3	2	2	2	1	1	4	2	1	1	1	2	2	3	3	1	2	4	3	4	3	5	2	1	1	1	1	2	2	1	2	2
2	3	3	4	4	3	3	4	5	3	4	4	3	2	4	4	5	3	2	2	2	5	3	4	4	4	3	4	4	3	3	2	2	4	4
2	2	2	1	0	0	3	1	1	2	3	3	2	2	4	3	2	3	1	3	1	1	2	2	2	3	1	3	2	3	4	3	1	1	2
2	3	3	3	2	3	3	3	5	3	2	2	1	3	1	1	1	4	4	5	1	1	4	2	2	3	1	1	1	1	5	5	3	2	3
4	5	4	1	0	0	4	4	4	4	3	2	5	3	4	5	2	4	3	3	1	2	3	4	4	3	1	3	4	3	2	4	4	4	4
3	3	2	3	3	3	3	2	3	3	3	2	4	2	3	3	4	4	4	4	3	3	3	3	3	3	2	4	5	4	4	3	3	4	4
4	4	4	5	5	4	5	4	4	5	4	5	5	4	4	4	5	5	5	5	4	4	5	5	4	3	3	4	4	3	5	4	5	3	4
3	5	5	1	0	0	5	5	3	5	0	2	4	5	5	5	5	4	5	5	4	3	3	5	5	5	2	5	5	5	5	5	1	5	5
3	4	4	3	4	4	3	3	2	2	3	2	2	3	3	3	3	3	1	3	2	2	2	3	2	4	3	3	3	3	3	2	2	3	3
3	4	4	0	0	0	1	1	2	1	2	2	3	2	3	2	2	3	1	4	2	2	1	3	3	2	1	4	4	1	3	1	3	2	2
2	5	5	4	5	4	4	5	1	3	4	3	3	4	2	4	4	4	1	3	1	2	4	2	3	5	2	1	3	1	1	2	1	3	3
5	5	4	0	0	0	3	2	4	3	3	4	4	2	3	4	4	5	3	5	3	4	4	3	3	4	2	4	4	3	4	4	3	4	4
5	4	5	3	3	3	4	5	4	3	4	3	5	5	5	5	5	5	3	4	3	4	4	4	4	5	4	5	5	5	5	3	3	4	5

Questions

36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	R1	R2	R3	R4	R5	R6	R7
4	5	4	3	3	5	3	2	3	3	4	3	4	4	4	3	4	4	2	4	3	4	5	3	3	4	2	1	1	1	1	3	1	3	3	2	4	4	3	3
2	4	4	3	4	2	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	3	4	4	4	5	3	1	1	1	3	3	1	3	3	2	4	4	3	3
2	5	5	1	5	1	5	4	5	5	5	5	4	3	3	3	5	3	4	5	5	5	4	2	2	2	1	1	1	1	2	1	1	5	4	3	5	5	5	5
4	3	3	1	1	1	5	4	5	5	4	4	2	4	4	4	4	2	3	4	5	2	3	4	4	2	2	2	2	3	3	3	4	4	2	4	5	4	4	5
1	5	5	5	5	4	5	4	4	4	4	5	5	4	4	5	4	5	3	5	5	5	4	5	5	5	5	5	5	4	5	2	5	5	5	4	5	4	4	5
4	4	3	4	4	4	4	3	3	4	4	4	4	4	3	3	4	4	2	4	2	4	2	4	4	4	3	2	3	4	4	2	4	4	2	4	4	4	3	3
1	1	1	2	2	1	3	1	2	3	4	3	3	2	2	2	2	2	1	2	2	1	2	3	3	2	1	2	3	2	3	2	2	3	2	3	3	3	4	4
1	1	1	3	1	2	3	1	2	2	2	2	4	3	3	3	1	4	2	3	2	2	1	2	2	2	2	3	3	3	0	5	5	4	2	3	3	5	3	4
4	1	1	5	5	5	5	4	5	4	4	5	5	5	2	1	4	4	5	2	3	3	2	4	2	5	4	1	2	1	1	2	5	5	4	4	5	4	4	5
1	2	3	1	2	1	3	3	3	3	3	3	4	1	1	1	2	1	2	3	1	2	3	2	2	1	2	3	3	3	3	3	2	4	4	3	2	4	3	3
2	2	0	4	3	3	4	3	3	3	4	3	5	4	2	3	4	4	1	4	1	3	2	1	1	1	2	2	4	4	3	2	2	4	4	3	3	5	4	4
3	3	3	3	3	3	4	4	4	4	3	3	4	4	3	3	3	3	4	4	3	2	4	2	2	2	5	4	2	2	4	2	5	5	4	4	4	5	5	5
2	4	4	3	3	4	5	4	4	5	4	4	3	1	2	1	1	2	2	3	1	1	3	4	4	1	1	2	1	2	1	1	1	1	2	2	3	3	4	3
2	4	4	2	2	3	3	3	3	4	4	4	2	2	2	2	2	1	2	4	2	1	2	3	3	1	1	3	3	4	3	2	1	2	1	1	4	2	5	3
3	2	3	2	4	5	4	4	3	4	4	5	4	3	4	4	4	4	3	4	5	1	4	5	4	2	3	3	2	1	3	3	4	4	5	3	4	5	5	3
2	2	2	2	2	4	4	4	4	4	4	3	2	2	2	3	3	4	2	3	2	2	2	2	1	2	1	3	4	2	2	2	2	3	4	4	3	4	4	3
2	3	2	4	4	3	4	4	4	3	3	4	4	3	3	2	2	4	3	4	2	2	2	3	2	3	2	4	4	4	4	3	3	4	4	3	4	4	4	3
3	4	4	4	4	4	3	3	4	3	4	5	5	4	3	2	3	4	3	3	5	3	4	4	4	3	2	3	3	3	4	2	2	4	4	2	2	3	3	4
3	3	2	4	4	4	3	3	3	3	3	4	3	3	2	3	3	3	2	3	3	2	3	3	3	2	2	2	2	3	3	3	3	3	2	3	3	2	3	2
3	4	4	4	4	3	5	5	5	5	3	5	5	5	5	5	5	5	4	4	4	5	5	4	3	5	3	3	3	4	2	2	2	4	3	3	4	4	4	3
3	5	3	5	5	3	5	5	5	5	4	3	2	5	3	3	1	2	4	3	4	5	5	2	2	5	5	3	5	4	0	1	3	5	5	5	4	5	4	5
4	1	1	5	3	3	5	3	4	4	2	3	1	4	1	1	3	2	1	2	5	1	3	3	1	1	1	3	1	4	4	3	5	4	1	4	5	5	3	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5	5	4	5	5	3	4	4	3	3	4	3	3	4	4	4	4	4	2	3	4	4	5	5
3	4	3	4	4	3	4	3	4	3	3	4	3	4	2	2	2	3	2	4	1	2	3	1	1	2	2	3	3	3	4	3	3	4	5	3	5	5	5	5
1	3	2	3	2	3	4	3	3	4	3	3	2	1	2	1	1	2	1	2	1	1	3	3	3	1	1	3	3	4	3	4	4	3	2	4	4	3	3	4
3	4	5	5	5	5	5	4	4	5	4	4	5	4	5	5	5	5	1	4	5	1	2	5	5	3	2	3	1	1	1	3	1	5	5	3	5	3	5	5
3	1	1	1	4	3	4	5	5	5	2	5	5	5	5	3	5	5	4	5	3	5	5	5	5	3	1	1	1	2	3	3	2	5	1	2	5	1	1	3
1	2	5	5	4	2	3	2	3	4	4	4	2	3	5	1	4	2	1	4	1	1	1	1	1	1	3	1	1	1	3	1	3	4	4	3	4	4	3	3
3	2	0	4	5	2	4	3	3	4	4	3	5	4	1	1	4	4	5	4	1	1	3	2	1	5	1	2	5	3	3	3	1	4	3	3	3	3	4	2
5	4	4	4	5	3	4	4	5	4	5	5	4	5	5	4	4	4	5	4	3	5	4	4	4	4	4	2	1	2	4	1	1	5	5	2	2	2	5	5
2	3	2	1	2	1	4	2	2	4	3	4	4	3	3	2	3	3	2	4	4	1	2	3	2	2	2	2	2	0	0	0	4	4	4	3	4	3	4	4
3	5	5	4	1	3	5	5	4	5	4	2	4	4	4	3	4	2	3	5	1	1	3	5	4	2	2	5	2	3	3	3	2	4	3	3	5	4	4	5
2	5	4	3	2	4	5	3	4	5	5	5	5	3	3	3	5	5	5	4	4	3	1	3	2	3	4	3	4	5	5	5	5	5	5	4	5	5	5	5
3	3	3	3	2	4	4	4	3	5	5	4	5	4	4	4	5	4	4	4	3	3	4	5	4	4	4	4	5	4	5	3	3	5	3	4	5	5	5	4
3	3	3	1	1	2	3	3	3	2	2	1	1	1	1	1	1	1	2	3	1	1	1	3	3	1	2	2	4	2	3	2	2	4	4	4	3	2	4	3
3	2	3	2	1	1	4	4	4	3	4	3	5	4	3	3	2	4	5	4	3	2	2	3	3	4	1	2	3	4	3	1	1	4	4	4	4	2	5	3
1	4	4	4	4	5	4	4	4	4	5	5	4	2	4	1	3	3	3	3	1	1	4	2	2	4	4	2	2	2	5	1	1	4	4	3	5	4	5	1
5	5	5	5	3	5	5	3	5	5	5	5	4	5	5	5	5	5	5	5	5	2	5	5	2	5	5	4	4	4	4	3	3	5	4	3	4	5	5	5
1	1	0	5	1	5	5	0	5	5	5	4	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	3	2	2	3	3	4	3	1	3	4	3	4	4
2	4	3	4	5	4	5	4	4	4	4	4	3	2	1	1	1	1	1	4	2	5	4	3	3	1	1	1	2	3	0	0	0	4	4	2	4	5	5	5
2	4	4	0	2	3	4	4	5	5	4	4	4	3	3	2	2	3	2	2	2	1	5	0	0	1	2	3	1	2	0	0	0	4	4	3	4	4	2	3
5	4	5	5	3	5	5	3	5	4	5	5	4	5	5	4	5	4	5	5	5	2	5	5	2	5	5	4	4	4	4	3	3	5	4	3	4	5	5	5
1	5	5	5	1	5	5	5	5	4	1	5	5	3	5	5	4	5	2	1	5	1	3	5	3	5	3	4	2	3	4	2	2	4	2	3	3	2	3	3
2	2	1	3	1	3	4	1	1	1	1	3	1	2	2	2	1	2	5	2	1	1	2	4	4	2	3	3	2	3	3	3	3	4	4	3	4	3	4	4
2	2	2	5	5	4	5	5	5	5	5	5	5	4	4	4	3	4	3	4	5	2	4	3	3	3	2	1	1	1	1	1	1	5	5	5	5	4	4	4
1	1	1	3	2	3	2	1	1	2	1	2	1	1	1	1	2	2	1	1	2	1	2	2	1	1	1	3	3	2	4	3	2	4	4	4	3	3	4	3
2	1	1	4	4	1	5	3	5	2	5	4	3	5	4	2	1	3	1	5	3	3	3	4	4	1	3	3	4	4	4	4	4	4	4	3	4	2	5	2
4	3	4	2	4	4	5	4	4	4	4	4	4	4	5	4	4	5	2	5	4	3	3	4	2	3	1	2	2	2	3	2	2	4	4	3	4	3	3	4
3	3	3	4	4	4	5	5	5	5	5	5	4	4	4	4	3	4	3	3	4	3	3	3	3	3	2	2	2	2	3	2	2	3	3	3	3	3	3	4
4	4	4	4	5	5	4	4	4	4	4	5	4	4	3	4	4	4	4	4	3	5	3	4	4	5	4	4	4	3	3	5	4	5	4	4	4	5	5	4
5	5	5	5	1	5	5	3	4	5	5	4	5	5	3	3	1	5	4	5	1	3	4	2	3	1	2	2	2	3	4	1	5	3	5	3	5	4	3	5
2	3	3	4	3	4	4	4	4	4	3	3	3	2	3	3	3	3	2	4	3	3	2	3	2	2	1	3	5	3	3	3	3	4	3	3	4	4	4	4
1	2	3	3	3	2	4	4	4	4	3	4	3	2	3	2	3	3	1	3	4	3	2	4	4	2	1	4	4	4	1	2	2	4	2	4	4	2	4	4
1	1	1	1	2	1	4	5	5	3	4	3	1	5	1	2	3	2	2	4	3	1	2	3	3	1	1	3	2	2	3	2	2	4	4	4	4	3	5	4
2	2	2	4	4	3	5	4	4	3	2	3	3	3	3	3	4	3	3	2	3	2	3	1	1	3	2	3	2	2	4	2	4	3	2	3	5	3	3	2
3	4	4	4	4	5	5	4	4	4	5	5	4	4	4	4	4	4	3	4	4	1	5	5	5	1	5	5	5	3	1	1	5	1	1	5	4	3	5	5

MAQUILADORAS

FIRMS (Maquiladoras)	State	Size	Name	Position	Type
CAMSCO	BC	MAQ	Joyce Robertson	Dir.Op.	Aparatos Electronicos
Clemar Manufacturing	BC	MAQ	Carlos Lujan	Ger.Gen.	Rotores p/tractocamiones
Electra Estrella de Oro	BC	MAQ	Arturo Altamirano	Ger.Planta	
L-N Safety Glass	BC	MAQ	Moises Sotelo		
Matsushita Electronic Components	BC	MAQ	J.Hefferan	Dir.Prod.	Tuners p/T.V.
Ind. Internacional de San Pedro	Coah.	MAQ	Sergio Cano	Ger. Cal.	
ACS Internacional, S.A. de C.V.	NL	MAQ	Gloria Moreyra	Ger. Cal.	Cable p/energ. elec.
Allied Signal Automotive	NL	MAQ	Edmundo Gonzalez	Jefe Cal.	
Amelec, S.A. de C.V.	NL	MAQ	José Miguel Gonzalez	Dir.Gen.	Electronica
American Electric de Mexico, S.A.de C.V.	NL	MAQ	José Miguel Gonzalez	Dir.Gen.	Electronica
Anchorlok de Mexico	NL	MAQ	Fernando Izunza	Ger.R.H.	
Anchorlok, S.A.de C.V.	NL	MAQ	José Miguel Gonzalez	Dir.Gen.	Frenos para autos
Armoflex, S.A.	NL	MAQ	Donato Rodriguez	Jefe R.H.	
Automotive Wire Harnesses of México S.A. de C.V.	NL	MAQ	Roberto Serrato		
Automotive Wireharness de México S.A de C.V.	NL	MAQ	Tereza Cavazos	Ger. Cal.	
Beta de Monterrey S.A.	NL	MAQ	Hugo Elizondo	Ger. Gen.	Ind. Eléctrica
CCI Mexicana, S.A.	NL	MAQ	Rolando Montelongo	Jefe Cal.	
Corporación Industrial Moldeo, S.A. de C.V.	NL	MAQ	Carlos Chavez	Ger.planta	Productos plástico
Criser, S.A.	NL	MAQ	Juan José Garcia	Jefe R.H.	Productos plástico
Deming Worthington de Mexico	NL	MAQ	Carlos Mejia	Ger. Cal.	
Jugetes Damar, S.A. de C.V.	NL	MAQ	Arturo Guzmán	Ger. cal.	Productos plástico
Juguetes Damar S.A. de C.V.	NL	MAQ	Juan G. Meléndez P.		Juguetes
Kaydon S.A. de C.V.	NL	MAQ	Ing. Rafael Salazar		Anillos, baleros, bolas
Kemet de México S.A. de C.V.	NL	MAQ	Ing. Víctor Rivera		Industria eléctrica
KEMET de Mexico, S.A. de C.V.	NL	MAQ	Jessy Franco	Ger. Cal.	
Moldes Cerámicos	NL	MAQ	Alejandro Treviño	Sup.Prod.	Moldes industriales
Motores Domésticos	NL	MAQ	Cázarez	Ger.Planta	
Nothern Telecom	NL	MAQ	Gerardo Garza	Dir. Gen	
Oranjugos, S.A. de C.V.	NL	MAQ	Douis F. Hovel	Dir. Gen.	Alimentos
Orval Kent de Linares	NL	MAQ	Pedro Vaquero	Jefe Cal.	
Plasticos IGA	NL	MAQ	Angel Rincon	Ger. Planta	.
Plasticos Leon	NL	MAQ	German Avalos	Ger. Cal.	
POPI, S.A. de C.V.	NL	MAQ	Guillermo Ortiz	Ger. Cal.	
Producción Imagen de México, S.A.	NL	MAQ	Nelly Medina	Jefe Cal.	
Productos Mexicanos de Resinas	NL	MAQ	Gregorio Operel	Ger .R.H.	Harneses de Hule
Saturn de Monterrey,S.A.de C.V.	NL	MAQ	Hugo Elizondo	Dir.Cal.	Botellas Plásticas
Sentek de Mexico	NL	MAQ	Eugenio Garza	Ger. Planta	
Smartflex Systems de Mexico, S.A.de C.V.	NL	MAQ	José Antonio Romero	Dir.Prod.	
Thomas & Betts de Monterrey, S.A.de R.L.	NL	MAQ	José Miguel Gonzalez	Dir.Gen.	
usem	NL	MAQ	Raymundo Solis	Jefe Prod.	Producción de ropa int.
Usem de México, S.A.	NL	MAQ	René J. Resendez Hdez.		Motores de inducción
Vexon, Balsa Industrias, S.A.de C.V.	NL	MAQ	Vicente Ibarra	Ins.Cal.	Muebles Metal
Winston Data	NL	MAQ	Fernando Gutierrez	Ger. Cal.	
York International, S.A. de C.V.	NL	MAQ	Gerardo Del Prado	Dir. Cal.	Aire acondicionado
Alcom Electronics de Mexico	Tamps	MAQ	Janett Galvan	Sup.Cal.	
Controles Reynosa, S.A.deC.V.	Tamps	MAQ	Flovit Vite	Sub-Ger.Cal.	
Delnosa,S.A.deC.V.	Tamps	MAQ	Mario Serrano	Ger.Cal.	
Deltronicos, S.A.	Tamps	MAQ	Nicolás Castillo		Autoestereos
ITT Automotive	Tamps	MAQ	Carlos Carmona	Sup.Cal.	
Kimco, S.A.de C.V.	Tamps	MAQ	Orlando Martinez	Ing.Cal.	
Norton Company	Tamps	MAQ	Elizabeth Hernandez		
Sociedad de Motores,S.A.deC.V.	Tamps	MAQ	Blanca Cardenas	Audit.Cal.	
TRW VSS1 (Planta del Norte)	Tamps	MAQ	Rafael Martinez	Ger.Planta	
Zenith	Tamps	MAQ	Heber Ramirez		
AT&T de Mexico, S.A. de C.V.	Tamps.	MAQ	Raquel Avila	Ger.Cal.	
Birds Eye de Mexico, S.A.	Tamps.	MAQ	Jose Medellin	Ger.Cal.	Comida Enlatada
Delnosa, S.A. de C.V.	Tamps.	MAQ	Gerardo Bonilla		Electronico
Leece Neville de Mexico, S.A.	Tamps.	MAQ	Guadalupe Gonzalez	Ger.Cal.	
Resortes K L. de Mexico	Tamps.	MAQ	Beatriz Ramos	Ger Cal.	
Varel Manufacturing ,S.A. de C.V.	Tamps.	MAQ	Mario Ruiz	Ger.Oper.	

Questions

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
4	3	3	5	4	3	3	3	5	4	5	2	5	2	3	3	3	4	2	1	2	3	3	4	4	5	4	4	3	5	5	3	4	4	4
5	5	4	4	4	5	3	3	4	4	4	3	3	3	4	4	3	5	4	2	5	4	4	4	4	4	3	4	4	5	4	4	5	4	4
4	4	3	1	1	1	2	2	2	2	4	3	4	2	4	2	5	3	2	4	1	2	3	3	2	1	1	2	2	1	1	2	1	1	2
4	4	4	4	5	5	4	4	3	4	2	1	1	5	3	3	1	5	4	2	2	1	4	4	2	2	1	4	4	2	5	3	3	4	2
4	4	4	5	5	5	4	4	3	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	5	4	5	4	4	4
4	4	4	5	2	5	3	3	3	4	5	3	5	4	4	4	5	5	3	4	5	5	5	5	2	5	1	3	3	5	1	4	2	2	4
3	3	2	0	0	0	3	1	1	3	2	1	3	0	4	3	2	3	3	3	0	3	3	2	3	2	1	4	4	2	4	2	3	3	3
5	5	4	4	3	4	4	4	5	4	4	4	4	4	4	4	4	4	5	4	4	3	4	4	4	3	3	4	1	5	5	4	4	3	3
5	5	5	5	5	4	4	3	5	4	4	3	5	3	4	5	5	5	5	2	4	4	4	3	3	4	5	3	5	3	5	4	5	3	3
4	5	5	4	4	3	3	3	4	3	4	3	5	3	4	4	5	5	4	2	4	3	4	3	3	4	5	3	5	3	4	4	5	3	3
1	5	3	1	0	0	3	3	1	5	4	2	5	3	5	5	4	5	4	5	3	3	3	3	5	4	5	5	5	3	5	4	3	3	3
4	4	4	4	4	3	3	2	4	3	3	2	4	2	3	4	4	4	4	1	3	3	3	2	2	3	4	2	4	2	4	3	4	2	2
3	5	5	5	5	5	4	4	5	4	3	4	5	5	5	4	4	4	3	4	3	4	4	4	4	4	3	4	4	5	5	3	4	4	4
4	3	3	4	2	3	3	3	4	3	4	2	3	2	3	3	2	3	3	2	2	2	3	4	3	3	2	3	3	3	1	2	2	3	3
4	4	4	4	3	4	4	3	5	4	4	4	4	2	4	4	3	4	4	2	3	3	4	4	3	3	3	4	4	3	2	4	3	3	3
3	4	3	5	5	3	3	4	3	3	4	2	1	2	2	2	2	3	5	3	3	1	3	3	3	2	2	3	4	5	5	4	3	3	2
4	3	4	0	0	0	4	4	5	3	2	2	2	3	4	4	3	3	4	1	3	3	4	3	1	2	2	2	3	5	5	4	2	2	3
4	5	4	1	5	5	5	3	3	5	5	5	5	5	5	5	5	5	4	1	3	5	5	5	5	5	5	4	5	5	5	3	5	5	5
5	4	4	2	0	0	4	4	4	4	3	3	5	3	4	4	5	5	5	3	3	5	4	3	2	4	5	4	5	4	4	4	4	3	5
4	5	5	5	4	5	4	4	3	4	5	5	3	3	5	4	5	5	5	5	4	5	4	4	4	5	5	5	4	3	5	4	5	5	4
4	4	3	5	4	5	4	2	4	3	3	2	4	3	3	3	4	4	2	4	4	4	3	4	4	4	3	4	5	2	2	1	4	4	4
3	5	2	4	5	5	2	1	1	3	2	4	4	4	2	2	1	3	1	1	4	3	5	3	3	3	1	3	4	1	1	1	1	2	2
2	4	4	5	5	5	3	3	5	3	5	5	4	3	5	4	4	5	5	3	3	5	5	4	4	5	3	4	5	4	5	4	5	4	5
5	5	5	5	5	5	5	4	5	5	5	4	4	3	5	5	4	5	5	5	5	5	5	5	5	4	3	5	5	5	5	5	5	3	3
4	4	4	5	3	5	4	3	5	4	5	5	5	4	5	5	4	5	4	4	5	4	5	5	5	4	2	4	4	5	5	5	5	4	5
5	5	5	5	5	5	4	5	4	5	3	5	5	5	5	5	1	5	1	4	5	0	5	5	5	5	5	5	5	4	5	5	5	0	5
5	5	4	4	5	5	4	4	4	5	5	4	4	4	5	5	5	5	4	4	5	4	5	4	4	5	4	4	5	5	5	5	5	4	5
2	2	2	5	4	5	2	3	4	4	3	3	4	2	4	3	3	4	4	4	4	3	3	3	2	4	2	4	4	4	4	4	4	3	4
2	4	4	0	0	0	2	3	3	3	4	2	3	1	2	2	4	5	4	5	2	1	4	4	4	4	2	3	5	3	5	3	2	3	2
3	4	4	3	4	4	4	5	3	4	5	5	3	4	4	4	3	4	2	2	2	3	3	4	4	2	2	2	4	3	4	4	3	3	3
2	5	5	1	3	3	5	4	4	2	5	2	4	3	3	4	4	4	4	1	4	3	4	4	4	4	4	4	5	4	4	4	2	3	5
1	4	4	3	2	1	2	2	1	1	5	4	4	3	4	2	1	3	3	1	3	2	3	4	3	4	1	2	4	5	4	4	1	1	1
3	2	3	4	4	5	2	1	1	2	4	2	2	3	3	4	3	1	2	2	3	2	2	5	5	5	4	3	1	1	1	1	2	3	4
4	3	4	5	5	5	4	4	4	4	5	5	4	5	4	4	4	5	4	4	4	3	4	4	5	5	4	4	5	5	4	4	3	5	4
3	3	2	2	0	0	3	3	4	3	3	3	4	3	2	2	3	2	3	3	2	3	3	3	3	3	2	2	3	2	3	3	3	2	2
4	3	3	4	2	3	4	3	1	2	2	1	3	1	3	2	3	3	2	1	3	2	3	4	3	2	2	3	4	4	4	2	4	3	2
2	5	5	5	5	5	5	2	1	5	5	2	5	2	5	5	5	5	5	5	2	2	5	5	2	5	3	5	5	5	5	5	5	5	2
5	3	3	5	5	5	5	2	2	5	5	4	1	1	5	5	3	4	5	5	4	3	5	4	5	3	1	2	3	1	1	5	5	1	1
4	5	5	4	5	4	4	3	4	3	3	3	5	3	4	5	5	5	4	2	4	3	4	3	3	5	4	3	5	3	5	5	4	3	3
1	2	1	5	1	5	1	3	1	2	5	1	1	1	5	5	5	5	5	5	3	3	5	5	3	4	2	5	1	1	5	5	2	1	1
5	5	5	5	5	5	5	3	4	5	5	4	5	5	5	5	5	5	5	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5
1	1	3	2	3	2	4	2	1	2	5	2	3	3	3	4	3	4	1	1	5	1	3	3	2	3	2	3	4	3	2	5	3	5	4
4	4	5	3	4	5	4	3	2	4	4	4	5	5	5	5	5	5	4	4	4	5	5	5	4	4	3	5	5	4	4	5	5	5	4
4	4	4	5	5	4	5	3	3	3	4	3	5	5	4	3	4	3	4	3	3	3	3	3	3	3	3	3	4	3	4	4	5	4	3
5	5	4	5	5	5	5	4	5	5	5	5	4	5	5	5	5	4	5	5	5	5	5	5	5	4	5	5	5	5	1	5	5	4	5
5	5	5	5	5	5	5	5	5	5	5	4	4	5	4	4	5	5	5	5	5	5	5	5	4	4	4	5	5	5	4	4	5	5	5
5	5	5	5	5	5	5	4	3	4	5	5	5	4	5	5	5	4	5	5	5	4	5	5	4	5	4	5	4	5	5	5	5	4	4
4	4	4	5	4	5	4	4	4	4	5	5	5	3	5	4	4	5	5	5	4	4	4	5	4	5	5	5	5	5	4	5	5	4	5
5	5	4	5	5	5	4	4	4	5	5	4	5	4	4	4	5	4	3	3	5	5	4	5	5	4	4	4	4	5	5	5	5	4	4
5	5	5	5	5	5	5	5	1	3	4	1	5	3	3	4	3	4	5	1	4	4	4	4	5	4	5	5	5	4	4	2	2	3	4
2	1	2	4	5	5	1	2	4	3	3	1	5	4	2	2	2	2	4	4	2	1	3	2	1	1	1	3	5	5	5	5	3	1	1
5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	4	4	4	3	4	4	2	5	4	2	3	5	1	2	3	4	4	4	3	5	2	4	4	3	2	2	3	5	3	5	3	2	3	4
3	3	3	5	4	5	4	3	3	4	5	4	5	5	5	5	4	4	5	3	5	4	5	5	5	4	5	4	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	3	3	4	3	3	3	4	4	4	5	2	3	2	4	4	3	4	5	4	5	3	3	3	4	4	3	3	4	4	5	5	4	4	4
5	5	5	5	4	5	5	4	5	5	5	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
4	5	5	5	4	5	4	5	5	5	5	5	5	5	5	5	4	5	5	3	5	5	5	5	5	5	4	5	5	4	5	5	5	5	5
3	5	5	4	3	3	4	3	5	4	3	3	4	4	2	4	3	3	4	3	3	4	2	3	3	3	2	4	3	3	3	4	3	3	3
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Questions

36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	R1	R2	R3	R4	R5	R6	R7
2	4	3	3	5	3	4	2	4	3	3	4	3	1	2	3	3	4	4	4	5	5	3	1	1	5	5	4	5	4	4	3	5	4	4	3	4	3	3	4
2	3	3	4	4	4	4	3	5	4	4	4	4	5	5	4	3	4	5	4	5	4	5	4	4	5	5	3	4	4	5	3	5	4	5	4	4	4	4	4
1	2	2	4	3	2	3	3	4	3	3	2	2	2	3	2	2	2	2	3	1	1	1	2	1	1	2	4	5	5	5	3	4	4	3	3	3	5	4	3
2	4	4	4	2	3	5	3	2	4	3	4	4	4	3	4	5	5	3	4	4	5	3	4	3	2	5	2	4	5	5	2	3	4	2	5	4	5	4	5
4	5	4	5	4	5	5	4	4	4	3	4	5	5	4	5	4	5	5	5	5	3	3	4	3	3	5	2	2	2	2	4	4	4	4	4	4	4	4	4
1	5	4	2	2	2	4	4	4	4	5	4	5	1	3	3	2	2	3	3	4	2	1	5	0	1	2	0	3	1	1	2	2	2	2	2	2	2	2	2
2	3	3	3	2	3	3	3	3	3	3	3	3	2	2	3	3	2	2	3	4	0	3	3	3	2	3	3	2	2	2	2	2	4	3	3	3	3	3	3
1	4	4	4	4	5	5	3	3	4	4	4	4	3	4	4	4	5	4	4	3	3	3	4	3	5	5	3	3	4	4	4	4	4	4	4	4	3	4	4
2	5	5	2	4	5	5	4	5	4	5	5	5	3	4	4	4	3	4	5	4	5	3	3	2	5	3	2	4	4	3	5	5	3	4	4	2	4	4	4
2	4	4	3	4	4	4	4	5	4	5	5	5	3	4	4	4	3	4	5	4	5	3	3	2	5	3	4	3	3	3	3	3	4	5	4	5	5	4	4
3	4	3	5	5	3	5	4	4	5	5	5	5	3	4	3	2	3	3	3	1	1	2	3	2	3	3	2	1	1	4	1	2	5	5	5	5	5	5	5
1	4	4	1	3	4	4	3	4	3	4	4	4	2	3	3	3	2	3	3	2	2	2	1	2	2	3	2	2	1	2	3	2	4	4	4	4	3	4	4
4	4	5	5	3	4	5	4	3	4	4	3	4	4	4	4	4	4	2	5	3	1	5	1	1	5	3	3	2	4	3	3	3	3	3	4	5	4	3	5
2	2	2	3	3	3	4	4	4	4	4	4	3	2	2	2	2	2	2	2	1	1	1	1	1	2	1	4	4	4	4	2	4	4	4	4	4	5	4	5
3	4	4	5	4	3	4	4	4	4	4	4	3	3	3	2	3	3	2	2	2	1	4	2	2	2	5	4	4	4	4	3	4	4	4	3	4	4	4	4
3	3	3	4	3	3	5	5	4	4	5	5	4	3	3	3	3	3	3	3	2	1	2	5	3	2	2	4	4	3	4	4	4	3	3	3	4	5	5	4
1	5	5	5	2	4	5	2	3	5	2	2	3	3	3	4	4	2	2	4	2	2	2	2	2	3	2	4	3	3	3	2	4	3	4	3	4	5	4	2
5	5	5	5	5	5	5	5	5	5	5	5	3	5	3	3	4	3	5	5	4	1	1	2	3	5	1	4	1	1	5	5	4	5	5	5	5	3	4	4
3	4	5	5	3	4	5	4	5	5	5	4	4	4	3	3	5	4	5	5	4	1	3	4	4	5	5	1	3	4	4	1	1	3	3	3	5	4	5	4
5	5	5	5	4	5	5	4	4	4	5	4	4	5	4	4	5	5	3	5	3	1	3	2	1	2	2	1	1	2	3	1	3	4	5	3	3	5	5	4
4	5	5	4	5	4	5	4	4	4	5	5	5	4	4	5	4	4	4	3	4	2	3	3	3	4	2	3	4	4	3	3	4	4	3	3	3	2	4	2
2	1	1	2	2	2	4	2	3	4	4	4	2	4	3	2	4	2	3	4	4	1	5	5	5	2	1	1	1	1	4	1	4	2	4	5	4	4	4	3
2	5	4	5	4	5	4	4	4	5	5	4	4	2	5	5	5	3	3	4	2	4	2	3	4	2	2	1	1	2	4	1	5	5	5	4	4	5	3	5
5	5	5	5	4	5	5	5	5	5	5	4	5	4	4	5	5	4	4	4	4	4	4	4	4	4	3	2	2	1	4	1	3	5	5	5	5	4	4	4
4	5	5	5	5	4	5	4	4	5	5	4	5	4	5	4	4	5	3	4	5	3	3	2	3	4	5	1	1	3	3	2	3	5	5	4	5	3	5	5
5	5	5	5	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	1	5	5	4	5	2	1	1	1	4	1	1	4	4	4	4	2	4	4
4	4	4	5	5	4	5	4	5	5	4	4	5	5	4	4	4	5	5	5	5	4	4	3	3	5	5	3	2	3	3	2	3	5	5	4	5	3	4	5
2	1	1	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	3	2	3	3	2	2	2	1	5	1	1	1	4	1	3	4	4	4	4	3	3	3
2	5	5	5	5	4	5	4	4	3	3	3	3	2	2	2	5	3	3	3	1	1	1	1	1	2	1	1	1	2	3	3	4	4	2	3	5	4	4	4
3	3	4	3	2	4	3	2	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	4	3	3	3	2	1	5	5	5	3	3	4	3	3	4	2
2	4	4	5	4	2	4	4	3	3	5	2	3	3	4	4	4	4	2	4	1	5	5	5	4	3	2	1	1	1	5	1	1	4	4	3	4	4	3	4
1	3	3	4	1	4	4	4	3	2	4	3	2	1	1	1	1	1	1	4	1	1	1	1	1	2	1	4	5	2	3	5	5	4	3	3	3	3	5	3
2	2	2	4	1	3	4	4	4	4	3	3	3	2	1	2	2	2	0	1	2	2	3	1	2	3	0	2	2	3	3	3	2	3	3	3	5	4	4	4
3	5	5	5	5	5	5	4	4	5	4	5	5	5	5	4	4	5	4	5	5	4	1	5	5	5	3	2	1	3	3	1	4	5	4	5	4	4	5	5
3	2	2	2	2	2	3	3	3	2	1	2	2	3	3	2	2	3	3	4	3	2	2	3	2	2	2	3	2	3	2	2	2	3	2	4	3	4	4	2
2	4	3	4	4	2	4	3	3	4	4	3	3	2	2	2	2	2	2	2	1	3	2	2	1	5	2	4	4	3	3	4	4	4	3	4	3	4	3	3
2	5	5	3	3	5	5	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	4	5	1	2	5	5	1	5	4	4	4	5	4	4	4
1	5	4	1	1	5	4	1	1	1	5	1	5	1	5	1	1	1	4	5	5	5	5	1	1	5	3	3	1	1	4	1	1	5	5	5	5	5	3	3
2	4	4	3	5	4	5	5	5	5	5	5	5	4	4	4	4	3	5	5	4	5	3	3	2	5	3	4	1	1	2	1	1	5	4	3	4	4	3	5
1	5	5	1	1	5	3	3	4	1	1	2	1	1	1	1	1	1	1	5	1	2	1	5	1	1	1	1	3	1	3	3	4	3	4	4	5	5	4	1
4	5	5	5	5	5	5	5	5	5	5	5	5	5	2	5	5	5	3	4	2	5	2	3	3	5	5	4	4	3	4	2	4	5	5	5	5	5	4	4
2	2	3	3	3	4	4	4	3	4	5	3	3	3	4	3	4	3	3	5	3	2	5	2	2	4	2	3	1	1	5	4	3	4	3	4	2	3	4	4
5	5	5	5	5	5	4	5	5	5	5	5	4	5	4	4	4	4	3	5	1	3	4	4	3	5	3	3	3	1	2	3	2	4	5	4	4	5	5	5
2	4	3	4	4	3	3	3	3	3	4	4	4	3	3	3	4	4	3	3	2	2	2	3	3	2	2	2	5	5	3	3	2	3	2	2	4	3	3	3
5	5	5	5	5	5	4	5	4	5	5	5	4	5	5	5	5	5	3	4	5	5	5	4	5	3	3	2	1	1	4	2	4	3	5	3	5	2	3	3
3	5	5	5	4	4	4	5	5	5	5	5	5	4	5	5	5	5	1	5	4	3	1	3	4	4	4	4	4	4	3	2	4	4	4	4	4	4	4	3
4	5	5	5	5	4	5	5	5	4	5	5	5	4	5	4	5	5	4	4	5	4	4	3	3	4	5	2	4	4	4	2	4	4	3	4	3	3	4	4
4	4	5	5	3	5	5	5	5	4	5	5	5	3	3	4	5	5	2	3	5	1	2	1	1	5	5	2	2	2	3	3	4	3	4	4	4	4	3	2
5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	3	4	4	4	5	4	4	4	4	5	4	1	2	2	1	5	4	4	4	4	4	3	4
1	4	4	5	4	3	5	4	4	5	4	4	5	4	2	2	3	5	3	3	1	2	1	1	1	1	1	4	4	3	3	3	3	4	4	4	4	3	3	3
1	1	1	1	1	3	4	5	4	4	4	4	1	4	1	1	4	1	1	3	1	0	1	5	1	1	1	2	4	4	4	3	4	3	4	3	3	4	5	5
4	5	4	5	5	5	5	5	5	5	5	4	5	5	4	5	4	4	3	4	5	5	5	5	4	5	5	4	4	3	3	3	2	4	4	3	5	4	4	5
4	4	3	5	3	4	4	5	5	4	5	4	3	3	3	4	4	3	3	4	5	4	5	4	3	5	5	4	4	3	4	2	4	4	4	5	4	3	4	4
4	4	4	5	5	5	5	5	5	4	4	4	4	3	4	4	3	4	1	4	5	5	3	4	4	5	2	1	3	3	5	5	5	5	5	5	4	4	3	3
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	3	3	4	3	4	5	5	4	5	5	5	5
5	3	4	5	4	3	5	4	4	5	4	5	4	4	5	3	5	3	4	4	4	1	4	4	4	5	3	3	4	1	1	5	5	5	5	5	5	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	4	5	5	4	4	4	5	5	5	3	5	5	5	5	5	5	5	3	5	3	4	3
5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	3	5	2	5	5	2	2	3	2	4	5	3	4	4	3	4	4	3	3	3	5	3	3	3
4	3	3	3	4	3	2	3	4	3	3	3	3	4	3	4	4	3	4	3	4	3	3	3	3	3	3	4	3	3	3	3	3	4	4	4	4	3	4	4
5	5	5	4	4	5	5	5	4	5	4	5	5	5	4	5	4	5	3	5	3	3	4	3	3	5	4	3	2	3	4	3	2	4	4	3	5	4	5	4

APPENDIX 4: FACTOR ANALYSIS AND CANONICAL CORRELATION RESULTS

Large companies

Medium companies

Small companies

Maquiladoras

LARGE COMPANIES

Empresas Medianas
TQM:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 47 Average = 1

	1	2	3	4	5
Eigenvalue	18.4716	3.5171	2.6135	2.1210	1.7237
Difference	14.9545	0.9036	0.4925	0.3973	0.1118
Proportion	0.3930	0.0748	0.0556	0.0451	0.0367
Cumulative	0.3930	0.4678	0.5234	0.5686	0.6052

	6	7	8	9	10
Eigenvalue	1.6118	1.4733	1.3929	1.3084	1.1470
Difference	0.1386	0.0803	0.0845	0.1614	0.0615
Proportion	0.0343	0.0313	0.0296	0.0278	0.0244
Cumulative	0.6395	0.6709	0.7005	0.7284	0.7528

	11	12	13	14	15
Eigenvalue	1.0855	1.0276	0.9097	0.8618	0.8441
Difference	0.0580	0.1179	0.0479	0.0177	0.1243
Proportion	0.0231	0.0219	0.0194	0.0183	0.0180
Cumulative	0.7759	0.7977	0.8171	0.8354	0.8534

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
X1	64 *	-7	17	0	-4	25
X2	28	-1	51 *	15	10	61 *
X3	20	4	17	6	7	81 *
X4	32	1	76 *	30	8	8
X5	20	11	91 *	-2	6	15
X6	21	5	89 *	6	4	24
X7	16	34	41 *	-9	-12	20
X8	10	9	10	8	9	9
X9	6	13	23	28	-5	0
X10	11	46 *	25	23	-12	29
X11	74 *	6	19	0	21	23
X12	67 *	17	25	19	18	37
X13	37	28	26	29	34	1
X14	34	26	17	18	9	8
X15	60 *	19	24	28	17	-7
X16	62 *	7	19	36	20	9
X17	20	9	10	16	23	11
X18	9	14	23	-5	31	32
X19	12	21	12	13	5	15
X20	10	9	-6	-4	12	11
X21	22	1	19	29	28	33
X22	13	23	9	40 *	30	39
X23	17	3	17	72 *	22	32
X24	38	21	19	42 *	18	2
X25	10	34	17	22	8	67 *
X26	35	22	18	10	21	30

X27	18	41 *	30	28	49 *	8
X28	27	52 *	-4	23	48 *	30
X29	17	18	1	7	66 *	28
X30	62 *	4	29	22	-3	11
X31	24	3	13	17	4	-2
X32	64 *	34	-1	28	8	7
X33	48 *	7	45 *	15	43 *	4
X34	48 *	10	25	23	23	5
X35	23	5	17	10	35	23
X36	54 *	26	22	20	30	1
X37	44 *	1	17	35	22	41 *
X38	56 *	5	17	38	25	19
X39	18	19	26	49 *	35	-1
X40	17	16	3	10	82 *	2
X41	38	6	23	63 *	1	6
X42	16	20	-6	84 *	3	8
X43	5	62 *	33	15	22	1
X44	0	88 *	13	0	9	14
X45	1	88 *	-4	9	9	3
X46	29	59 *	-17	43 *	5	-2
X47	21	75 *	3	6	14	-1

	FACTOR7	FACTOR8	FACTOR9	FACTOR10	FACTOR11	FACTOR12
X1	25	11	26	-4	-33	-4
X2	7	30	11	12	0	-6
X3	1	10	12	9	-7	1
X4	24	15	2	14	11	-8
X5	8	13	2	7	7	5
X6	12	8	7	-2	-2	6
X7	10	19	16	41 *	0	39
X8	-8	4	16	87 *	4	-5
X9	9	23	62 *	-3	11	33
X10	31	48 *	20	0	1	-6
X11	21	-3	6	14	17	-12
X12	3	0	18	17	10	10
X13	16	24	13	8	2	-41 *
X14	24	21	22	3	55 *	-9
X15	0	51 *	-3	0	7	11
X16	13	44 *	-1	5	21	0
X17	10	41 *	60 *	23	1	-24
X18	2	68 *	18	-1	13	-3
X19	36	52 *	33	27	-14	19
X20	-5	-2	88 *	11	6	-5
X21	53 *	22	-6	33	-13	4
X22	18	20	14	30	30	-8
X23	10	5	18	17	-8	-7
X24	29	31	2	21	16	-3
X25	29	3	-3	-2	28	4
X26	62 *	6	14	6	13	16
X27	7	1	18	14	30	-5
X28	-4	-9	8	6	20	-21
X29	22	15	29	15	-9	-13
X30	22	25	-8	2	0	-25
X31	77 *	7	-8	-16	0	-14
X32	33	-7	18	0	4	13
X33	24	1	-6	30	4	24
X34	47 *	2	20	5	21	5

X35	53 *	11	18	1	44 *	22
X36	-4	-10	16	20	38	21
X37	30	21	-2	1	7	15
X38	19	28	10	3	0	13
X39	7	10	-10	-18	-1	47 *
X40	13	16	2	-1	8	8
X41	15	18	8	-21	12	4
X42	14	-3	4	10	7	1
X43	15	7	20	4	-35	0
X44	9	1	7	2	8	-7
X45	-1	4	7	-1	9	8
X46	11	6	0	21	24	-18
X47	0	33	-5	10	0	21

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
5.883499	4.567058	4.220861	3.928983	3.168040	3.064884

FACTOR7	FACTOR8	FACTOR9	FACTOR10	FACTOR11	FACTOR12
3.028972	2.568256	2.388933	1.803120	1.566835	1.303781

Rotation Method: Varimax

Final Communality Estimates: Total = 37.493222

X1	X2	X3	X4	X5	X6	X7
0.764028	0.862354	0.774364	0.906735	0.936888	0.926891	0.758440

X8	X9	X10	X11	X12	X13	X14
0.847371	0.719079	0.809048	0.795145	0.831961	0.752706	0.723012

X15	X16	X17	X18	X19	X20	X21
0.845810	0.865060	0.803829	0.802161	0.758502	0.853053	0.814735

X22	X23	X24	X25	X26	X27	X28
0.762036	0.815875	0.687365	0.816646	0.800977	0.764716	0.826939

Rotation Method: Varimax

X29	X30	X31	X32	X33	X34	X35
0.788483	0.709628	0.747895	0.778275	0.865265	0.739006	0.844934

X36	X37	X38	X39	X40	X41	X42
0.801987	0.723176	0.737443	0.771854	0.796257	0.733303	0.818286

X43	X44	X45	X46	X47

0.757458 0.842213 0.817464 0.797839 0.796728

WT:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 15 Average = 1

	1	2	3	4	5
Eigenvalue	6.0709	1.9451	1.2132	1.0896	1.0314
Difference	4.1258	0.7320	0.1236	0.0582	0.2875
Proportion	0.4047	0.1297	0.0809	0.0726	0.0688
Cumulative	0.4047	0.5344	0.6153	0.6879	0.7567

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
X48	73 *	-2	38	10	-4
X49	86 *	22	0	15	5
X50	81 *	27	5	23	4
X51	68 *	18	28	40 *	12
X52	47 *	4	20	6	63 *
X53	67 *	-13	53 *	6	19
X54	41 *	-9	47 *	60 *	17
X55	11	-1	-3	83 *	15
X56	13	40 *	35	40	46 *
X57	10	36	83 *	-1	-9
X58	-9	25	-9	5	82 *
X59	14	89 *	3	-10	20
X60	14	83 *	10	19	12
X61	36	-8	65 *	32	15
X62	35	29	23	68 *	-19

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
3.580649	2.094081	2.079419	2.079407	1.516763

Rotation Method: Varimax

Final Communality Estimates: Total = 11.350319

X48	X49	X50	X51	X52
0.692361	0.819310	0.788890	0.753492	0.660524

X53	X54	X55	X56	X57
0.786663	0.789635	0.730122	0.666969	0.837672

X58	X59	X60	X61	X62
0.757167	0.860683	0.767153	0.681119	0.758560

JIT:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 6 Average = 1

	1	2	3
Eigenvalue	2.4113	1.1443	0.9783
Difference	1.2670	0.1660	0.3460
Proportion	0.4019	0.1907	0.1630
Cumulative	0.4019	0.5926	0.7556

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3
X63	70 *	41 *	17
X64	84 *	5	-2
X65	85 *	1	24
X66	21	-7	88 *
X67	-1	70 *	52 *
X68	17	84 *	-25

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3
1.993106	1.358651	1.182122

Final Communality Estimates: Total = 4.533879

X63	X64	X65	X66	X67	X68
0.682754	0.708761	0.784273	0.816050	0.752972	0.789069

Correlación Canónica

Means and Standard Deviations

7 'VAR' Variables
20 'WITH' Variables
61 Observations

Variable	Mean	Std Dev
R1	3.967213	0.752046
R2	3.573770	0.990943
R3	3.557377	0.806734
R4	3.950820	0.739960
R5	3.803279	0.872156
R6	3.836066	0.934172
R7	3.672131	0.907769
FAC1TQM	1.475406E-11	1.000000
FAC2TQM	2.950795E-11	1.000000

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC1TQM	FAC2TQM	FAC3TQM	FAC4TQM	FAC5TQM
R1	-0.0545	0.0049	0.1227	0.2462	0.3080
R2	0.0998	0.1465	-0.0479	0.2462	-0.1385
R3	0.0942	0.0181	0.0867	0.0960	0.0325
R4	0.1041	0.1086	-0.0253	0.1582	0.1951
R5	0.0641	-0.0240	-0.1136	0.0094	0.1682
R6	0.0588	0.2994	0.0148	0.1708	0.1684
R7	0.2217	0.1324	0.2119	0.2270	0.0322

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC6TQM	FAC7TQM	FAC8TQM	FAC9TQM	FAC10TQM
R1	0.1840	0.2001	-0.0591	0.1611	0.1882
R2	0.0723	0.0825	-0.0682	0.3930	0.0324
R3	0.0386	-0.0632	-0.0938	0.2177	-0.0026
R4	0.2206	0.2708	0.1000	0.2581	0.2470
R5	-0.0465	0.2357	-0.2481	0.0315	0.1391
R6	0.2219	-0.0188	-0.0615	0.1330	0.0507
R7	0.3612	0.0960	0.3027	0.2487	0.0652

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC11TQM	FAC12TQM	FAC1WT	FAC2WT	FAC3WT
R1	0.2841	-0.0048	0.2453	-0.0218	-0.0440
R2	0.1322	-0.0810	-0.0445	0.3217	-0.0183
R3	0.2261	-0.0470	-0.1091	0.3516	-0.0195
R4	0.1296	-0.0982	0.1987	0.1190	0.2385
R5	0.0206	0.1690	-0.0549	-0.0307	-0.0348
R6	0.3460	-0.0621	0.0797	0.3405	-0.0376
R7	0.1044	-0.0598	0.2338	0.1582	0.3159

Correlations Between the 'VAR' Variables and the 'WITH' Variables

FAC4WT	FAC5WT	FAC1JIT	FAC3JIT	FAC2JIT

R1	0.1078	0.3142	-0.4211	-0.1673	-0.0467
R2	0.1767	0.1051	-0.2961	0.0395	0.0578
R3	0.1976	0.1953	-0.1506	0.1125	0.0887
R4	0.1027	0.1911	-0.2870	-0.0627	0.0173
R5	0.1792	0.0331	0.0148	0.0978	-0.1344
R6	0.2125	0.2690	-0.1816	-0.0579	0.0290
R7	0.2837	0.2216	-0.1819	0.2298	0.0104

Canonical Correlation Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation
1	0.810582	0.701327	0.044276	0.657043
2	0.730866	0.554664	0.060139	0.534166
3	0.699876	.	0.065863	0.489826
4	0.578885	0.330907	0.085837	0.335108
5	0.542940	.	0.091043	0.294784
6	0.405069	0.144696	0.107917	0.164081
7	0.345947	.	0.113649	0.119680

Eigenvalues of INV(E)*H
= CanRsq/(1-CanRsq)

	Eigenvalue	Difference	Proportion	Cumulative
1	1.9158	0.7691	0.3631	0.3631
2	1.1467	0.1866	0.2173	0.5804
3	0.9601	0.4561	0.1819	0.7623
4	0.5040	0.0860	0.0955	0.8578
5	0.4180	0.2217	0.0792	0.9370
6	0.1963	0.0603	0.0372	0.9742
7	0.1360	.	0.0258	1.0000

Test of H0: The canonical correlations in the
current row and all that follow are zero

	Likelihood Ratio	Approx F	Num DF	Den DF	Pr > F
1	0.02812338	1.2029	140	236.5977	0.1065
2	0.08200268	0.9966	114	208.8212	0.5017
3	0.17603406	0.8571	90	179.1587	0.7924
4	0.34504731	0.6757	68	147.517	0.9650
5	0.51895239	0.5851	48	113.8154	0.9810
6	0.73587676	0.4309	30	78	0.9942
7	0.88032034	0.3884	14	40	0.9705

Multivariate Statistics and F Approximations

S=7 M=6 N=16

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.028123376	1.20293	140	236.598	0.1065

Pillai's Trace	2.594687228	1.17798	140	280	0.1264
Hotelling-Lawley Trace	5.276868448	1.21691	140	226	0.0951
Roy's Greatest Root	1.915819322	3.83164	20	40	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Canonical Correlation Analysis

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'VAR' Variables

	V1	V2	V3	V4	V5	V6	V7
R1	-0.1421	0.6706	0.7612	-0.2925	-0.2100	-0.4884	0.3101
R2	0.2541	0.0656	-0.5592	0.9047	-0.4446	-0.4484	0.2920
R3	0.2879	-0.1474	0.0660	-0.7927	0.4885	-0.4957	-0.8622
R4	0.3667	0.2518	0.1325	0.1862	-0.1611	0.5838	-0.9728
R5	-0.4599	0.0223	0.1654	0.7084	0.7309	0.0667	0.2565
R6	0.3552	0.5667	-0.8193	-0.1870	0.1260	0.5690	0.5189
R7	0.3519	-0.9512	0.6341	0.0514	0.2548	-0.0192	0.4727

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W1	W2	W3	W4
FAC1TQM	0.2952	-0.2215	-0.1087	0.3881
FAC2TQM	0.2755	0.1261	-0.4601	0.5216
FAC3TQM	0.2845	-0.1190	0.1301	-0.1130
FAC4TQM	0.2634	0.1166	0.0003	0.3438
FAC5TQM	0.0549	0.2890	0.2614	-0.0879
FAC6TQM	0.4710	0.0224	-0.0630	0.1495
FAC7TQM	0.1577	0.2498	0.1478	0.7269
FAC8TQM	0.3639	-0.3708	0.0607	-0.0206
FAC9TQM	0.2892	-0.0082	-0.0204	0.5518
FAC10TQM	0.1934	0.3472	-0.0209	0.2208
FAC11TQM	0.2517	0.2231	-0.0218	-0.2437
FAC12TQM	-0.2172	0.1012	0.0399	0.3382
FAC1WT	-0.2901	-0.0698	0.4298	-0.6039
FAC2WT	0.4611	0.0005	-0.4246	-0.2765
FAC3WT	-0.0600	-0.2588	0.3838	-0.1676
FAC4WT	-0.0350	-0.1386	0.2145	-0.4562
FAC5WT	0.0158	0.3180	0.0808	-0.2095
FAC1JIT	-0.0628	-0.0449	-0.4046	-0.0319
FAC3JIT	-0.0241	-0.3644	0.1315	0.1462
FAC2JIT	0.0043	0.1766	-0.0271	-0.1340

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W5	W6	W7
FAC1TQM	0.1773	-0.0400	0.1401
FAC2TQM	-0.2013	0.4155	0.5897
FAC3TQM	0.0958	-0.4237	0.2636

FAC4TQM	-0.2453	-0.1731	0.5102
FAC5TQM	0.3655	0.2856	-0.0427
FAC6TQM	0.0114	0.3349	0.3889
FAC7TQM	0.2528	0.0294	-0.0718
FAC8TQM	-0.4432	0.2322	-0.0028
FAC9TQM	-0.3109	-0.1850	-0.0646
FAC10TQM	0.1997	0.2007	-0.2544
FAC11TQM	0.0879	0.0912	0.0985
FAC12TQM	0.2263	-0.0499	0.2403
FAC1WT	-0.1732	0.0713	-0.0483
FAC2WT	0.4647	0.0227	-0.4435
FAC3WT	-0.0219	0.3507	-0.4729
FAC4WT	0.4314	-0.1400	-0.1356
FAC5WT	0.4220	-0.0819	-0.0906
FAC1JIT	0.3999	0.4664	0.1050
FAC3JIT	0.5345	-0.2275	0.1913
FAC2JIT	-0.0545	-0.0868	-0.2519

Canonical Structure

Correlations Between the 'VAR' Variables and Their Canonical Variables

	V1	V2	V3	V4	V5	V6	V7
R1	0.3788	0.6426	0.5672	0.0077	0.0291	-0.2669	0.2229
R2	0.5949	0.1282	-0.1784	0.5181	-0.0373	-0.5727	-0.0052
R3	0.4767	0.1143	-0.1423	-0.1263	0.5934	-0.5499	-0.2626
R4	0.5763	0.2961	0.3898	0.3715	0.0055	0.3778	-0.3840
R5	-0.1043	0.2792	0.1235	0.4733	0.8183	-0.0421	-0.0204
R6	0.6566	0.4062	-0.1783	-0.1286	0.4176	0.2182	0.3655
R7	0.7755	-0.2802	0.4095	0.0936	0.1954	0.0866	0.3131

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W1	W2	W3	W4
FAC1TQM	0.2071	-0.2651	0.0368	0.1670
FAC2TQM	0.3030	0.1106	-0.3257	0.1223
FAC3TQM	0.1458	-0.1857	0.3229	-0.3887
FAC4TQM	0.3078	0.1205	0.1179	0.1563
FAC5TQM	-0.0053	0.4247	0.3574	-0.1994
FAC6TQM	0.3844	-0.0559	0.2442	-0.0582
FAC7TQM	-0.0095	0.1648	0.3617	0.5047
FAC8TQM	0.2461	-0.4562	0.2879	-0.1729
FAC9TQM	0.4374	0.0085	0.0076	0.3356
FAC10TQM	0.0596	0.2199	0.2579	0.1982
FAC11TQM	0.3158	0.4046	-0.0563	-0.2822
FAC12TQM	-0.2348	-0.0012	0.0950	0.1302
FAC1WT	0.1617	0.0673	0.4353	-0.0523
FAC2WT	0.5187	0.0362	-0.4877	-0.0629
FAC3WT	0.2434	-0.3972	0.3320	0.0947
FAC4WT	0.2677	-0.0887	0.0648	0.1598
FAC5WT	0.3289	0.2454	0.2061	-0.2272
FAC1JIT	-0.3693	-0.3851	-0.2387	-0.0754
FAC3JIT	0.0722	-0.5351	0.0843	0.1307
FAC2JIT	0.1591	-0.0447	-0.1416	-0.1750

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W5	W6	W7
FAC1TQM	0.1972	0.0726	-0.0535
FAC2TQM	-0.0386	0.3765	0.3898
FAC3TQM	0.0273	-0.2455	0.1521
FAC4TQM	-0.0987	-0.2282	0.3178
FAC5TQM	0.2461	0.2861	-0.0491
FAC6TQM	-0.0028	0.2557	0.3012
FAC7TQM	0.0757	0.1429	-0.0773
FAC8TQM	-0.2415	0.2641	-0.0205
FAC9TQM	-0.0750	-0.3435	-0.2297
FAC10TQM	0.0546	0.1875	-0.2239
FAC11TQM	0.1039	-0.0945	0.1152
FAC12TQM	0.2401	-0.0451	0.2711
FAC1WT	-0.1613	0.2652	0.2938
FAC2WT	0.1380	-0.1229	-0.2548
FAC3WT	0.0363	0.3675	-0.3276
FAC4WT	0.3846	-0.1049	0.3036
FAC5WT	0.1224	-0.0860	0.0769
FAC1JIT	0.2474	0.3622	0.0450
FAC3JIT	0.3782	-0.1461	0.0789
FAC2JIT	-0.1239	-0.0732	-0.3050

Canonical Structure

Correlations Between the 'VAR' Variables and the Canonical Variables of the 'WITH' Variables

	W1	W2	W3	W4	W5	W6	W7
R1	0.3071	0.4697	0.3970	0.0044	0.0158	-0.1081	0.0771
R2	0.4822	0.0937	-0.1249	0.2999	-0.0203	-0.2320	-0.0018
R3	0.3864	0.0835	-0.0996	-0.0731	0.3222	-0.2227	-0.0908
R4	0.4671	0.2164	0.2728	0.2151	0.0030	0.1530	-0.1329
R5	-0.0846	0.2041	0.0865	0.2740	0.4443	-0.0171	-0.0071
R6	0.5322	0.2969	-0.1248	-0.0745	0.2267	0.0884	0.1264
R7	0.6286	-0.2048	0.2866	0.0542	0.1061	0.0351	0.1083

Correlations Between the 'WITH' Variables and the Canonical Variables of the 'VAR' Variables

	V1	V2	V3	V4
FAC1TQM	0.1678	-0.1938	0.0257	0.0967
FAC2TQM	0.2456	0.0808	-0.2280	0.0708
FAC3TQM	0.1182	-0.1358	0.2260	-0.2250
FAC4TQM	0.2495	0.0881	0.0825	0.0905
FAC5TQM	-0.0043	0.3104	0.2501	-0.1154
FAC6TQM	0.3116	-0.0408	0.1709	-0.0337
FAC7TQM	-0.0077	0.1204	0.2531	0.2921
FAC8TQM	0.1995	-0.3334	0.2015	-0.1001
FAC9TQM	0.3546	0.0062	0.0053	0.1943
FAC10TQM	0.0483	0.1607	0.1805	0.1147
FAC11TQM	0.2560	0.2957	-0.0394	-0.1634
FAC12TQM	-0.1903	-0.0009	0.0665	0.0754

FAC1WT	0.1311	0.0492	0.3047	-0.0303
FAC2WT	0.4204	0.0264	-0.3413	-0.0364
FAC3WT	0.1973	-0.2903	0.2323	0.0548
FAC4WT	0.2170	-0.0648	0.0453	0.0925
FAC5WT	0.2666	0.1794	0.1442	-0.1315
FAC1JIT	-0.2993	-0.2814	-0.1671	-0.0436
FAC3JIT	0.0585	-0.3911	0.0590	0.0757
FAC2JIT	0.1290	-0.0326	-0.0991	-0.1013

Correlations Between the 'WITH' Variables and
the Canonical Variables of the 'VAR' Variables

	V5	V6	V7
FAC1TQM	0.1071	0.0294	-0.0185
FAC2TQM	-0.0209	0.1525	0.1349
FAC3TQM	0.0148	-0.0995	0.0526
FAC4TQM	-0.0536	-0.0924	0.1099
FAC5TQM	0.1336	0.1159	-0.0170
FAC6TQM	-0.0015	0.1036	0.1042
FAC7TQM	0.0411	0.0579	-0.0267
FAC8TQM	-0.1311	0.1070	-0.0071
FAC9TQM	-0.0407	-0.1391	-0.0795
FAC10TQM	0.0296	0.0759	-0.0775
FAC11TQM	0.0564	-0.0383	0.0398
FAC12TQM	0.1303	-0.0183	0.0938
FAC1WT	-0.0875	0.1074	0.1016
FAC2WT	0.0749	-0.0498	-0.0881
FAC3WT	0.0197	0.1488	-0.1133
FAC4WT	0.2088	-0.0425	0.1050
FAC5WT	0.0664	-0.0348	0.0266
FAC1JIT	0.1343	0.1467	0.0156
FAC3JIT	0.2054	-0.0592	0.0273
FAC2JIT	-0.0673	-0.0296	-0.1055

Canonical Redundancy Analysis

Raw Variance of the 'VAR' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.3149	0.3149	0.6570	0.2069	0.2069
2	0.1104	0.4252	0.5342	0.0589	0.2658
3	0.0936	0.5188	0.4898	0.0459	0.3117
4	0.1041	0.6230	0.3351	0.0349	0.3466
5	0.1776	0.8006	0.2948	0.0524	0.3989
6	0.1319	0.9325	0.1641	0.0216	0.4206
7	0.0675	1.0000	0.1197	0.0081	0.4287

Raw Variance of the 'WITH' Variables
Explained by

Their Own Canonical Variables

The Opposite Canonical Variables

	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.0755	0.0755	0.6570	0.0496	0.0496
2	0.0715	0.1470	0.5342	0.0382	0.0878
3	0.0687	0.2157	0.4898	0.0336	0.1215
4	0.0470	0.2628	0.3351	0.0158	0.1372
5	0.0341	0.2968	0.2948	0.0100	0.1473
6	0.0529	0.3497	0.1641	0.0087	0.1560
7	0.0513	0.4010	0.1197	0.0061	0.1621

Canonical Redundancy Analysis

Standardized Variance of the 'VAR' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.3000	0.3000	0.6570	0.1971	0.1971
2	0.1217	0.4217	0.5342	0.0650	0.2621
3	0.1058	0.5274	0.4898	0.0518	0.3139
4	0.0960	0.6234	0.3351	0.0322	0.3461
5	0.1767	0.8001	0.2948	0.0521	0.3982
6	0.1287	0.9288	0.1641	0.0211	0.4193
7	0.0712	1.0000	0.1197	0.0085	0.4278

Standardized Variance of the 'WITH' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.0755	0.0755	0.6570	0.0496	0.0496
2	0.0715	0.1470	0.5342	0.0382	0.0878
3	0.0687	0.2157	0.4898	0.0336	0.1215
4	0.0470	0.2628	0.3351	0.0158	0.1372
5	0.0341	0.2968	0.2948	0.0100	0.1473
6	0.0529	0.3497	0.1641	0.0087	0.1560
7	0.0513	0.4010	0.1197	0.0061	0.1621

Squared Multiple Correlations Between the 'VAR' Variables and
the First 'M' Canonical Variables of the 'WITH' Variables

M	1	2	3	4	5	6	7
R1	0.0943	0.3149	0.4725	0.4725	0.4727	0.4844	0.4904
R2	0.2325	0.2413	0.2569	0.3468	0.3473	0.4011	0.4011
R3	0.1493	0.1563	0.1662	0.1716	0.2754	0.3250	0.3332
R4	0.2182	0.2650	0.3395	0.3857	0.3857	0.4091	0.4268

R5	0.0071	0.0488	0.0563	0.1313	0.3288	0.3290	0.3291
R6	0.2832	0.3714	0.3869	0.3925	0.4439	0.4517	0.4677
R7	0.3951	0.4370	0.5192	0.5221	0.5334	0.5346	0.5463

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and
the First 'M' Canonical Variables of the 'VAR' Variables

M	1	2	3	4
FAC1TQM	0.0282	0.0657	0.0664	0.0757
FAC2TQM	0.0603	0.0668	0.1188	0.1238
FAC3TQM	0.0140	0.0324	0.0835	0.1341
FAC4TQM	0.0622	0.0700	0.0768	0.0850
FAC5TQM	0.0000	0.0964	0.1589	0.1723
FAC6TQM	0.0971	0.0987	0.1279	0.1291
FAC7TQM	0.0001	0.0146	0.0786	0.1640
FAC8TQM	0.0398	0.1510	0.1916	0.2016
FAC9TQM	0.1257	0.1257	0.1258	0.1635
FAC10TQM	0.0023	0.0282	0.0608	0.0739
FAC11TQM	0.0655	0.1530	0.1545	0.1812
FAC12TQM	0.0362	0.0362	0.0406	0.0463
FAC1WT	0.0172	0.0196	0.1124	0.1133
FAC2WT	0.1768	0.1775	0.2940	0.2953
FAC3WT	0.0389	0.1232	0.1772	0.1802
FAC4WT	0.0471	0.0513	0.0534	0.0619
FAC5WT	0.0711	0.1033	0.1241	0.1414
FAC1JIT	0.0896	0.1688	0.1967	0.1986
FAC3JIT	0.0034	0.1564	0.1598	0.1656
FAC2JIT	0.0166	0.0177	0.0275	0.0378

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and
the First 'M' Canonical Variables of the 'VAR' Variables

M	5	6	7
FAC1TQM	0.0872	0.0881	0.0884
FAC2TQM	0.1243	0.1475	0.1657
FAC3TQM	0.1343	0.1442	0.1470
FAC4TQM	0.0879	0.0964	0.1085
FAC5TQM	0.1901	0.2035	0.2038
FAC6TQM	0.1291	0.1398	0.1507
FAC7TQM	0.1657	0.1690	0.1697
FAC8TQM	0.2188	0.2302	0.2303
FAC9TQM	0.1652	0.1845	0.1909
FAC10TQM	0.0748	0.0806	0.0866
FAC11TQM	0.1844	0.1858	0.1874
FAC12TQM	0.0633	0.0636	0.0724
FAC1WT	0.1210	0.1326	0.1429
FAC2WT	0.3009	0.3034	0.3112
FAC3WT	0.1806	0.2027	0.2156
FAC4WT	0.1055	0.1073	0.1184
FAC5WT	0.1458	0.1470	0.1477
FAC1JIT	0.2167	0.2382	0.2384
FAC3JIT	0.2077	0.2112	0.2120
FAC2JIT	0.0423	0.0432	0.0543

Medium- TQM/JIT

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM11
- TQM12
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9
- JIT1
- JIT2
- JIT3

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 61

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.593499	.770389	.0618859	134.949	105	. 260
2	.486854	.697749	.15224	91.2913	84	.2749
3	.367984	.606617	.29668	58.9323	65	.6882
4	.288461	.537086	.469419	36.6785	48	.8833
5	.186812	.432217	.659724	20.1728	33	.9610
6	.139527	.373533	.811281	10.1433	20	.9655
7	.0571685	.239099	.942831	2.85508	9	.9698

Coefficients for Canonical Variables of the First Set

TQM1	.190988	.287179	.0768511	.252876	.135441	-.00431146	.112566
TQM10	.124605	-.257136	.213357	.119546	-.0321498	.311822	.312475
TQM11	-.195234	-.00909907	.240318	.108781	.154727	-.123423	-.24099
TQM12	-.253643	.326691	.219373	.159478	-.452612	.267646	-.148237
TQM2	.173739	-.0380533	-.458591	.285655	.448981	.266305	-.155679
TQM3	.261879	.28636	.275603	-.428463	.0576905	-.395823	-.132785
TQM4	.371408	.0665586	-.202736	.39791	-.156311	-.214092	.392287
TQM5	.328843	.365327	.000120095	-.379931	-.289844	.554299	.0114305
TQM6	-.393008	-.103587	.0163491	.0780653	-.319751	-.346005	.141518
TQM7	.146878	-.106042	.516046	.458184	-.105319	.145192	-.0238505
TQM8	-.107298	.319911	-.46332	.17443	-.470276	-.0255966	-.294287
TQM9	.331017	-.0572114	-.048342	.165795	.0100807	-.131418	-.490130
JIT1	-.277433	.156571	-.175678	.135549	.541299	.288785	.230122
JIT2	-.0372058	.0488008	.120999	.11357	.125388	.0325556	-.46838
JIT3	-.0265332	.436715	.321468	.309657	.460793	-.502369	.138921

Coefficients for Canonical Variables of the Second Set

R1	.273815	-.610307	.590608	-.506091	-.257334	-.363945	-.512561
R2	.130955	-.0629408	-.598862	.884228	-.500552	-.193227	-.484433
R3	.150464	.18831	.0644826	-.610539	.0470429	-.72837	.998737
R4	.362881	-.292865	.0476226	.136334	-.284969	.605477	.936586
R5	-.401955	-.0318417	.611557	.770183	.422486	-.0893297	-.17148
R6	.0715109	-.555416	-.85291	.0587688	.770525	.296013	-.191156
R7	.462046	1.03892	.47955	.0136386	.27935	-.0204063	-.347154

Medium- TQM/WT

Analysis Summary

Variables in set 1:
TQM1
TQM10
TQM11
TQM12
TQM2
TQM3
TQM4
TQM5
TQM6
TQM7
TQM8
TQM9
WT1
WT2
WT3
WT4
WT5

Variables in set 2:
R1
R2
R3
R4
R5
R6
R7

Number of complete cases: 61

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.655749	.809784	.0424423	150.081	119	. 284
2	.489791	.699851	.123289	99.4282	96	.3849
3	.436929	.661006	.241644	67.4638	75	.7198
4	.326959	.571803	.429153	40.1822	56	.9452
5	.192066	.438253	.637633	21.3746	39	.9902
6	.126871	.356189	.789214	11.2441	24	.9872
7	.0961083	.310013	.903892	4.79967	11	.9405

Coefficients for Canonical Variables of the First Set

TQM1	.30467	-.139957	-.0973946	-.320344	.343515	-.09706	.271862
TQM10	.197562	.353427	.0263514	-.222604	.215868	.0946559	-.155985
TQM11	-.213913	.116589	.0396559	-.350546	.261647	-.181189	.496982
TQM12	-.250872	-.251161	.0318616	-.295469	.117578	-.0816657	.0231989
TQM2	.294736	.0647684	-.465811	-.517509	-.480139	.318727	.569256
TQM3	.28548	-.0523061	.13946	.116773	.0078091	-.537104	.161012
TQM4	.29455	-.0123638	-.0133205	-.628266	-.298662	-.357024	-.306271
TQM5	.358911	-.491554	.222354	-.127769	-.146369	.101639	.0814862
TQM6	-.485425	-.031476	-.0935308	.19846	.136841	-.0387399	-.422159
TQM7	.158509	.391182	.063013	-.70119	.224693	-.0459469	.025336
TQM8	-.0504865	-.448162	-.209671	-.148792	-.0955919	-.338386	.00666625
TQM9	.264104	.143094	-.0332602	-.359241	-.448334	-.428673	.216993
WT1	-.306694	-.0109046	.400496	.551387	-.427629	.184797	-.288475
WT2	.485906	-.00347633	-.326262	.384228	.501039	.173971	-.316372
WT3	-.0458319	-.08202	.225116	.520757	.661015	-.0173847	.186076
WT4	.0221133	.357802	.145927	.225188	.28342	-.201047	-.0137698
WT5	-.0741118	-.196913	.421046	.311591	.187381	.506552	-.31261

Coefficients for Canonical Variables of the Second Set

R1	-.192554	.738072	.53352	.265417	-.44316	-.616409	-.0228693
R2	.261244	-.0616791	-.717774	-.871588	-.307693	-.481269	.104676
R3	.291065	-.117843	.143174	.845574	.687859	-.233095	-.776944
R4	.353765	.217273	.137356	-.262834	.0724535	.766987	-.84231
R5	-.448803	.29193	.0851485	-.569137	.668882	-.00769305	.529499

Large- TQM

Analysis Summary

Variables in set 1:

- TQM1
- TQM10
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9

Variables in set 2:

- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 122

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.452888	.67297	.318432	128.167	70	. 0
2	.194351	.440853	.582023	60.6194	54	.2495
3	.139551	.373565	.722128	36.4154	40	.6324
4	.0814173	.285337	.839594	19.5817	28	.8792
5	.0408054	.202003	.914011	10.0703	18	.9296
6	.035677	.188884	.952894	5.40419	10	.8626
7	.011852	.108867	.988148	1.33535	4	.8554

Coefficients for Canonical Variables of the First Set

TQM1	.415959	-.296422	.133921	-.425871	.115615	.405385	.294547
TQM10	.326112	-.168279	-.104038	-.115646	-.310778	-.255399	-.536236
TQM2	-.388303	-.0527548	.270588	.228078	.159527	-.162491	.443937
TQM3	.105244	-.226554	.445555	-.260865	.310158	-.699034	-.0604904
TQM4	.136897	.443118	-.436481	-.429989	.442676	-.181801	.206835
TQM5	.363666	-.178376	-.270072	.117409	-.0873352	-.0779738	.32611
TQM6	.177726	.732102	.163337	.0743595	-.203137	-.149283	-.0172857
TQM7	.159487	-.139563	-.297174	.218223	-.400161	-.417564	.450684
TQM8	.0542498	-.156908	-.403472	.466895	.565644	-.0595448	-.264329
TQM9	.589757	.146503	.397831	.464082	.208487	.126739	.0504029

Coefficients for Canonical Variables of the Second Set

R1	.23912	.865506	-.765635	-.237613	.015909	.026424	-.145639
R2	.394715	.209697	.638999	.250323	-.214367	-.784432	-.456497
R3	-.0254792	.35926	.380012	.115496	-.497126	.26427	.781642
R4	.108389	-.497464	-.0951286	-.986395	-.221036	.150898	.0904166
R5	-.0710846	-.197731	-.324717	.34699	-.798215	.385524	-.719297
R6	.174048	-.617039	-.213132	.16163	.387763	-.888	.647717
R7	.495648	-.307501	.152689	.366714	.468955	.872765	.0734229

Large- WT/R1,5,6,7

Analysis Summary

Variables in set 1:
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R5
- R6
- R7

Number of complete cases: 122

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.361783	.601484	.60818	57.9336	16	. 0
2	.0446136	.211219	.952935	5.61627	9	.7776
3	.00252384	.0502379	.997434	.299272	4	.9899
4	.0000418286	.0064675	.999958	.00487313	1	.9443

Coefficients for Canonical Variables of the First Set

WT1	.664335	.392219	.608772	.184987
WT2	.0815755	-.790243	.252231	.552487
WT3	-.742503	.277603	.554351	.253615
WT4	.0263505	.380287	-.5084	.772151

Coefficients for Canonical Variables of the Second Set

R1	.313233	.958666	.229218	-.560676
R5	-.19777	.02355	-1.07216	-.583484
R6	.288714	.148304	.0995699	1.29397
R7	.726266	-.824781	-.0365284	-.202844

Large- JIT/R1,2,3

Analysis Summary

Variables in set 1:
- JIT1
- JIT2
- JIT3

Variables in set 2:
- R1
- R2
- R3

Number of complete cases: 122

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.0445029	.210957	.939451	7.33901	9	.6019
2	.0151882	.12324	.983206	1.99	4	.7376
3	.00163012	.0403747	.99837	.191695	1	.6615

Coefficients for Canonical Variables of the First Set

JIT1	.844786	.0968752	.526263
JIT2	.524774	.0423341	-.850188
JIT3	.104641	-.994396	.015074

Coefficients for Canonical Variables of the Second Set

R1	-.490776	.782553	.584378
R2	-.155569	-.940877	.497384
R3	1.00395	.118583	.265994

Laige- TQM/JIT

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9
- JIT1
- JIT2
- JIT3

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 122

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.484615	.696143	.263317	147.451	91	. 2
2	.21659	.465392	.510913	74.207	72	.4061
3	.165594	.406932	.652165	47.2341	55	.7624
4	.0943114	.307102	.781591	27.2298	40	.9382
5	.0769326	.277367	.86298	16.2837	27	.9473
6	.0437788	.209234	.934905	7.43781	16	.9639
7	.0222922	.149306	.977708	2.49116	7	.9278

Coefficients for Canonical Variables of the First Set

TQM1	.386973	-.201278	.214676	-.2352	-.356338	.228659	.454068
TQM10	.283864	-.181204	-.0574393	.200737	-.305039	-.18518	-.386179
TQM2	-.39424	-.0528864	.13198	.0164197	.335077	-.255751	.39815
TQM3	.0695597	-.150413	.436627	-.377622	.0105648	-.605823	-.139064
TQM4	.162433	.405725	-.464076	-.409782	-.150778	.00484931	.0525651
TQM5	.361077	-.110285	-.28651	.220635	-.050357	-.257914	.312047
TQM6	.124788	.673202	.143544	.186874	.00783321	-.0044167	-.11876
TQM7	.14753	-.11365	-.21041	.385352	-.122559	-.488521	.0508711
TQM8	.0662443	-.108826	-.374827	.114881	.490543	-.0305787	-.196455
TQM9	.623708	.182435	.328398	.0910708	.551534	.0646427	.119916
JIT1	-.210851	.305479	.198904	.28917	-.323603	-.303188	.199948
JIT2	-.196692	-.168673	.128368	.515656	-.232439	.209154	.103029
JIT3	-.0281468	-.0494487	.391767	-.0155313	-.114958	.295772	-.570602

Coefficients for Canonical Variables of the Second Set

R1	.252031	.820416	-.774344	-.0471435	-.250254	.178464	-.195417
R2	.354324	.288132	.65335	.0923524	.212048	-.662869	-.641959
R3	-.117105	.423908	.422298	.448882	-.229872	-.0339856	.76692
R4	.118697	-.459918	-.00140515	-.493831	-.906659	.085131	.149278
R5	-.12907	-.239567	-.0518353	.817255	-.358177	.448704	-.70632
R6	.234128	-.563054	-.343442	-.160104	.349054	-1.01517	.41614
R7	.520171	-.362954	.143724	.0887561	.491081	.820253	.374462

Large- TQM/WT

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 122

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.48867	.69905	.247474	153.609	98	. 3
2	.247258	.49725	.483982	79.8278	78	.4213
3	.163825	.404753	.642959	48.5842	60	.8542
4	.109522	.330942	.768928	28.9033	44	.9615
5	.06186	.248717	.863501	16.1436	30	.9815
6	.0512426	.226368	.920439	9.11946	18	.9569
7	.0298475	.172764	.970152	3.33322	8	.9117

Coefficients for Canonical Variables of the First Set

TQM1	.274412	-.418537	-.19475	-.296899	-.256632	-.202584	.0199663
TQM10	.186807	-.23224	-.0277765	-.138605	-.585656	-.332397	.464225
TQM2	-.282419	.223323	.0119139	.494756	.336157	.324566	-.721139
TQM3	.0039292	-.425727	-.265019	.0511426	-.882069	.620422	.161507
TQM4	.038055	.311492	.106572	-.633164	-.133431	.265926	-.00971714
TQM5	.278114	-.132178	.244701	.00055658	-.212507	-.21538	.0293492
TQM6	.128697	.545088	-.323013	-.131782	-.252875	.0260589	.321064
TQM7	.0600502	.00786096	.437547	.294359	-.628517	-.202862	-.034534
TQM8	.0779318	-.184043	.473796	.112412	.238788	.422871	.547971
TQM9	.395991	-.0508749	-.528303	.256928	-.0917494	-.065514	.609099
WT1	.230377	.507973	.229618	.165120	.675802	.129542	-.977358
WT2	.0835903	-.146042	-.392707	-.204495	.616362	-.281417	-.238041
WT3	-.316412	-.113601	-.244119	-.255825	-.444143	-.390722	.391663
WT4	-.152849	.473107	.0235984	.43291	.0116004	-.213616	-.476147

Coefficients for Canonical Variables of the Second Set

R1	.198195	.878265	.422046	-.66067	-.0125409	-.0164091	.213149
R2	.33203	.201245	-.474576	.536378	-.80697	.310571	.459318
R3	-.0842965	.412729	-.463831	.22452	.127976	-.580815	-.647055
R4	.159116	-.663794	-.0233315	-.77688	-.258593	-.276923	-.327815
R5	-.0917374	-.140524	.301489	.148829	-.116481	-.851281	.832888
R6	.212273	-.315798	.584826	.479098	-.325251	.630398	-.788343
R7	.55113	-.303491	-.146725	.190305	1.00675	-.0673432	.115658

Large- WT/JIT

Analysis Summary

Variables in set 1:
- JIT1
- JIT2
- JIT3
- WT1
- WT2
- WT3
- WT4

Vaiiables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 122

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.45262	.67277	.415095	99.7946	49	. 0
2	.137102	.370272	.75833	31.3982	36	.6871
3	.0717352	.267834	.878817	14.6617	25	.9489
4	.0325247	.180346	.946731	6.21298	16	.9856
5	.0149941	.12245	.978559	2.46006	9	.9819
6	.00637677	.0798541	.993455	.74534	4	.9456
7	.000169675	.0130259	.99983	.0192598	1	.8896

Coefficients for Canonical Variables of the First Set

JIT1	-.274272	.594011	-.56892	-.389726	-.0544935	-.27233	-.308112
JIT2	-.166719	-.384442	-.485669	.633453	-.406549	-.325141	-.0736796
JIT3	-.0182223	-.0959849	-.448642	.0245731	.704504	-.0895752	.543343
WT1	.610112	.47606	.00202535	-.201639	-.270093	-.257116	.545261
WT2	.0267149	-.280677	-.598469	-.477975	-.407832	.472216	.0572811
WT3	-.7463	.117111	.17827	-.142183	-.229706	-.0486926	.577699
WT4	-.0408418	.628854	-.155291	.412033	.0558717	.656162	.0707592

Coefficients for Canonical Variables of the Second Set

R1	.200451	.693894	.546363	-.0884296	.0220825	-.649261	.470178
R2	.291869	.452943	-.302327	-.0618999	.90188	.41873	-.407591
R3	-.227155	.529995	-.685018	-.133311	-.61705	.122547	.0109251
R4	.169847	-.566881	-.0920283	-.685092	-.241504	-.589695	-.294885
R5	-.225856	-.192009	-.457474	.666865	.483312	-.761571	.133074
R6	.386457	-.0576457	.52662	.188951	-.399515	.481399	-.991948
R7	.529441	-.518962	-.289461	.347653	-.370021	.323053	.699633

MEDIUM COMPANIES

Medium- TQM/WT

R6	.375634	.387749	-.807439	.306311	-.249099	.558339	.592753
R7	.361509	-.65554	.827325	-.124845	.247501	-.244112	.583646

E

Medium- WT/JIT

Analysis Summary

Variables in set 1:
- JIT1
- JIT2
- JIT3
- WT1
- WT2
- WT3
- WT4
- WT5

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 61

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.417564	.646192	.188731	86.7065	56	. 53
2	.378327	.615083	.324037	58.5987	42	. 458
3	.364775	.603966	.521234	33.8809	30	.2856
4	.0928211	.304665	.820549	10.2846	20	.9627
5	.0642015	.25338	.904507	5.21901	12	.9503
6	.0232413	.152451	.966561	1.76855	6	.9397
7	.0104399	.102176	.98956	.545731	2	.7612

Coefficients for Canonical Variables of the First Set

JIT1	-.144327	-.193892	.627792	.136142	.84684	.183198	-.00400224
JIT2	-.198505	.190871	.0949356	-.351384	-.192414	.607251	.264421
JIT3	.255107	.327955	.569559	-.24999	-.0864336	-.561122	-.295196
WT1	.244409	.43545	-.228364	.0873649	.414483	.0814177	-.77028
WT2	.582065	-.63428	.284947	.183653	.00815022	.274076	-.207912
WT3	.410802	.0753317	.0621825	-.603567	-.0349183	.303186	.0487699
WT4	.356211	-.130492	-.265812	-.0969009	.790135	-.281768	.457942
WT5	.355095	.53731	.0638075	.536935	-.225078	.310935	.458756

Coefficients for Canonical Variables of the Second Set

R1	-.230691	.29307	-.967145	-.438942	.14947	-.473303	-.0169176
R2	.064902	-.407957	.00809113	-.308813	-1.00935	.277658	-.567647
R3	.494707	-.269638	.139372	.279131	.288613	-.919241	.788763
R4	.300889	.0114037	-.299086	.816639	-.233896	.439572	.68437
R5	-.277782	.344362	.377157	-.787755	-.142898	.47726	.372688
R6	.176964	-.843328	-.125124	-.114051	.544705	.747325	-.368787
R7	.574682	.941897	.499529	-.219214	.129353	-.211051	-.481677

Medium- TQM

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM11
- TQM12
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 61

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.565669	.75211	.0974042	116.444	84	. 111
2	.435399	.659848	.224263	74.7468	66	.2155
3	.333132	.577176	.397206	46.165	50	.6280
4	.263002	.512837	.595629	25.9069	36	.8930
5	.108067	.328736	.808183	10.6484	24	.9913
6	.0577488	.24031	.906102	4.93014	14	.9868
7	.0383642	.195868	.961636	1.95597	6	.9237

Coefficients for Canonical Variables of the First Set

TQM1	.221576	.20454	.0201754	.242538	.123797	-.284135	-.730818
TQM10	.121932	-.319494	.222164	.20596	.0709665	.304202	-.0752916
TQM11	-.211365	-.0798048	.188906	.139506	.059006	-.683904	-.0114796
TQM12	-.282715	.383115	.22644	.466846	.159282	.0176315	.17348
TQM2	.242769	-.0886799	-.518082	-.00445474	.593443	-.138578	.096228
TQM3	.235625	.208779	.373302	-.360632	-.318941	-.293332	.0100146
TQM4	.441847	-.0316317	-.237296	.350259	-.490227	.148471	-.211243
TQM5	.359718	.493882	.33309	-.0387594	.252956	.31532	.149756
TQM6	-.478433	-.0207882	-.143305	.0812918	-.307317	.182739	-.0856357
TQM7	.0944006	-.328919	.320972	.556751	.074409	-.0211238	.1721
TQM8	-.0667378	.528003	-.397133	.206335	-.181619	-.0992167	.210004
TQM9	.360679	-.13842	-.0835462	.09232	-.244151	-.297137	[illegible]

Coefficients for Canonical Variables of the Second Set

R1	.0916466	-.611465	.566278	-.379207	-.53147	-.152675	.601052
R2	.141904	-.00281544	-.85957	.752649	-.292424	-.17807	.49139
R3	.133022	.188928	.208127	-.619566	-.709288	.327324	-.935109
R4	.326315	-.291383	.0819035	.28373	.231935	1.02365	-.427865
R5	-.392115	-.349678	.247816	.662102	.207185	-.670632	-.277763
R6	.124068	-.442684	-.081036	-.466801	.723348	-.182083	.0224946
R7	.580954	.734809	.613609	.191809	.125393	-.642903	-.0464633

Medium- WT/R1,5,6,7

Analysis Summary

Variables in set 1:
- WT1
- WT2
- WT3
- WT4
- WT5

Variables in set 2:
- R1
- R5
- R6
- R7

Number of complete cases: 61

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.314039	.560392	.463471	42.2957	20	. 25
2	.193475	.439858	.675651	21.5643	12	. 427
3	.13189	.363166	.837731	9.73817	6	.1361
4	.0349943	.187060	.965006	1.95917	2	.3755

Coefficients for Canonical Variables of the First Set

WT1	.423597	.179107	.518253	.34354
WT2	.359613	-.66677	-.498652	.397099
WT3	.50404	.025984	-.224621	-.78952
WT4	.474945	-.313452	.530258	-.0694761
WT5	.460017	.651467	-.388756	.310039

Coefficients for Canonical Variables of the Second Set

R1	.084964	.0115339	1.15252	-.0632374
R5	-.0509786	.235407	-.222131	-1.00871
R6	.199616	-1.20676	-.316177	.088792
R7	.846098	.791154	-.348418	.0740968

Medium- JIT/R1,2,3

Analysis Summary

Variables in set 1:
JIT1
JIT2
JIT3
Variables in set 2:
R1
R2
R3

Number of complete cases: 61

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.226937	.476379	.736597	17.2729	9	. 446
2	.0471477	.217135	.952829	2.73008	4	.6040
3	.0000246602	.00496591	.999975	.00139332	1	.9702

Coefficients for Canonical Variables of the First Set

JIT1	-.934577	-.339914	.104997
JIT2	.0909771	-.513668	-.853152
JIT3	-.343933	.787783	-.510987

Coefficients for Canonical Variables of the Second Set

R1	.896732	-.437339	.407918
R2	.354084	.521712	-1.0701
R3	-.247369	.687253	.959282

SMALL COMPANIES

data file: MICRO.STA [56 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 47

Number of valid cases: 56
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	150.44642857	Sum:	8425.000000C
Standard Deviation:	32.261719710	Variance:	1040.8185587
Skewness:	-.247613688	Kurtosis:	-.631955515
Minimum:	78.000000000	Maximum:	206.00000000
Cronbach's alpha:	.943560916	Standardized alpha:	.948785943
		Average Inter-Item Correlation:	.292025834

RELIABILITY RESULTS

Number of items in scale: 15

Number of valid cases: 56
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	44.964285714	Sum:	2518.000000C
Standard Deviation:	13.205740480	Variance:	174.3915816:
Skewness:	-.158118628	Kurtosis:	-.58753302]
Minimum:	12.000000000	Maximum:	69.00000000(
Cronbach's alpha:	.916172010	Standardized alpha:	.91666433]
		Average Inter-Item Correlation:	.43475006(

d

RELIABILITY RESULTS

Number of items in scale: 6

Number of valid cases: 56

@

STATISTICA: Reliability and Item Analysis 11-11-96

E 48

Number of cases with missing data: 0

Summary statistics for scale:

Mean:	15.982142857	Sum:	895.0000000
Standard Deviation:	5.055022507	Variance:	25.55325255
Skewness:	-.192989089	Kurtosis:	-.33893787
Minimum:	6.000000000	Maximum:	27.00000000
Cronbach's alpha:	.766406689	Standardized alpha:	.77625106
		Average Inter-Item Correlation:	.37339342

Small companies

TQM

Initial Factor Method: Principal Components
Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 47 Average = 1

	1	2	3	4	5
Eigenvalue	14.5619	4.2593	3.1009	2.5500	2.4202
Difference	10.3026	1.1583	0.5510	0.1297	0.4031
Proportion	0.3098	0.0906	0.0660	0.0543	0.0515
Cumulative	0.3098	0.4004	0.4664	0.5207	0.5722

	6	7	8	9	10
Eigenvalue	2.0172	1.9086	1.7539	1.3708	1.2969
Difference	0.1086	0.1547	0.3831	0.0739	0.1362
Proportion	0.0429	0.406	0.0373	0.0292	0.0276
Cumulative	0.6151	0.6557	0.6930	0.7222	0.7498

	11	12	13	14	15
Eigenvalue	1.1608	1.0554	0.9324	0.8666	0.7892
Difference	0.1053	0.1230	0.0658	0.0775	0.1048
Proportion	0.0247	0.0225	0.0198	0.0184	0.0168
Cumulative	0.7745	0.7969	0.8168	0.8352	0.8520

Rotation Method: Varimax

Rotated Factor Pattern
FACTORS

Var.	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
1	61	22	-4	13	-3	24
2	81	0	2	-6	5	10
3	70	21	14	-1	26	1
4	10	0	91	15	10	4
5	4	7	96	-3	1	0
6	8	6	95	3	2	-4
7	32	19	25	-2	25	65
8	28	18	-2	3	-11	18
9	13	50	-19	19	-15	7
10	45	3	-4	14	15	32
11	10	7	25	-1	20	-15

Rotated Factor Pattern

FACTORS

Var.	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
12	22	8	23	6	0	10
13	-11	28	8	-6	44	7
14	2	12	6	-4	42	24
15	19	9	0	16	84	14
16	30	15	9	16	74	3
17	14	6	-5	-6	20	40
18	54	23	8	13	29	28
19	25	-2	14	13	31	17
20	34	22	-34	5	9	37
21	60	5	17	22	14	20
22	39	19	13	24	-8	27
23	35	9	10	20	-13	55
24	55	12	18	22	30	17
25	36	2	-1	5	4	70
26	12	12	5	21	35	3
27	31	-1	14	15	5	10
28	2	19	-19	22	23	16
29	8	18	-27	37	-4	25
30	17	-15	4	66	23	-18
31	31	7	5	81	-5	5
32	43	-8	17	42	16	4
33	12	22	37	17	35	5
34	11	49	0	27	31	5
35	-12	43	-20	41	10	15
36	-3	16	-17	15	10	73
37	23	18	1	19	6	22
38	17	17	1	-1	13	13
39	-7	16	2	84	12	14
40	4	25	7	33	-6	12
41	-14	16	29	60	25	27
42	21	81	3	23	17	19
43	33	65	5	-14	-16	15
44	14	82	8	5	7	5
45	-8	69	12	-5	37	1
46	-18	40	7	10	5	-3
47	5	45	17	18	8	5

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR7	FACTOR8	FACTOR9	FACTOR10	FACTOR11	FACTOR12
X1	10	20	11	17	8	-15
X2	-1	15	0	10	-6	18
X3	12	1	21	9	9	-5
X4	-3	-2	4	17	11	7
X5	3	6	4	9	-2	1
X6	4	1	-3	13	-1	-6
X7	21	5	25	-5	0	4
X8	7	10	71 *	-6	10	16
X9	31	3	9	8	57 *	-11
X10	-1	-1	5	49 *	22	-4
X11	4	1	11	84 *	0	12
X12	-1	14	8	80 *	9	2
X13	50 *	2	-8	26	4	25
X14	1	15	66 *	21	15	-21
X15	14	6	13	14	15	-1
X16	5	19	28	3	3	4
X17	40	-1	31	9	12	53 *
X18	18	-18	9	5	28	40
X19	15	19	6	14	72 *	6
X20	16	-25	9	2	41 *	29
X21	30	36	9	13	21	-17
X22	72 *	6	15	-2	7	9
X23	11	-1	38	21	0	15
X24	7	32	22	11	23	12
X25	4	30	3	-11	1	12
X26	15	5	75 *	9	1	3
X27	57 *	43 *	27	12	16	5
X28	76 *	18	7	-9	2	23
X29	26	28	20	-7	-12	58 *
X30	35	17	12	6	25	12
X31	-3	8	12	6	18	15
X32	-18	18	-2	19	50 *	12
X33	0	37	-6	26	24	-20
X34	-4	37	40 *	21	-1	-7
X35	32	7	51 *	16	-2	3
X36	17	23	9	9	18	12
X37	8	80 *	13	7	6	1
X38	18	81 *	7	4	12	7
X39	11	-1	3	4	2	9
X40	18	-3	-13	18	16	72 *

X41	29	24	15	-14	-4	-1
X42	-3	1	18	-1	-4	1
X43	26	16	-3	15	-10	27
X44	8	7	18	8	16	12
X45	21	35	1	0	12	12
X46	-6	32	25	-4	56 *	34
X47	39	24	19	-8	20	35

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
4.474703	4.099390	3.645766	3.535726	3.024282	3.019580

FACTOR7	FACTOR8	FACTOR9	FACTOR10	FACTOR11	FACTOR12
3.018479	2.990720	2.882275	2.276401	2.273987	2.214417

Rotation Method: Varimax

Final Communality Estimates: Total = 37.455728

X1	X2	X3	X4	X5	X6	X7
0.619551	0.746929	0.695757	0.921899	0.949206	0.932059	0.794431
X8	X9	X10	X11	X12	X13	X14
0.705734	0.820390	0.642949	0.872300	0.788509	0.684328	0.817401
X15	X16	X17	X18	X19	X20	X21
0.868527	0.820768	0.783775	0.836859	0.830556	0.767850	0.817846
X22	X23	X24	X25	X26	X27	X28
0.894616	0.728365	0.750894	0.749380	0.790774	0.769045	0.863571

Rotation Method: Varimax

X29	X30	X31	X32	X33	X34	X35
0.849909	0.819518	0.847091	0.781527	0.660418	0.771229	0.841606
X36	X37	X38	X39	X40	X41	X42
0.764356	0.846183	0.809846	0.783755	0.822252	0.815875	0.856756
X43	X44	X45	X46	X47		
0.800855	0.793219	0.824171	0.805400	0.697492		

Rotation Method: Varimax
wt:

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 15 Average = 1

	1	2	3	4	5
Eigenvalue	7.0586	1.5047	1.0724	1.0243	0.8131
Difference	5.5539	0.4323	0.0482	0.2111	0.0873
Proportion	0.4706	0.1003	0.0715	0.0683	0.0542
Cumulative	0.4706	0.5709	0.6424	0.7107	0.7649

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
X48	64 *	22	42 *	-3
X49	49 *	35	54 *	6
X50	70 *	21	24	33
X51	73 *	24	24	37
X52	79 *	21	14	11
X53	81 *	24	29	2
X54	20	78 *	29	1
X55	33	-4	76 *	21
X56	64 *	19	2	38
X57	10	24	73 *	8
X58	18	41 *	52 *	19
X59	34	20	6	85 *
X60	7	2	24	90 *
X61	47 *	71 *	12	7
X62	21	77 *	10	19

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4
3.933537	2.393401	2.245961	2.087175

Rotation Method: Varimax

Final Communality Estimates: Total = 10.660074

X48	X49	X50	X51	X52
0.645150	0.653329	0.697009	0.781872	0.694152
X53	**X54**	**X55**	**X56**	**X57**
0.805361	0.726142	0.737170	0.594287	0.607310
X58	**X59**	**X60**	**X61**	**X62**
0.512921	0.884171	0.881901	0.749065	0.690233

JIT:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 6 Average = 1

	1	2	3
Eigenvalue	2.8607	0.9866	0.7788
Difference	1.8741	0.2079	0.1905
Proportion	0.4768	0.1644	0.1298
Cumulative	0.4768	0.6412	0.7710

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3
X63	75 *	33	6
X64	88 *	13	4
X65	80 *	6	38
X66	15	13	92 *
X67	16	64 *	47 *
X68	20	90 *	3

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3
2.060487	1.360265	1.205424

Final Communality Estimates: Total = 4.626175

X63	X64	X65	X66	X67	X68
0.668648	0.798224	0.781378	0.881040	0.654871	0.842013

Correlación Canónica

Means and Standard Deviations

7 'VAR' Variables
19 'WITH' Variables
56 Observations

Variable	Mean	Std Dev
R1	3.928571	0.911685
R2	3.357143	1.227393
R3	3.232143	0.808839
R4	3.964286	0.830428
R5	3.642857	1.069045
R6	3.982143	0.924241
R7	3.803571	1.016583
FAC1TQM	8.928525E-12	1.000000

Canonical Correlation Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation
1	0.838120	0.73207	0.040122	0.702445
2	0.790491	0.658421	0.050582	0.624875
3	0.764947	.	0.055939	0.585143
4	0.655539	0.513600	0.076895	0.429731
5	0.579016	0.461199	0.089634	0.335260
6	0.426025	0.200645	0.110367	0.181498
7	0.327817	0.128349	0.120350	0.107464

Canonical Correlation Analysis

Eigenvalues of INV(E)*H
= CanRsq/(1-CanRsq)

	Eigenvalue	Difference	Proportion	Cumulative
1	2.3607	0.6949	0.3355	0.3355
2	1.6658	0.2553	0.2367	0.5722
3	1.4105	0.6569	0.2004	0.7726
4	0.7536	0.2492	0.1071	0.8797
5	0.5043	0.2826	0.0717	0.9514
6	0.2217	0.1013	0.0315	0.9829
7	0.1204	.	0.0171	1.0000

Canonical Correlation Analysis

Test of H0: The canonical correlations in the current row and all that follow are zero

	Likelihood Ratio	Approx F	Num DF	Den DF	Pr > F
1	0.01282386	1.4649	133	208.7351	0.0068
2	0.04309741	1.2509	108	184.8391	0.0915
3	0.11488824	1.0568	85	159.1169	0.3781

4	0.27693466	0.7973	64	131.4652	0.8434
5	0.48562118	0.6226	45	101.7859	0.9617
6	0.73054277	0.4249	28	70	0.9932
7	0.89253590	0.3334	13	36	0.9813

Canonical Correlation Analysis

Multivariate Statistics and F Approximations

S=7 M=5.5 N=14

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.012823864	1.46486	133	208.735	0.0068
Pillai's Trace	2.966415749	1.39344	133	252	0.0127
Hotelling-Lawley Trace	7.037022569	1.4966	133	198	0.0050
Roy's Greatest Root	2.360719396	4.47294	19	36	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Standardized Canonical Coefficients for the 'VAR' Variables

	V1	V2	V3	V4	V5	V6	V7
R1	0.1618	-0.2036	0.9410	0.1611	0.1860	0.5354	0.5787
R2	-0.7415	0.1751	-0.1428	0.3037	0.3277	-0.8795	-0.3011
R3	0.7414	-0.3885	-0.0203	0.1838	-0.0274	-0.6399	-0.0312
R4	0.0493	0.4621	0.2857	-0.4207	0.3703	-0.0363	-0.7796
R5	0.2213	0.4771	-0.1283	0.7472	-0.6278	0.3495	-0.1482
R6	0.0704	-0.6213	-0.2869	0.2110	0.4520	0.6676	-0.2975
R7	0.1146	0.5097	-0.5373	-0.3227	0.4842	-0.1361	0.6576

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W1	W2	W3	W4
FAC1TQM	-0.3169	0.1844	-0.1127	0.0992
FAC2TQM	0.2042	0.1961	-0.1588	-0.3320
FAC3TQM	-0.0545	0.0877	0.3061	0.1951
FAC4TQM	-0.2741	0.1053	-0.3871	-0.0036
FAC5TQM	0.3412	0.4147	0.1634	-0.0359
FAC6TQM	-0.2062	0.0739	-0.0818	0.0084
FAC7TQM	-0.0097	0.0656	-0.0358	-0.2509
FAC8TQM	-0.2235	0.3890	-0.7396	0.1864
FAC9TQM	0.0177	-0.0608	-0.2628	0.1411
FAC10TQM	0.1672	-0.2651	0.0217	0.0534
FAC11TQM	-0.4595	-0.1875	-0.2038	0.1080
FAC12TQM	0.0951	-0.1412	-0.1640	0.4555
FAC1WT	0.0746	-0.0376	0.5349	0.0766
FAC2WT	0.3585	-0.0472	0.4373	0.4375
FAC3WT	0.0072	0.5261	0.3337	-0.1461
FAC4WT	0.0797	-0.2503	-0.0222	-0.4798
FAC1JIT	0.5363	-0.3496	-0.1096	0.4487
FAC3JIT	-0.0870	-0.0366	0.4832	0.0046
FAC2JIT	0.4091	0.4533	-0.3328	0.1183

Standardized Canonical Coefficients for the 'WITH' Variables

	W5	W6	W7
FAC1TQM	0.6519	-0.6424	-0.3133
FAC2TQM	0.5505	-0.0367	-0.7409
FAC3TQM	0.2063	-0.1326	-0.3357
FAC4TQM	0.0393	-0.1028	-0.1317
FAC5TQM	-0.1305	-0.1152	-0.1532
FAC6TQM	0.5595	-0.5642	-0.4955
FAC7TQM	0.0763	-0.4570	-0.5418
FAC8TQM	0.1435	0.1656	-0.2204
FAC9TQM	0.3364	-0.1104	-0.1693
FAC10TQM	0.2975	-0.4527	-0.1786
FAC11TQM	0.3737	-0.3425	-0.4106
FAC12TQM	0.3733	-0.0039	-0.9772
FAC1WT	-0.3168	0.6393	0.9917
FAC2WT	-0.3107	0.6832	0.8564
FAC3WT	-0.3542	0.4613	0.9094
FAC4WT	0.3301	0.2266	0.4305
FAC1JIT	0.0884	0.1297	-0.1269
FAC3JIT	0.0429	0.5868	-0.4324
FAC2JIT	0.0086	0.2137	-0.0444

Canonical Structure

Correlations Between the 'VAR' Variables and Their Canonical Variables

	V1	V2	V3	V4	V5	V6	V7
R1	0.0744	0.1291	0.6709	0.4397	0.4794	0.0770	0.3139
R2	-0.4100	0.0992	0.1115	0.6566	0.4908	-0.3698	-0.0302
R3	0.7688	-0.1767	0.0568	0.2910	0.2152	-0.4889	-0.0674
R4	0.3488	0.4971	0.3065	-0.1491	0.4288	0.0593	-0.5723
R5	0.2615	0.5574	-0.0842	0.7508	-0.0337	0.1898	-0.1139
R6	0.0785	-0.3050	-0.3473	0.4118	0.6318	0.3903	-0.2434
R7	0.2913	0.5005	-0.3494	0.1063	0.5998	0.0295	0.4132

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W1	W2	W3	W4
FAC1TQM	-0.1034	0.2259	0.1962	0.2895
FAC2TQM	0.2553	0.1516	0.0330	-0.3853
FAC3TQM	-0.0891	0.1771	0.1990	0.0686
FAC4TQM	-0.0253	0.0615	-0.2456	0.2986
FAC5TQM	0.3309	0.6039	0.1132	0.0337
FAC6TQM	0.0040	0.2187	0.1540	0.1036
FAC7TQM	0.2140	-0.0345	0.2245	-0.1170
FAC8TQM	-0.3127	0.2556	-0.4796	0.0565
FAC9TQM	0.1122	-0.0917	-0.1499	0.2064
FAC10TQM	0.2361	-0.1849	0.1955	0.1187
FAC11TQM	-0.3708	-0.0720	0.0919	0.2208
FAC12TQM	-0.1340	0.1539	0.0729	0.2923
FAC1WT	0.0573	0.1888	0.3384	0.0261
FAC2WT	0.1724	-0.0261	0.1751	0.5073

FAC3WT	-0.2813	0.4261	0.0865	0.1275
FAC4WT	0.1109	-0.1773	-0.2023	-0.5143
FAC1JIT	0.3948	-0.3100	-0.2665	0.3179
FAC3JIT	-0.1833	-0.1336	0.3767	0.0170
FAC2JIT	0.5469	0.2658	-0.0111	0.0361

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W5	W6	W7
FAC1TQM	0.4060	-0.1986	0.3803
FAC2TQM	0.4794	0.2150	-0.2589
FAC3TQM	0.2237	-0.2035	-0.1705
FAC4TQM	-0.0475	0.2198	-0.0495
FAC5TQM	-0.2715	-0.1736	-0.0587
FAC6TQM	0.3746	-0.0765	0.1557
FAC7TQM	-0.0333	0.0276	0.0439
FAC8TQM	0.1165	0.3531	0.1262
FAC9TQM	0.2888	0.1038	0.0206
FAC10TQM	0.1946	-0.1577	0.0481
FAC11TQM	0.1581	0.0354	0.0418

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W5	W6	W7
FAC12TQM	0.1145	0.0792	-0.4596
FAC1WT	0.2249	0.1687	0.1701
FAC2WT	0.2657	0.1488	0.2283
FAC3WT	0.3419	0.0955	0.0701
FAC4WT	0.5183	0.2227	0.2560
FAC1JIT	0.1693	0.1346	0.2307
FAC3JIT	-0.0011	0.6775	-0.1351
FAC2JIT	0.0071	0.0016	0.0853

Correlations Between the 'VAR' Variables and the
Canonical Variables of the 'WITH' Variables

	W1	W2	W3	W4	W5	W6	W7
R1	0.0624	0.1021	0.5132	0.2883	0.2776	0.0328	0.1029
R2	-0.3436	0.0785	0.0853	0.4304	0.2842	-0.1575	-0.0099
R3	0.6443	-0.1397	0.0434	0.1908	0.1246	-0.2083	-0.0221
R4	0.2924	0.3930	0.2345	-0.0977	0.2483	0.0253	-0.1876
R5	0.2191	0.4407	-0.0644	0.4922	-0.0195	0.0809	-0.0373
R6	0.0658	-0.2411	-0.2656	0.2699	0.3658	0.1663	-0.0798
R7	0.2441	0.3956	-0.2672	0.0697	0.3473	0.0125	0.1354

Canonical Structure

Correlations Between the 'WITH' Variables and
the Canonical Variables of the 'VAR' Variables

V1 V2 V3 V4

FAC1TQM	-0.0866	0.1786	0.1501	0.1898
FAC2TQM	0.2140	0.1198	0.0252	-0.2526
FAC3TQM	-0.0746	0.1400	0.1522	0.0450
FAC4TQM	-0.0212	0.0486	-0.1879	0.1957
FAC5TQM	0.2773	0.4774	0.0866	0.0221
FAC6TQM	0.0034	0.1729	0.1178	0.0679
FAC7TQM	0.1793	-0.0273	0.1717	-0.0767
FAC8TQM	-0.2621	0.2021	-0.3669	0.0370
FAC9TQM	0.0940	-0.0725	-0.1146	0.1353
FAC10TQM	0.1979	-0.1462	0.1496	0.0778
FAC11TQM	-0.3107	-0.0569	0.0703	0.1447
FAC12TQM	-0.1123	0.1216	0.0558	0.1916
FAC1WT	0.0480	0.1493	0.2588	0.0171
FAC2WT	0.1445	-0.0206	0.1339	0.3325
FAC3WT	-0.2358	0.3368	0.0662	0.0836
FAC4WT	0.0929	-0.1402	-0.1547	-0.3371
FAC1JIT	0.3309	-0.2450	-0.2039	0.2084
FAC3JIT	-0.1536	-0.1056	0.2881	0.0111
FAC2JIT	0.4584	0.2101	-0.0085	0.0237

Correlations Between the 'WITH' Variables and
the Canonical Variables of the 'VAR' Variables

	V5	V6	V7
FAC1TQM	0.2351	-0.0846	0.1247
FAC2TQM	0.2776	0.0916	-0.0849
FAC3TQM	0.1295	-0.0867	-0.0559
FAC4TQM	-0.0275	0.0936	-0.0162
FAC5TQM	-0.1572	-0.0740	-0.0192
FAC6TQM	0.2169	-0.0326	0.0510
FAC7TQM	-0.0193	0.0118	0.0144
FAC8TQM	0.0674	0.1504	0.0414
FAC9TQM	0.1672	0.0442	0.0068
FAC10TQM	0.1127	-0.0672	0.0158
FAC11TQM	0.0916	0.0151	0.0137
FAC12TQM	0.0663	0.0338	-0.1507
FAC1WT	0.1302	0.0719	0.0558
FAC2WT	0.1538	0.0634	0.0748
FAC3WT	0.1980	0.0407	0.0230
FAC4WT	0.3001	0.0949	0.0839
FAC1JIT	0.0981	0.0573	0.0756
FAC3JIT	-0.0006	0.2886	-0.0443
FAC2JIT	0.0041	0.0007	0.0280

Canonical Redundancy Analysis

Raw Variance of the 'VAR' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.1340	0.1340	0.7024	0.0941	0.0941
2	0.1360	0.2700	0.6249	0.0850	0.1791
3	0.1038	0.3739	0.5851	0.0608	0.2399

4	0.2505	0.6244	0.4297	0.1077	0.3476
5	0.2123	0.8367	0.3353	0.0712	0.4187
6	0.0807	0.9175	0.1815	0.0147	0.4334
7	0.0825	1.0000	0.1075	0.0089	0.4423

Canonical Redundancy Analysis

Standardized Variance of the 'VAR' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.1494	0.1494	0.7024	0.1049	0.1049
2	0.1370	0.2864	0.6249	0.0856	0.1906
3	0.1156	0.4021	0.5851	0.0677	0.2582
4	0.2108	0.6129	0.4297	0.0906	0.3488
5	0.2087	0.8216	0.3353	0.0700	0.4188
6	0.0821	0.9037	0.1815	0.0149	0.4337
7	0.0963	1.0000	0.1075	0.0104	0.4440

Canonical Redundancy Analysis

Standardized Variance of the 'WITH' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.0618	0.0618	0.7024	0.0434	0.0434
2	0.0576	0.1194	0.6249	0.0360	0.0794
3	0.0493	0.1687	0.5851	0.0289	0.1083
4	0.0625	0.2312	0.4297	0.0269	0.1351
5	0.0721	0.3033	0.3353	0.0242	0.1593
6	0.0509	0.3542	0.1815	0.0092	0.1685
7	0.0387	0.3928	0.1075	0.0042	0.1727

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'VAR' Variables and
the First 'M' Canonical Variables of the 'WITH' Variables

M	1	2	3	4	5	6	7
R1	0.0039	0.0143	0.2777	0.3608	0.4379	0.4389	0.4495
R2	0.1181	0.1242	0.1315	0.3168	0.3975	0.4223	0.4224
R3	0.4152	0.4347	0.4366	0.4730	0.4885	0.5319	0.5324
R4	0.0855	0.2399	0.2949	0.3045	0.3661	0.3667	0.4019
R5	0.0480	0.2422	0.2463	0.4886	0.4890	0.4955	0.4969
R6	0.0043	0.0624	0.1330	0.2059	0.3397	0.3673	0.3737
R7	0.0596	0.2161	0.2876	0.2924	0.4130	0.4132	0.4315

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and
the First 'M' Canonical Variables of the 'VAR' Variables

M	1	2	3	4
FAC1TQM	0.0075	0.0394	0.0619	0.0980
FAC2TQM	0.0458	0.0601	0.0608	0.1246
FAC3TQM	0.0056	0.0252	0.0483	0.0504
FAC4TQM	0.0005	0.0028	0.0381	0.0764
FAC5TQM	0.0769	0.3048	0.3123	0.3128
FAC6TQM	0.0000	0.0299	0.0438	0.0484
FAC7TQM	0.0322	0.0329	0.0624	0.0683
FAC8TQM	0.0687	0.1095	0.2441	0.2455
FAC9TQM	0.0088	0.0141	0.0272	0.0455
FAC10TQM	0.0392	0.0605	0.0829	0.0890
FAC11TQM	0.0966	0.0998	0.1047	0.1257
FAC12TQM	0.0126	0.0274	0.0305	0.0672
FAC1WT	0.0023	0.0246	0.0916	0.0919
FAC2WT	0.0209	0.0213	0.0392	0.1498
FAC3WT	0.0556	0.1691	0.1734	0.1804
FAC4WT	0.0086	0.0283	0.0522	0.1659
FAC1JIT	0.1095	0.1696	0.2111	0.2545
FAC3JIT	0.0236	0.0348	0.1178	0.1179
FAC2JIT	0.2101	0.2543	0.2543	0.2549

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and
the First 'M' Canonical Variables of the 'VAR' Variables

M	5	6	7
FAC1TQM	0.1532	0.1604	0.1759
FAC2TQM	0.2016	0.2100	0.2172
FAC3TQM	0.0671	0.0747	0.0778
FAC4TQM	0.0772	0.0860	0.0862
FAC5TQM	0.3375	0.3429	0.3433
FAC6TQM	0.0954	0.0965	0.0991
FAC7TQM	0.0686	0.0688	0.0690
FAC8TQM	0.2500	0.2727	0.2744
FAC9TQM	0.0735	0.0755	0.0755
FAC10TQM	0.1016	0.1062	0.1064
FAC11TQM	0.1341	0.1343	0.1345
FAC12TQM	0.0716	0.0728	0.0955
FAC1WT	0.1088	0.1140	0.1171
FAC2WT	0.1735	0.1775	0.1831
FAC3WT	0.2196	0.2213	0.2218
FAC4WT	0.2559	0.2649	0.2720
FAC1JIT	0.2641	0.2674	0.2731
FAC3JIT	0.1179	0.2012	0.2032
FAC2JIT	0.2549	0.2549	0.2557

Small- TQM/JIT

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM11
- TQM12
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9
- JIT1
- JIT2
- JIT3

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 56

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.67325	.820518	.0294491	153.342	105	. 15
2	.540546	.735218	.0901272	104.684	84	. 628
3	.52905	.727358	.196161	70.8535	65	.2888
4	.34373	.586285	.416523	38.0979	48	.8463
5	.216566	.465367	.634683	19.7764	33	.9665
6	.154448	.392999	.810129	9.15942	20	.9810
7	.041893	.204678	.958107	1.86162	9	.9935

Coefficients for Canonical Variables of the First Set

TQM1	.314523	-.116078	-.248236	-.024143	-.79174	.0502429	-.23034
TQM10	-.425819	.0129476	-.078383	.197719	.0164244	-.0793175	.00612215
TQM11	.341941	-.228001	-.447078	-.175211	.500553	.146406	-.0323316
TQM12	.0783611	-.000414644	-.172157	.391993	.180853	.502242	-.561551
TQM2	-.0372763	-.33246	-.0814937	.309935	.0572996	.0771879	-.355575
TQM3	.194992	.176946	.473036	-.335979	-.0142865	.324759	-.421468
TQM4	-.157551	.329808	-.0831487	.0819493	.191931	.082191	-.0865664
TQM5	-.0318353	-.135572	-.0890956	-.355015	.115148	.0128255	.0461934
TQM6	.0811478	-.702562	.42032	-.0316106	.274031	-.159938	-.244055
TQM7	-.0630842	-.208346	-.221868	.313502	-.0851459	-.198336	.113106
TQM8	-.117649	.293081	-.0886973	.101442	.0113997	.0149992	-.180857
TQM9	.166923	-.215833	.274382	.325453	.0677493	-.230937	-.0564518
JIT1	.499208	.0854587	.445128	.533046	.190652	.331766	[illegible]
JIT2	-.503128	-.334689	.33196	-.0249113	.122137	-.19527	-.240667
JIT3	-.13468	-.53334	-.0465366	-.00346525	-.0696315	.833438	.300011

Coefficients for Canonical Variables of the Second Set

R1	.00295502	-.851966	.106012	.327725	-.0447027	.35034	.916048
R2	-.678964	.126139	-.416787	.141356	.204507	-.70215	-.660381
R3	.670025	-.101885	.498677	.224874	.335666	-.468037	-.235973
R4	.149757	-.402923	-.520268	-.145623	-.458502	.115775	-.721344
R5	.223247	.32144	-.34139	.0393295	.826281	.659347	.0310851
R6	-.0301647	.242514	.534071	.52032	-.493587	.620551	-.108726
R7	.264862	.500185	-.504638	.0803492	-.467004	-.571726	.474076

Small- TQM/WT

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM11
- TQM12
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 56

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.593651	.770488	.046503	131.934	112	.960
2	.52316	.723298	.114441	93.2109	90	.3874
3	.413213	.642817	.239999	61.3662	70	.7596
4	.333113	.577159	.409005	38.4432	52	.9192
5	.234252	.483996	.613305	21.0224	36	.9779
6	.145414	.381332	.800923	9.54559	22	.9900
7	.0627939	.250587	.937206	2.78864	10	.9860

Coefficients for Canonical Variables of the First Set

TQM1	.128654	.0875216	.518573	.490281	.158871	-.550323	.462024
TQM10	-.541882	.0901796	-.12465	.379467	.0218724	-.631631	.0166259
TQM11	.476603	-.381302	.451936	-.236935	.354071	-.160512	-.199813
TQM12	-.296886	-.0100017	-.0461375	.271345	.452207	-.662932	.585853
TQM2	.0164932	-.370712	-.0563122	.193712	-.20668	-.341107	.145285
TQM3	.291197	.178808	-.0408197	-.610807	-.250849	.860078	.535563
TQM4	-.33019	-.070296	.317237	-.0167392	.267536	-.156613	.0236987
TQM5	.141181	-.0650829	-.152567	-.260819	-.570423	.216352	.0635783
TQM6	.655776	.203741	-.480278	-.0372253	-.202164	.138455	.0376022
TQM7	-.186883	-.177196	.205353	.502784	.0910684	-.819468	-.197378
TQM8	-.0615812	-.0332729	-.206506	-.0489067	-.0113852	.810173	[illegible]
TQM9	.140968	.184088	-.119042	.278924	.31756	-.445618	[illegible]
WT1	.34202	-.145172	-.558061	-.169925	-.611562	1.37196	.23081
WT2	.177521	.114527	.27549	.35769	.00434809	.439151	-.221459
WT3	.365099	-.493408	.0246954	-.273043	-.510347	1.04827	-.0200732
WT4	.457295	-.113749	-.592054	-.27451	.348924	1.10271	.179162

Coefficients for Canonical Variables of the Second Set

R1	.522499	-.058414	-.746222	.286698	-.209436	.020871	-.034170
R2	-.638110	-.474744	-.141645	.344103	-.104496	-.917156	[illegible]
R3	.498741	.378869	-.21557	-.0590076	.562263	-.526724	[illegible]
R4	.360019	-.280591	.374776	.371905	-.283386	-.43106	.683711
R5	-.0340437	-.588779	-.0519582	-.758609	.574832	.260895	[illegible]
R6	-.342069	.546016	-.0965225	.393441	.46515	.302163	.56096
R7	-.00509925	-.17613	.761791	.426513	.0538831	.220151	-.711675

Small- JIT/WT

Analysis Summary

Variables in set 1:
JIT1
JIT2
JIT3
WT1
WT2
WT3
WT4

Variables in set 2:
R1
R2
R3
R4
R5
R6
R7

Number of complete cases: 56

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.47209	.687088	.167272	84.9363	49	. 11
2	.383528	.619297	.316857	54.5919	36	. 242
3	.249629	.499629	.513985	31.6141	25	.1695
4	.217562	.466435	.684975	17.9727	16	.3255
5	.108959	.330089	.875436	6.31906	9	.7076
6	.0173514	.131725	.982486	[illegible]	4	.9331
7	.000165203	.0128531	.999835	.00784779	1	.9294

Coefficients for Canonical Variables of the First Set

JIT1	.670898	-.0778492	.253294	-.292889	.223155	.350129	.538669
JIT2	-.330274	.606084	.358836	-.151353	.537022	-.334184	.216488
JIT3	-.348357	.174593	.346716	-.517766	-.478988	.495426	-.0959889
WT1	-.165084	-.259652	-.194322	-.35199	-.186503	-.555657	.655818
WT2	.135533	.526851	-.676806	-.454295	.0721896	-.0660421	-.234406
WT3	-.451467	-.441051	-.449003	-.00490034	.404662	.522668	.0975009
WT4	-.0548742	-.415013	.188145	-.427202	.363285	-.423253	-.600426

Coefficients for Canonical Variables of the Second Set

R1	-.276962	-.31165	.226761	-.947613	-.409639	-.343082	.475849
R2	-.474557	-.00423601	-.019501	.533428	.890524	-.390943	-.456878
R3	.805755	-.195631	.178905	.14618	-.0299701	-.591269	-.233643
R4	-.372091	-.0936199	-.534573	.0414741	-.344003	.0316306	-.816409
R5	.0605795	-.741358	.51869	.311518	-.135146	.661314	.121393
R6	.320632	.319976	.221437	-.772111	.221861	.487765	-.344537
R7	.21986	-.0990272	-.941779	.0683413	.394136	.0315774	.495035

Small- TQM

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM11
- TQM12
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 56

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.554249	.744479	.103439	102.095	84	.873
2	.446921	.668522	.232056	65.735	66	.4860
3	.341421	.584312	.419571	49.0835	50	.8676
4	.219205	.468193	.637085	20.2883	36	.9838
5	.126265	.355339	.815944	9.15341	24	.9973
6	.0560117	.236668	.933858	3.07917	14	.9989
7	.010731	.103591	.989269	.485505	6	.9980

Coefficients for Canonical Variables of the First Set

TQM1	.347882	.114305	.0634318	.780987	-.209897	-.252563	.0910319
TQM10	-.348635	.149539	-.365466	-.131632	-.211889	-.113074	.35423
TQM11	.482501	.461034	.51531	-.350442	.115101	.0243911	.00627498
TQM12	-.120953	.323865	-.104476	-.124822	.0960654	-.757411	.0701279
TQM2	.0701061	.323319	-.214832	-.0479048	-.240699	-.207436	-.468156
TQM3	.0039712	-.516599	.360718	.0245101	-.0625524	-.454666	-.0712386
TQM4	-.23662	.112765	.194008	-.0208072	.522623	-.15099	.24731
TQM5	.0685298	-.0339711	.103987	-.316842	-.606215	-.00138736	.161362
TQM6	.519007	-.291778	-.42379	-.323111	.071075	-.195221	-.0697628
TQM7	.105023	.399386	-.205734	.152473	-.0150522	.188728	.107087
TQM8	-.319795	.0985472	.0824319	.0152252	.0104717	.00723117	-.221449
TQM9	.248419	-.0865723	-.364018	.0523793	.42509	.0320048	-.112563

Coefficients for Canonical Variables of the Second Set

R1	.383115	.0345316	-.69518	-.0661115	.0213804	.242534	.46961
R2	-.517613	.524915	-.373353	-.238103	-.242793	-.0573248	-.920965
R3	.542997	-.352812	-.190781	-.130562	.585251	.13911	-.557833
R4	.438033	.388352	.0409389	.345079	-.476043	-.605346	-.246840
R5	-.0765528	.34812	.557915	-.605604	.601242	-.306683	.359279
R6	-.39222	-.343889	-.25464	.638689	.459762	-.453513	.30709
R7	.00383032	.418862	.359272	.602297	-.0407913	.807925	-.171639

Small- WT/R1,5,6,7

Analysis Summary

Variables in set 1:
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R5
- R6
- R7

Number of complete cases: 56

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.325403	.570441	.519377	33.0838	16	. 72
2	.18983	.435694	.769906	13.2051	9	.1535
3	.0366519	.191447	.950302	2.57427	4	.6314
4	.0135425	.116372	.986457	.688571	1	.4066

Coefficients for Canonical Variables of the First Set

WT1	.367993	.333348	-.522372	.693244
WT2	-.638971	.76671	.0601667	.0158452
WT3	.361363	.353353	-.475507	-.720036
WT4	.570714	.419733	.705266	.02665

Coefficients for Canonical Variables of the Second Set

R1	.651625	.459489	-.144974	.721057
R5	.720616	-.595614	.213973	-.606897
R6	-.182915	.368436	.987999	.0642965
R7	-.302158	.707936	-.56876	-.638086

Small- JIT/R1,2,3

Analysis Summary

Variables in set 1:
    JIT1
    JIT2
    JIT3
Variables in set 2:
    R1
    R2
    R3

Number of complete cases: 56

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.29943	.547202	.630671	23.74	9	. 47
2	.0966759	.310927	.900226	5.41315	4	.2475
3	.00342997	.058566	.99657	.176947	1	.6740

Coefficients for Canonical Variables of the First Set

JIT1	.622344	-.0216279	.782445
JIT2	-.651629	-.560139	.502591
JIT3	-.433668	.822649	.367671

Coefficients for Canonical Variables of the Second Set

R1	-.118645	1.153	.361916
R2	-.28351	-.914081	.709525
R3	1.00745	-.157347	.157097

MAQUILADORAS

data file: MAQUILA.STA [60 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 47

Number of valid cases: 60
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	179.03333333	Sum:	10742.000000
Standard Deviation:	34.538850911	Variance:	1192.9322222
Skewness:	-.194470796	Kurtosis:	-1.083338719
Minimum:	112.00000000	Maximum:	235.00000000
Cronbach's alpha:	.966518116	Standardized alpha:	.968715695
		Average Inter-Item Correlation:	.406127729

data file: MAQUILA.STA [60 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 15

Number of valid cases: 60
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	50.483333333	Sum:	3029.0000000
Standard Deviation:	13.321025569	Variance:	177.44972222
Skewness:	-.459545578	Kurtosis:	-.531508425
Minimum:	20.000000000	Maximum:	75.000000000
Cronbach's alpha:	.919348271	Standardized alpha:	.922430965
		Average Inter-Item Correlation:	.452440795

data file: MAQUILA.STA [60 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 6

Number of valid cases: 60
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	17.600000000	Sum:	1056.0000000
Standard Deviation:	4.673328578	Variance:	21.840000000
Skewness:	-.067620857	Kurtosis:	-.932543041
Minimum:	9.000000000	Maximum:	28.000000000
Cronbach's alpha:	.709126984	Standardized alpha:	.695160372
		Average Inter-Item Correlation:	.287232948

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 47 Average = 1

	1	2	3	4	5
Eigenvalue	19.5986	3.2598	2.5996	2.0683	1.9556
Difference	16.3388	0.6602	0.5313	0.1127	0.2908
Proportion	0.4170	0.0694	0.0553	0.0440	0.0416
Cumulative	0.4170	0.4863	0.5417	0.5857	0.6273

	6	7	8	9	10
Eigenvalue	1.6648	1.5217	1.3006	1.2032	1.1094
Difference	0.1431	0.2211	0.0974	0.0938	0.1261
Proportion	0.0354	0.0324	0.0277	0.0256	0.0236
Cumulative	0.6627	0.6951	0.7227	0.7483	0.7719

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
X1	17	10	14	30	77 *
X2	39	19	16	2	60 *
X3	43 *	17	16	9	52 *
X4	15	15	-2	87 *	13
X5	9	2	8	84 *	15
X6	26	10	14	87 *	8
X7	37	-17	30	16	48 *
X8	25	3	41 *	11	46 *
X9	-6	25.	1	12	60 *
X10	34	8	22	25	39
X11	56 *	7	17	25	-24
X12	38	10	29	21	27
X13	9	62 *	-2	-1	19
X14	11	15	36	33	29
X15	73 *	5	17	10	1
X16	72 *	12	11	21	14
X17	57 *	37	-12	-7	18
X18	69 *	21	6	7	15
X19	39	7	-14	10	14
X20	39	13	10	9	-2
X21	34	34	24	44 *	18
X22	40 *	23	13	10	37
X23	70 *	14	12	23	19
X24	60 *	14	53 *	35	4
X25	41 *	5	62 *	26	10
X26	59 *	42 *	30	27	-3
X27	38	44 *	30	14	24
X28	43 *	32	45 *	23	5
X29	12	29	14	1	8
X30	13	29	28	16	10
X31	20	14	9	-4	2

X32	46 *	8	-10	17	-8
X33	36	8	5	37	23
X34	15	8	44 *	22	1
X35	21	40 *	55 *	12	23
X36	16	23	57 *	13	22
X37	77 *	3	17	4	33
X38	75 *	3	23	0	32
X39	15	23	76 *	-16	17
X40	14	31	26	1	18
X41	62 *	7	10	27	1
X42	33	26	38	18	11
X43	10	69 *	33	15	-5
X44	21	85 *	10	9	13
X45	6	51 *	41 *	14	23
X46	27	34	6	27	7
X47	7	56 *	19	37	13

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR6	FACTOR7	FACTOR8	FACTOR9	FACTOR10
X1	-1	3	12	-2	11
X2	-3	34	7	3	-7
X3	22	35	12	18	-25
X4	9	-7	5	3	13
X5	8	34	10	14	-5
X6	-3	5	4	8	11
X7	11	40	32	15	-4
X8	53 *	-6	1	20	2
X9	38	-7	17	31	18
X10	15	29	15	16	51 *
X11	10	-14	34	39	-4
X12	-6	13	6	62 *	21
X13	-4	36	19	37	-5
X14	9	18	3	50 *	-2
X15	7	10	14	26	28
X16	9	12	21	17	14
X17	1	-3	55 *	6	11
X18	27	29	12	-3	12
X19	53 *	-3	32	-10	27
X20	10	-7	2	4	75 *
X21	9	11	5	28	4
X22	-7	-5	53 *	24	16
X23	7	18	-11	14	18
X24	-4	-13	-1	14	5
X25	-10	2	22	11	11
X26	1	2	23	9	-9
X27	15	16	37	1	-7
X28	16	12	19	-10	30
X29	25	75 *	13	9	5
X30	59 *	15	11	37	-5
X31	77 *	18	7	-7	6
X32	53 *	11	5	48 *	29
X33	23	32	40 *	16	34
X34	19	27	69 *	4	4
X35	5	12	34	29	1

X36	8	22	20	23	43 *
X37	23	11	14	-10	3
X38	31	12	12	-5	4
X39	25	18	15	8	2
X40	16	22	72 *	0	2
X41	30	14	11	14	28
X42	42 *	34	-6	-22	-3
X43	24	23	3	14	15
X44	14	8	18	0	14
X45	23	43 *	11	-4	6
X46	-3	66 *	12	13	1
X47	20	45 *	18	-8	15

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
7.736762	4.066058	4.007439	3.988121	3.399162

FACTOR6	FACTOR7	FACTOR8	FACTOR9	FACTOR10
3.057778	3.028579	2.922042	2.146354	1.929306

Rotation Method: Varimax

Final Communality Estimates: Total = 36.281601

X1	X2	X3	X4	X5	X6	X7
0.778371	0.701749	0.794946	0.854807	0.894980	0.878090	0.814013

X8	X9	X10	X11	X12	X13	X14
0.780079	0.743389	0.795537	0.773562	0.799714	0.735649	0.656272

X15	X16	X17	X18	X19	X20	X21
0.759217	0.733911	0.822746	0.734746	0.671351	0.763939	0.621751

X22	X23	X24	X25	X26	X27	X28
0.750622	0.722887	0.822353	0.715524	0.764813	0.696821	0.712148

Rotation Method: Varimax

X29	X30	X31	X32	X33	X34	X35
0.776265	0.737424	0.712288	0.868605	0.786528	0.863080	0.792487

X36	X37	X38	X39	X40	X41	X42
0.804170	0.830642	0.841358	0.830130	0.802011	0.689842	0.711743

X43	X44	X45	X46	X47
0.768422	0.872785	0.752032	0.736296	0.811507

FACTOR1	FACTOR2	FACTOR3	FACTOR4
3.602456	2.663226	2.517428	2.008894

Rotation Method: Varimax

Final Communality Estimates: Total = 10.792005

X48	X49	X50	X51	X52
0.753757	0.775267	0.661579	0.832043	0.700403

X53	X54	X55	X56	X57
0.854110	0.580085	0.733005	0.659153	0.704197

X58	X59	X60	X61	X62
0.586415	0.781249	0.824933	0.687082	0.658728

Rotation Method: Varimax
JIT:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 6 Average = 1

	1	2	3
Eigenvalue	2.5136	1.1379	0.9371
Difference	1.3757	0.2007	0.2490
Proportion	0.4189	0.1896	0.1562
Cumulative	0.4189	0.6086	0.7648

	4	5	6
Eigenvalue	0.6881	0.4997	0.2236
Difference	0.1885	0.2761	
Proportion	0.1147	0.0833	0.0373
Cumulative	0.8795	0.9627	1.0000

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3
1	0.77165	0.61508	0.16194
2	-0.10121	-0.13263	0.98599
3	-0.62794	0.77723	0.04009

Rotation Method: Varimax

Rotated Factor Pattern

FACTOR1	FACTOR2	FACTOR3

X63	61 *	28	-33
X64	85 *	32	0
X65	84 *	0	39
X66	4	10	89 *
X67	23	85 *	-14
X68	14	79 *	32

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3
1.877907	1.537092	1.173637

Final Communality Estimates: Total = 4.588636

X63	X64	X65	X66	X67	X68
0.560053	0.829435	0.856886	0.800239	0.791938	0.750086

Correlations Among the Original Variables

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC1TQM	FAC2TQM	FAC3TQM	FAC4TQM	FAC5TQM
R1	0.2485	-0.0075	0.2018	-0.0008	-0.0915
R2	0.3176	0.1814	0.0377	0.2203	0.0113
R3	0.0778	-0.1477	0.1242	0.1784	-0.0741
R4	0.3234	0.0533	0.2748	0.0565	0.0873
R5	0.0904	-0.1442	-0.0840	-0.1107	-0.1144
R6	-0.0451	0.0879	0.0955	-0.1326	-0.0921
R7	-0.0860	0.1904	0.1179	0.1106	0.0162

Correlations Among the Original Variables

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC6TQM	FAC7TQM	FAC8TQM	FAC9TQM	FAC10TQM
R1	0.1813	0.2567	0.2981	-0.0361	0.1220
R2	0.0883	0.1615	0.2347	0.1065	0.2369
R3	0.0222	0.2183	-0.0415	-0.0991	0.1992
R4	0.1426	-0.0080	0.1116	-0.1012	0.2555
R5	0.1717	-0.0707	0.0419	-0.2234	0.1042
R6	0.2116	0.1090	-0.1267	-0.0119	0.1922
R7	0.2203	0.4101	0.1002	0.0115	-0.0107

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC1WT	FAC2WT	FAC3WT	FAC4WT	FAC1JIT
R1	0.1958	0.2859	0.2537	-0.0907	-0.0375
R2	0.1599	0.2268	0.3221	0.1331	-0.2364
R3	0.0100	0.1494	0.2675	0.1018	-0.2677
R4	0.2242	0.1670	0.1758	0.0623	-0.0452
R5	-0.1320	-0.0846	-0.0256	0.0154	0.0958
R6	0.1598	-0.3346	0.1701	0.1778	0.0912
R7	0.2558	0.0868	0.2066	0.0731	0.0616

Correlations Among the Original Variables

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC3JIT	FAC2JIT
R1	0.0673	0.0273
R2	0.0941	0.1210
R3	0.1505	0.1366
R4	0.0848	-0.1403
R5	0.0833	-0.1009
R6	0.1179	0.0342
R7	0.0942	-0.2287

Canonical Correlation Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation
1	0.796885	0.690301	0.047516	0.635026
2	0.703264	0.529429	0.065800	0.494580
3	0.656627	.	0.074057	0.431159
4	0.580132	0.346152	0.086373	0.336553
5	0.552856	.	0.090397	0.305649
6	0.422798	0.232188	0.106917	0.178758
7	0.365725	.	0.112776	0.133755

Canonical Correlation Analysis

Eigenvalues of INV(E)*H
= CanRsq/(1-CanRsq)

	Eigenvalue	Difference	Proportion	Cumulative
1	1.7399	0.7614	0.3628	0.3628
2	0.9786	0.2206	0.2040	0.5668
3	0.7580	0.2507	0.1580	0.7249
4	0.5073	0.0671	0.1058	0.8306
5	0.4402	0.2225	0.0918	0.9224
6	0.2177	0.0633	0.0454	0.9678
7	0.1544	.	0.0322	1.0000

Canonical Correlation Analysis

Test of H0: The canonical correlations in the
current row and all that follow are zero

	Likelihood Ratio	Approx F	Num DF	Den DF	Pr > F
1	0.03438768	1.3916	119	244.6911	0.0161
2	0.09421944	1.1663	96	216.4444	0.1797
3	0.18641802	1.0430	75	186.229	0.4031
4	0.32771553	0.9127	56	153.875	0.6463
5	0.49395867	0.8220	39	119.1964	0.7555
6	0.71139669	0.6342	24	82	0.8964
7	0.86624514	0.5896	11	42	0.8264

Canonical Correlation Analysis

Multivariate Statistics and F Approximations

S=7 M=4.5 N=17

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.034387677	1.39156	119	244.691	0.0161
Pillai's Trace	2.515479749	1.38581	119	294	0.0143

Hotelling-Lawley Trace	4.795980309	1.3818	119	240	0.0184
Roy's Greatest Root	1.73991884	4.29862	17	42	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'VAR' Variables

	V1	V2	V3	V4	V5	V6	V7
R1	-0.5564	0.7340	0.0318	-0.1101	-0.5407	0.8161	-0.2993
R2	0.8233	-0.0519	0.4715	-0.1256	0.8480	0.0722	-0.4149
R3	0.3971	-0.3349	0.2077	0.3244	-0.8497	-0.4884	-0.0452
R4	-0.1789	0.4879	0.2613	0.2967	0.0223	-0.3106	0.8843
R5	-0.5879	0.2495	0.0817	-0.3244	0.1664	-0.5978	-0.5604
R6	-0.3034	-0.2542	0.0686	0.9657	0.1806	0.3101	-0.1200
R7	0.5706	0.1476	-0.9919	-0.0131	0.0958	-0.3766	0.0327

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W1	W2	W3	W4
FAC1TQM	-0.2495	0.5360	0.5398	-0.1476
FAC2TQM	0.4636	0.2157	-0.1236	0.0073
FAC3TQM	0.0952	0.6566	-0.0243	0.1805
FAC4TQM	0.4943	0.1042	-0.0007	-0.1356
FAC5TQM	0.4810	0.0661	0.2728	-0.3101
FAC6TQM	0.0201	0.6244	-0.2042	0.0371
FAC7TQM	0.3885	0.3814	-0.3224	-0.0899
FAC8TQM	0.1527	0.6397	0.0425	-0.3315
FAC9TQM	0.1426	-0.0319	-0.1475	-0.0940
FAC10TQM	0.0390	0.2529	0.4559	0.3109
FAC1WT	-0.2946	-0.7085	-0.1235	0.4561
FAC2WT	0.1700	0.0610	-0.0228	-0.2505
FAC3WT	0.1632	-0.0681	-0.0914	0.5926
FAC4WT	-0.0850	-0.1578	0.0388	0.2788
FAC1JIT	-0.6506	0.1354	-0.2824	0.2641
FAC3JIT	0.1290	0.0348	0.0679	0.1198
FAC2JIT	0.1350	-0.4678	0.5684	0.1252

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W5	W6	W7
FAC1TQM	0.5626	-0.0590	-0.0658
FAC2TQM	0.5768	-0.0494	0.0057
FAC3TQM	-0.1083	-0.3325	0.3511
FAC4TQM	0.3140	-0.5798	-0.0257
FAC5TQM	0.4199	-0.6505	0.1882

FAC6TQM	0.2838	-0.5662	-0.3286
FAC7TQM	-0.0081	-0.2220	-0.5364
FAC8TQM	0.5075	-0.1963	-0.4045
FAC9TQM	0.4209	0.3580	0.0145
FAC10TQM	0.1233	-0.2405	-0.1431
FAC1WT	-0.5095	1.1745	0.5617
FAC2WT	-0.7750	0.4712	0.2783
FAC3WT	-0.3719	0.2609	0.0011
FAC4WT	0.2507	-0.0470	0.0367
FAC1JIT	0.2209	0.3418	-0.0549
FAC3JIT	0.0449	-0.3100	-0.1649
FAC2JIT	-0.2521	0.5258	-0.2668

Canonical Structure

Correlations Between the 'VAR' Variables and Their Canonical Variables

	V1	V2	V3	V4	V5	V6	V7
R1	0.1689	0.7849	0.0492	0.1700	-0.3169	0.3168	-0.3512
R2	0.5804	0.5027	0.4203	0.1907	0.2675	0.0001	-0.3548
R3	0.3997	0.1451	0.3106	0.3333	-0.6246	-0.3531	-0.3111
R4	0.0748	0.7026	0.2868	0.3243	0.1070	-0.3115	0.4526
R5	-0.3749	0.3334	0.0759	0.0791	0.1446	-0.6503	-0.5408
R6	-0.1838	0.0091	-0.1157	0.8991	0.2248	0.0294	-0.3050
R7	0.3411	0.5077	-0.6679	0.3200	0.0418	-0.1973	-0.1915

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W1	W2	W3	W4
FAC1TQM	0.0097	0.4535	0.5298	-0.0308
FAC2TQM	0.3164	0.0431	-0.1920	0.1294
FAC3TQM	0.0084	0.2997	0.0070	0.3669
FAC4TQM	0.5157	-0.0309	0.0424	-0.0803
FAC5TQM	0.1501	-0.0044	-0.0334	-0.0715
FAC6TQM	-0.1057	0.3017	-0.1533	0.2830
FAC7TQM	0.4025	0.1681	-0.4227	0.2461
FAC8TQM	0.0778	0.4726	0.0549	-0.3101
FAC9TQM	0.2861	-0.1411	-0.0433	-0.0185
FAC10TQM	0.0437	0.1575	0.3900	0.4295
FAC1WT	0.2030	0.2924	-0.1695	0.3825

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W1	W2	W3	W4
FAC2WT	0.3236	0.4355	0.1138	-0.4461
FAC3WT	0.3515	0.2085	0.1006	0.4144
FAC4WT	0.2109	-0.1533	0.0582	0.3629
FAC1JIT	-0.4026	0.0884	-0.3459	-0.0177
FAC3JIT	0.0673	0.0571	0.0325	0.2419
FAC2JIT	0.1032	-0.2390	0.4121	0.0918

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W5	W6	W7
FAC1TQM	0.1352	0.1221	0.0772
FAC2TQM	0.5332	0.2466	0.1565
FAC3TQM	-0.2929	0.1343	0.5491
FAC4TQM	0.0094	-0.2507	0.0884
FAC5TQM	0.1625	-0.0735	0.4894
FAC6TQM	0.0889	-0.0492	-0.2193
FAC7TQM	-0.2539	0.0913	-0.3303
FAC8TQM	0.1254	0.3400	-0.2489
FAC9TQM	0.2778	0.4342	0.0235
FAC10TQM	0.0405	-0.1386	0.0010
FAC1WT	0.1043	0.3049	0.3721
FAC2WT	-0.2743	0.0923	0.1412
FAC3WT	-0.0744	0.0835	-0.1791
FAC4WT	0.2144	-0.2721	-0.0141
FAC1JIT	0.1530	0.1061	0.0515
FAC3JIT	-0.0695	-0.2054	-0.1333
FAC2JIT	-0.1155	0.3901	-0.3927

Canonical Structure

Correlations Between the 'VAR' Variables and the Canonical Variables of the 'WITH' Variables

	W1	W2	W3	W4	W5	W6	W7
R1	0.1346	0.5520	0.0323	0.0986	-0.1752	0.1340	-0.1284
R2	0.4625	0.3535	0.2760	0.1106	0.1479	0.0000	-0.1298
R3	0.3185	0.1021	0.2040	0.1933	-0.3453	-0.1493	-0.1138
R4	0.0596	0.4941	0.1883	0.1881	0.0591	-0.1317	0.1655
R5	-0.2988	0.2345	0.0499	0.0459	0.0800	-0.2749	-0.1978
R6	-0.1465	0.0064	-0.0760	0.5216	0.1243	0.0124	-0.1116
R7	0.2718	0.3570	-0.4386	0.1857	0.0231	-0.0834	-0.0700

Correlations Between the 'WITH' Variables and the Canonical Variables of the 'VAR' Variables

	V1	V2	V3	V4
FAC1TQM	0.0077	0.3190	0.3479	-0.0179
FAC2TQM	0.2521	0.0303	-0.1261	0.0751
FAC3TQM	0.0067	0.2108	0.0046	0.2128
FAC4TQM	0.4110	-0.0218	0.0278	-0.0466
FAC5TQM	0.1196	-0.0031	-0.0219	-0.0415
FAC6TQM	-0.0843	0.2122	-0.1006	0.1642
FAC7TQM	0.3207	0.1182	-0.2775	0.1428
FAC8TQM	0.0620	0.3324	0.0360	-0.1799
FAC9TQM	0.2280	-0.0993	-0.0284	-0.0107
FAC10TQM	0.0348	0.1108	0.2561	0.2492
FAC1WT	0.1617	0.2056	-0.1113	0.2219
FAC2WT	0.2579	0.3063	0.0747	-0.2588
FAC3WT	0.2801	0.1466	0.0661	0.2404
FAC4WT	0.1681	-0.1078	0.0382	0.2106

FAC1JIT	-0.3208	0.0622	-0.2271	-0.0103
FAC3JIT	0.0537	0.0402	0.0213	0.1403
FAC2JIT	0.0823	-0.1681	0.2706	0.0533

Canonical Structure

Correlations Between the 'WITH' Variables and
the Canonical Variables of the 'VAR' Variables

	V5	V6	V7
FAC1TQM	0.0748	0.0516	0.0282
FAC2TQM	0.2948	0.1043	0.0572
FAC3TQM	-0.1620	0.0568	0.2008
FAC4TQM	0.0052	-0.1060	0.0323
FAC5TQM	0.0898	-0.0311	0.1790
FAC6TQM	0.0491	-0.0208	-0.0802
FAC7TQM	-0.1404	0.0386	-0.1208
FAC8TQM	0.0693	0.1437	-0.0910
FAC9TQM	0.1536	0.1836	0.0086
FAC10TQM	0.0224	-0.0586	0.0004
FAC1WT	0.0577	0.1289	0.1361
FAC2WT	-0.1517	0.0390	0.0517
FAC3WT	-0.0412	0.0353	-0.0655
FAC4WT	0.1185	-0.1150	-0.0052
FAC1JIT	0.0846	0.0449	0.0188
FAC3JIT	-0.0384	-0.0869	-0.0487
FAC2JIT	-0.0638	0.1649	-0.1436

Canonical Redundancy Analysis

Raw Variance of the 'VAR' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.1272	0.1272	0.6350	0.0808	0.0808
2	0.2563	0.3835	0.4946	0.1268	0.2076
3	0.1399	0.5235	0.4312	0.0603	0.2679
4	0.1412	0.6647	0.3366	0.0475	0.3154
5	0.0823	0.7470	0.3056	0.0251	0.3406
6	0.1141	0.8611	0.1788	0.0204	0.3610
7	0.1389	1.0000	0.1338	0.0186	0.3796

Canonical Redundancy Analysis

Raw Variance of the 'WITH' Variables
Explained by

Their Own Canonical Variables			The Opposite Canonical Variables	
Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion

1	0.0672	0.0672	0.6350	0.0427	0.0427
2	0.0645	0.1317	0.4946	0.0319	0.0746
3	0.0603	0.1920	0.4312	0.0260	0.1006
4	0.0766	0.2686	0.3366	0.0258	0.1264
5	0.0448	0.3133	0.3056	0.0137	0.1400
6	0.0520	0.3654	0.1788	0.0093	0.1493
7	0.0685	0.4338	0.1338	0.0092	0.1585

Canonical Redundancy Analysis

Standardized Variance of the 'VAR' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.1173	0.1173	0.6350	0.0745	0.0745
2	0.2503	0.3677	0.4946	0.1238	0.1983
3	0.1176	0.4853	0.4312	0.0507	0.2490
4	0.1712	0.6565	0.3366	0.0576	0.3067
5	0.0924	0.7489	0.3056	0.0282	0.3349
6	0.1121	0.8610	0.1788	0.0200	0.3549
7	0.1390	1.0000	0.1338	0.0186	0.3735

Canonical Redundancy Analysis

Standardized Variance of the 'WITH' Variables
Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.0672	0.0672	0.6350	0.0427	0.0427
2	0.0645	0.1317	0.4946	0.0319	0.0746
3	0.0603	0.1920	0.4312	0.0260	0.1006
4	0.0766	0.2686	0.3366	0.0258	0.1264
5	0.0448	0.3133	0.3056	0.0137	0.1400
6	0.0520	0.3654	0.1788	0.0093	0.1493
7	0.0685	0.4338	0.1338	0.0092	0.1585

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'VAR' Variables and
the First 'M' Canonical Variables of the 'WITH' Variables

M	1	2	3	4	5	6	7
R1	0.0181	0.3228	0.3238	0.3336	0.3643	0.3822	0.3987
R2	0.2139	0.3389	0.4151	0.4273	0.4492	0.4492	0.4660
R3	0.1014	0.1119	0.1535	0.1908	0.3101	0.3324	0.3453
R4	0.0035	0.2477	0.2832	0.3186	0.3221	0.3394	0.3668
R5	0.0893	0.1442	0.1467	0.1488	0.1552	0.2308	0.2699
R6	0.0215	0.0215	0.0273	0.2993	0.3147	0.3149	0.3273

R7	0.0739	0.2014	0.3937	0.4282	0.4287	0.4357	0.4406

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and the First 'M' Canonical Variables of the 'VAR' Variables

M	1	2	3	4
FAC1TQM	0.0001	0.1018	0.2228	0.2231
FAC2TQM	0.0636	0.0645	0.0804	0.0860
FAC3TQM	0.0000	0.0445	0.0445	0.0898
FAC4TQM	0.1689	0.1694	0.1702	0.1723
FAC5TQM	0.0143	0.0143	0.0148	0.0165
FAC6TQM	0.0071	0.0521	0.0622	0.0892
FAC7TQM	0.1029	0.1168	0.1939	0.2143
FAC8TQM	0.0038	0.1143	0.1156	0.1480
FAC9TQM	0.0520	0.0618	0.0626	0.0628
FAC10TQM	0.0012	0.0135	0.0791	0.1412

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and the First 'M' Canonical Variables of the 'VAR' Variables

M	1	2	3	4
FAC1WT	0.0262	0.0684	0.0808	0.1301
FAC2WT	0.0665	0.1603	0.1659	0.2329
FAC3WT	0.0784	0.0999	0.1043	0.1621
FAC4WT	0.0282	0.0399	0.0413	0.0857
FAC1JIT	0.1029	0.1068	0.1584	0.1585
FAC3JIT	0.0029	0.0045	0.0049	0.0246
FAC2JIT	0.0068	0.0350	0.1082	0.1111

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and the First 'M' Canonical Variables of the 'VAR' Variables

M	5	6	7
FAC1TQM	0.2287	0.2314	0.2322
FAC2TQM	0.1729	0.1838	0.1871
FAC3TQM	0.1160	0.1192	0.1596
FAC4TQM	0.1724	0.1836	0.1846
FAC5TQM	0.0246	0.0256	0.0576
FAC6TQM	0.0916	0.0920	0.0985
FAC7TQM	0.2340	0.2354	0.2500
FAC8TQM	0.1528	0.1734	0.1817
FAC9TQM	0.0863	0.1200	0.1201
FAC10TQM	0.1417	0.1451	0.1451

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and the First 'M' Canonical Variables of the 'VAR' Variables

M	5	6	7
FAC1WT	0.1334	0.1500	0.1685
FAC2WT	0.2559	0.2574	0.2601
FAC3WT	0.1638	0.1650	0.1693
FAC4WT	0.0997	0.1129	0.1130
FAC1JIT	0.1656	0.1676	0.1680
FAC3JIT	0.0261	0.0337	0.0360
FAC2JIT	0.1151	0.1424	0.1630

Maquiladoras- TQM/JIT

Analysis Summary

Variables in set 1:
TQM1
TQM10
TQM2
TQM3
TQM4
TQM5
TQM6
TQM7
TQM8
TQM9
JIT1
JIT2
JIT3

Variables in set 2:
R1
R2
R3
R4
R5
R6
R7

Number of complete cases: 60

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.599189	.774073	.0664702	131.484	91	. 35
2	.43101	.656514	.165839	87.1417	72	.1079
3	.422393	.649918	.291463	59.7929	55	.3059
4	.247054	.497045	.504604	33.1731	40	.7691
5	.153573	.391883	.670172	19.4107	27	.8546
6	.141133	.375676	.791766	11.3242	16	.7890
7	.0781277	.279513	.921872	3.9454	7	.7860

Coefficients for Canonical Variables of the First Set

TQM1	.263973	-.17583	.669409	-.229035	.0272234	-.0431732	-.0532956
TQM10	.290206	-.451523	-.0593339	-.426555	.094624	.535764	.0925496
TQM2	-.386084	.258461	.136438	-.235988	.580963	.124009	.120511
TQM3	-.491093	.0957563	.0966527	.00377438	-.344902	.258907	.170853
TQM4	.478862	.206954	-.0535147	.0383319	.0379187	-.436806	.128037
TQM5	-.154388	-.227395	-.322846	-.452682	-.0399685	-.291095	.668684
TQM6	.0143788	-.266118	-.43927	.445985	.410813	.239603	.0207892
TQM7	.17607	.394401	.2003	.148995	.0939625	.00982116	.427576
TQM8	.205324	-.181692	.00834081	.299422	-.412226	.133727	.279799
TQM9	-.0261441	.295615	-.406512	-.340933	-.345583	-.0040419	-.213563
JIT1	.635011	.293476	-.0343121	-.109923	.387277	-.185709	-.124978
JIT2	.0827197	.0863742	-.00879348	-.125711	-.0887526	-.0752504	-.142989
JIT3	-.26751	-.666912	[illegible]	.159651	[illegible]	-.550361	[illegible]

Coefficients for Canonical Variables of the Second Set

R1	.776554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R3	-.381091	-.391347	[illegible]	.912462	[illegible]	[illegible]	[illegible]
R4	.302845	-.00412666	.542528	[illegible]	.0530125	.900229	[illegible]
R5	.631213	-.0777108	-.051036	-.251186	-.363635	-.0861309	.780413
R6	.205359	-.136757	.0123409	.490013	.035507	-.227578	[illegible]
R7	-.49739	.994587	-.284711	.121483	-.184501	.217465	.264236

Maquiladoras- TQM/WT

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 60

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.51896	.720389	.07768	122.648	98	. 467
2	.471897	.686948	.161483	87.5209	78	.2159
3	.330112	.574554	.305781	56.8746	60	.5907
4	.309598	.556415	.456465	37.6436	44	.7393
5	.181934	.426537	.661159	19.8605	30	.9201
6	.133116	.36485	.808197	10.2216	18	.9244
7	.0676987	.26019	.932301	3.36476	8	.9094

Coefficients for Canonical Variables of the First Set

TQM1	.129654	.715082	-.615153	.136799	.0320814	.156104	.169
TQM10	.513732	-.135433	-.206587	-.247486	-.176098	-.643293	-.319586
TQM2	-.498078	.0485552	-.405827	.103094	.339374	-.00305827	.34119
TQM3	-.427433	-.00346677	-.39941	.0854992	-.433649	.400695	.299817
TQM4	.112384	-.119086	.506611	-.18824	.0586662	-.123067	-.852044
TQM5	.189691	-.510949	-.20448	.195314	.0790728	.123848	-.490735
TQM6	.157546	-.50043	.341909	-.362697	-.397691	-.398356	-.0459062
TQM7	-.0794091	.375094	.00360726	-.0605841	.480532	.565729	.553902
TQM8	.254213	.142782	.338401	-.196886	-.163954	.227658	.40057
TQM9	.0256156	-.432667	.252642	.362193	.14374	-.26635	.0115621
WT1	.148957	-.112061	-.638972	-.310009	.357412	.424879	.184127
WT2	-.0442658	-.112017	-.275905	-.317628	-.0525185	.13209	.0952796
WT3	.126896	-.538347	.438821	-.371874	.074017	-1.04409	-.69744
WT4	.295856	.0951638	-.34493	.507333	.160233	.163866	.57834

Coefficients for Canonical Variables of the Second Set

R1	.300813	.745069	.729425	.282152	.514827	-.223175	-.599878
R2	-.670675	.106373	-1.04042	.172637	-.0226322	.349871	-.319313
R3	-.146993	-.173076	.473193	-.449071	-.896833	.297045	-.105377
R4	.115592	.53768	-.0427936	-.423465	-.207611	-.55485	.606176
R5	.600924	.26198	-.0690739	.224057	.183498	.784197	.29242
R6	.120702	-.155949	-.0015118	-.919414	.443578	-.108301	-.971114
R7	-.779932	-.450148	.320757	.194983	.215027	.21240	[illegible]

Maquiladora- JIT/WT

Analysis Summary

Variables in set 1:
- JIT1
- JIT2
- JIT3
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 60

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.446511	.668215	.273473	66.7724	49	.0464
2	.278966	.528173	.49409	36.3094	36	.4542
3	.22891	.478467	.685252	19.4654	25	.7743
4	.0690694	.262811	.888703	6.07657	16	.9872
5	.0406732	.201676	.95464	2.39066	9	.9837
6	.00447196	.0668727	.995114	.252226	4	.9927
7	.00041551	.0203841	.999584	.0214032	1	.8837

Coefficients for Canonical Variables of the First Set

JIT1	.545002	.143302	.381972	.349814	.230083	-.616341	-.253982
JIT2	.00725219	-.138839	.0628558	.147397	-.813553	-.444643	.49403
JIT3	-.282314	.146408	-.633982	.633732	-.093764	-.142574	-.285987
WT1	.664016	.609708	-.193215	.0699584	.0628383	.317885	.282393
WT2	-.000510189	.511113	-.0444825	-.48086	-.471668	-.56682	-.313143
WT3	-.326181	.365092	.577757	.407659	-.457660	.344211	-.169814
WT4	.409402	-.460927	-.169992	-.0637154	-.534006	.34614	-.459281

Coefficients for Canonical Variables of the Second Set

R1	-.0931029	-.484166	.298483	1.09778	.606167	.0172214	-.0673561
R2	-.612229	.289381	-.378874	-.229033	-.479262	-.94899	-.173663
R3	-.410622	.182232	-.457192	-.451569	.446166	.68182	.319509
R4	-.0888075	.067205	.522347	-.200048	-.118325	.601256	-.777594
R5	.494258	-.361843	-.0979248	-.323678	.625931	-.474984	-.334402
R6	.280128	.941202	-.123999	.463334	.113818	.11554	-.12791
R7	-.0742706	.129962	.726803	-.613676	-.0725124	-.187913	.718181

Maquiladora- TQM

Analysis Summary

Variables in set 1:
- TQM1
- TQM10
- TQM2
- TQM3
- TQM4
- TQM5
- TQM6
- TQM7
- TQM8
- TQM9

Variables in set 2:
- R1
- R2
- R3
- R4
- R5
- R6
- R7

Number of complete cases: 60

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.487904	.698501	.135137	100.073	70	.105
2	.422244	.649803	.26389	66.6111	54	.1164
3	.266006	.515757	.456751	39.1809	40	.5070
4	.190289	.436222	.622201	23.7182	28	.6963
5	.12752	.3571	.768523	13.1643	18	.7817
6	.08074	.284148	.880849	6.34348	10	.7856
7	.0417852	.204414	.958215	2.13417	4	.7111

Coefficients for Canonical Variables of the First Set

TQM1	.232798	.654873	-.288948	-.0389676	-.124273	.0203784	-.0590128
TQM10	.534274	-.110245	-.577803	-.153258	.269761	-.159399	.156767
TQM2	-.49038	.169511	-.188407	.0284316	.603462	.0232021	.190592
TQM3	-.465614	.113903	-.176063	-.363081	-.529161	.0716073	.30693
TQM4	.176746	-.0413114	.179883	.190057	-.0959967	.460904	-.432456
TQM5	-.0475207	-.335022	-.470897	.271545	-.111011	.654105	.214888
TQM6	.0438522	-.452611	.176008	-.642729	.221955	.120137	.0038944
TQM7	.0458381	.219994	.374027	.235678	.34612	.273833	.434865
TQM8	.384966	-.0188071	.291803	.000590022	-.248767	-.0192549	.639581
TQM9	-.131784	-.386942	-.0776698	.513666	-.122969	-.488298	.0996638

Coefficients for Canonical Variables of the Second Set

R1	.561637	.492848	.421734	.81089	-.119499	-.248517	[illegible]
R2	-.660025	.440097	-.850355	-.0760617	.0449473	.663577	[illegible]
R3	-.0604835	-.214974	.486317	-.740685	-.709822	.167702	-.11745
R4	.345294	.525951	.130461	-.536224	.233587	-.598144	[illegible]
R5	.614108	-.0776774	-.0770933	.433432	-.190784	.500997	[illegible]
R6	.15643	.00639451	.387005	-.333668	.775516	.404933	[illegible]
R7	-.89851	-.19781	.428011	.227662	-.0343896	-.117573	[illegible]

Maquiladoras- WT/R1,5,6,7

Analysis Summary

Variables in set 1:
- WT1
- WT2
- WT3
- WT4

Variables in set 2:
- R1
- R5
- R6
- R7

Number of complete cases: 60

Canonical Correlations

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Square	D.F.	P-Value
1	.289381	.537942	.547616	32.8109	16	. 70
2	.216901	.465726	.770618	14.2006	9	.1154
3	.013967	.118182	.984063	.875585	4	.9280
4	.00199831	.0447025	.998002	.109017	1	.7413

Coefficients for Canonical Variables of the First Set

WT1	.880938	.25547	.234674	-.321887
WT2	.315984	.303777	-.448331	.779021
WT3	-.245549	.713580	-.475368	-.452241
WT4	.252602	-.577275	-.719689	-.291538

Coefficients for Canonical Variables of the Second Set

R1	-.752359	.149398	.800009	-.236951
R5	.19344	-.543540	.448617	.777386
R6	.659015	.735976	.427976	-.267968
R7	-.252373	.444523	-.867510	.670922

data file: MEDIANA.STA [61 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 47

Number of valid cases: 61
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	162.78688525	Sum:	9930.0000000
Standard Deviation:	35.711556083	Variance:	1275.3152378
Skewness:	-.340469032	Kurtosis:	-.382566516
Minimum:	79.000000000	Maximum:	228.00000000
Cronbach's alpha:	.962690122	Standardized alpha:	.964440779
		Average Inter-Item Correlation:	.376577789

data file: MEDIANA.STA [61 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 15

Number of valid cases: 61
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	47.360655738	Sum:	2889.0000000
Standard Deviation:	11.563130762	Variance:	133.70599301
Skewness:	-.117526626	Kurtosis:	-.197292454
Minimum:	21.000000000	Maximum:	75.000000000
Cronbach's alpha:	.879595652	Standardized alpha:	.883678166
		Average Inter-Item Correlation:	.350731943

RELIABILITY RESULTS

Number of items in scale: 6

Number of valid cases: 61
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	17.278688525	Sum:	1054.0000000
Standard Deviation:	4.602676155	Variance:	21.184627788
Skewness:	-.493869379	Kurtosis:	-.409444930
Minimum:	6.000000000	Maximum:	26.000000000
Cronbach's alpha:	.673922972	Standardized alpha:	.678287255
		Average Inter-Item Correlation:	.269058409

data file: GRANDE.STA [122 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 47

Number of valid cases: 122
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	178.41803279	Sum:	21767.000000
Standard Deviation:	34.329846538	Variance:	1178.5383633
Skewness:	-.754944464	Kurtosis:	.076970673
Minimum:	80.000000000	Maximum:	234.00000000
Cronbach's alpha:	.969886410	Standardized alpha:	.971523487
		Average Inter-Item Correlation:	.427426403

RELIABILITY RESULTS

Number of items in scale: 15

Number of valid cases: 122
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	51.893442623	Sum:	6331.0000000
Standard Deviation:	12.703947610	Variance:	161.39028487
Skewness:	-.510798293	Kurtosis:	-.431787504
Minimum:	17.000000000	Maximum:	75.000000000
Cronbach's alpha:	.915686184	Standardized alpha:	.918069044
		Average Inter-Item Correlation:	.439733396

data file: GRANDE.STA [122 cases with 81 variables]

RELIABILITY RESULTS

Number of items in scale: 6

Number of valid cases: 122
Number of cases with missing data: 0

Summary statistics for scale:

Mean:	19.983606557	Sum:	2438.0000000
Standard Deviation:	4.836649034	Variance:	23.393173878
Skewness:	-.016257238	Kurtosis:	-.315607740
Minimum:	9.000000000	Maximum:	30.000000000
Cronbach's alpha:	.752436643	Standardized alpha:	.751035606
		Average Inter-Item Correlation:	.339884726

EMPRESAS: GRANDES

Factores de TQM:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 47 Average = 1

	1	2	3	4	5
Eigenvalue	20.5620	2.9804	1.8650	1.6995	1.4021
Difference	17.5817	1.1154	0.1655	0.2974	0.0686
Proportion	0.4375	0.0634	0.0397	0.0362	0.0298
Cumulative	0.4375	0.5009	0.5406	0.5767	0.6066

	6	7	8	9	10
Eigenvalue	1.3335	1.2059	1.1908	1.1236	0.9735
Difference	0.1276	0.0152	0.0672	0.1501	0.0852
Proportion	0.0284	0.0257	0.0253	0.0239	0.0207
Cumulative	0.6349	0.6606	0.6859	0.7098	0.7306

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
X1	18	8	80 *	31	9
X2	13	19	73 *	21	23
X3	14	27	70 *	22	28
X4	-3	14	30	81 *	23
X5	1	18	36	76 *	19
X6	1	14	32	80 *	22
X7	14	38	56 *	14	19
X8	41 *	11	24	31	7
X9	22	25	24	33	-3
X10	23	3	53 *	37	14
X11	35	13	14	19	57 *
X12	22	19	18	9	24
X13	36	12	22	11	7
X14	5	48 *	5	24	18
X15	14	23	19	19	75 *
X16	24	30	18	26	64 *
X17	8	32	3	7	22
X18	42 *	30	34	16	26
X19	31	0	27	11	16
X20	6	21	8	14	5
X21	17	32	21	41 *	13
X22	20	25	24	22	30
X23	21	11	29	11	24
X24	15	12	29	33	53 *
X25	25	30	18	35	35
X26	27	64 *	5	28	14
X27	12	29	11	16	17
X28	39	30	27	1	31
X29	44 *	20	35	13	17

X30	36	27	37	-4	32
X31	54 *	0	-9	55 *	22
X32	36	40 *	10	50 *	4
X33	22	44 *	28	37	-1
X34	19	73 *	14	5	15
X35	20	71 *	8	5	27
X36	15	53 *	31	9	7
X37	33	66 *	26	10	28
X38	31	68 *	22	21	19
X39	40	12	-1	20	18
X40	25	28	-3	17	-5
X41	18	28	26	19	59 *
X42	51 *	19	-2	0	25
X43	67 *	28	11	-3	7
X44	72 *	14	9	11	7
X45	66 *	29	23	-1	19
X46	60 *	26	22	20	17
X47	73 *	26	19	5	20

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR6	FACTOR7	FACTOR8	FACTOR9
X1	12	3	4	4
X2	16	6	10	26
X3	12	15	18	10
X4	9	14	14	14
X5	2	21	16	18
X6	6	23	11	10
X7	4	9	27	8
X8	22	4	33	24
X9	32	0	25	40
X10	25	-7	23	28
X11	19	11	28	16
X12	10	8	68 *	12
X13	21	29	59 *	8
X14	10	4	54 *	-22
X15	0	16	8	8
X16	7	17	21	28
X17	51 *	26	43 *	16
X18	34	2	22	16
X19	67 *	7	9	3
X20	70 *	23	16	20
X21	39	10	-5	45 *
X22	16	25	37	18
X23	4	3	7	68 *
X24	23	0	23	40 *
X25	9	0	19	38
X26	7	6	13	30
X27	29	64 *	12	17
X28	6	49 *	9	27
X29	9	44 *	-9	27
X30	45 *	33	-6	-12
X31	24	2	-3	-12
X32	41 *	-14	6	-21
X33	13	28	27	19

X34	26	25	17	12
X35	11	14	20	14
X36	10	31	27	11
X37	9	19	6	3
X38	9	18	0	6
X39	-1	67 *	14	-7
X40	31	60 *	19	-16
X41	27	7	8	3
X42	20	11	3	44 *
X43	17	26	15	11
X44	23	27	11	15
X45	5	12	26	12
X46	-5	25	30	10
X47	8	10	9	11

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5
5.353476	5.175773	4.265701	4.200320	3.537502

FACTOR6	FACTOR7	FACTOR8	FACTOR9
2.882046	2.851820	2.672704	2.423483

Rotation Method: Varimax

Final Communality Estimates: Total = 33.362826

X1	X2	X3	X4	X5	X6	X7
0.794698	0.783028	0.787942	0.882050	0.880840	0.887693	0.625996
X8	**X9**	**X10**	**X11**	**X12**	**X13**	**X14**
0.552710	0.602218	0.694096	0.671721	0.674861	0.694364	0.669239
X15	**X16**	**X17**	**X18**	**X19**	**X20**	**X21**
0.740208	0.822148	0.697188	0.656463	0.669100	0.686368	0.724914
X22	**X23**	**X24**	**X25**	**X26**	**X27**	**X28**
0.554330	0.673990	0.773198	0.618370	0.697221	0.705573	0.738518
X29	**X30**	**X31**	**X32**	**X33**	**X34**	**X35**
0.676960	0.764176	0.724763	0.789315	0.663417	0.784630	0.715880
X36	**X37**	**X38**	**X39**	**X40**	**X41**	**X42**
0.603896	0.757841	0.732570	0.716820	0.689041	0.641038	0.611437
X43	**X44**	**X45**	**X46**	**X47**		
0.676615	0.721043	0.713959	0.711156	0.709226		

Factores del WT:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 15 Average = 1

	1	2	3	4	5
Eigenvalue	7.2005	1.5172	0.9694	0.9437	0.6810
Difference	5.6833	0.5478	0.0257	0.2627	0.0220
Proportion	0.4800	0.1011	0.0646	0.0629	0.0454
Cumulative	0.4800	0.5812	0.6458	0.7087	0.7541

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
X48	71 *	49 *	-8	6
X49	74 *	29	19	3
X50	77 *	27	31	9
X51	78 *	37	10	20
X52	74 *	12	20	21
X53	60 *	53 *	-11	-5
X54	23	82 *	26	2
X55	30	66 *	15	4
X56	50 *	48 *	36	27
X57	14	9	6	92 *
X58	20	45 *	30	43 *
X59	9	19	89 *	12
X60	19	14	84 *	3
X61	28	77 *	8	22
X62	33	66 *	17	11

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4
3.847064	3.448308	2.042867	1.292543

Rotation Method: Varimax

Final Communality Estimates: Total = 10.630781

X48	X49	X50	X51	X52
0.756093	0.674785	0.766577	0.786223	0.647000

X53	X54	X55	X56	X57
0.662990	0.790121	0.544745	0.682585	0.885876

X58	X59	X60	X61	X62
0.517017	0.844802	0.758065	0.729479	0.584422

Factores JIT:

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 6 Average = 1

	1	2	3
Eigenvalue	2.6971	1.0311	0.7838
Difference	1.6661	0.2472	0.1265
Proportion	0.4495	0.1718	0.1306
Cumulative	0.4495	0.6214	0.7520

	4	5	6
Eigenvalue	0.6573	0.5388	0.2918
Difference	0.1185	0.2470	
Proportion	0.1095	0.0898	0.0486
Cumulative	0.8616	0.9514	1.0000

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3
X63	90 *	12	-2
X64	77 *	15	42 *
X65	34	76 *	20
X66	0	88 *	20
X67	12	11	89 *
X68	11	32	66 *

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 have been flagged by an '*'.

Rotation Method: Varimax

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3
1.542277	1.496772	1.472984

Final Communality Estimates: Total = 4.512033

X63	X64	X65	X66	X67	X68
0.818349	0.790552	0.728599	0.812777	0.810607	0.551149

CORRELACION CANONICA: EMPRESAS GRANDES

Means and Standard Deviations

7 'VAR' Variables
16 'WITH' Variables
122 Observations

Variable	Mean	Std Dev
R1	4.188525	0.785530
R2	3.934426	0.915773
R3	3.819672	0.872125
R4	4.090164	0.603079
R5	3.975410	0.817809
R6	4.081967	0.777686
R7	3.868852	0.861968
FAC1TQM	-9.83635E-12	1.000000
FAC2TQM	-4.09837E-12	1.000000
FAC3TQM	1.639311E-11	1.000000
FAC4TQM	8.195666E-13	1.000000
FAC5TQM	-1.88534E-11	1.000000
FAC6TQM	-5.73797E-12	1.000000
FAC7TQM	3.688522E-11	1.000000
FAC8TQM	3.114731E-11	1.000000
FAC9TQM	2.049272E-11	1.000000
FAC1WT	0	1.000000
FAC2WT	2.295186E-11	1.000000
FAC3WT	5.737744E-12	1.000000
FAC4WT	-8.20233E-13	1.000000
FAC1JIT	-9.83702E-12	1.000000
FAC3JIT	2.37706E-11	1.000000
FAC2JIT	-7.37688E-12	1.000000

Correlations Among the Original Variables

Correlations Among the 'VAR' Variables

	R1	R2	R3	R4
R1	1.0000	0.3505	0.2672	0.2778
R2	0.3505	1.0000	0.2024	0.4597
R3	0.2672	0.2024	1.0000	0.2040
R4	0.2778	0.4597	0.2040	1.0000
R5	0.2260	0.0861	0.3182	0.1218
R6	0.4209	0.1237	0.3388	0.1427
R7	0.4274	0.4706	0.1772	0.3250

	R5	R6	R7
R1	0.2260	0.4209	0.4274
R2	0.0861	0.1237	0.4706
R3	0.3182	0.3388	0.1772
R4	0.1218	0.1427	0.3250
R5	1.0000	0.5879	0.1712
R6	0.5879	1.0000	0.2997
R7	0.1712	0.2997	1.0000

Correlations Among the 'WITH' Variables

	FAC1TQM	FAC2TQM	FAC3TQM	FAC4TQM
FAC1TQM	1.0000	-0.0000	0.0000	-0.0000
FAC2TQM	-0.0000	1.0000	0.0000	0.0000
FAC3TQM	0.0000	0.0000	1.0000	-0.0000
FAC4TQM	-0.0000	0.0000	-0.0000	1.0000
FAC5TQM	-0.0000	0.0000	-0.0000	0.0000
FAC6TQM	-0.0000	0.0000	-0.0000	-0.0000
FAC7TQM	0.0000	-0.0000	0.0000	0.0000
FAC8TQM	-0.0000	0.0000	0.0000	-0.0000
FAC9TQM	0.0000	0.0000	-0.0000	0.0000
FAC1WT	0.2620	0.3076	0.3036	0.3689
FAC2WT	0.2657	0.0851	0.3550	0.1846
FAC3WT	0.1512	0.2943	-0.0735	-0.1313
FAC4WT	-0.0663	0.1001	0.1094	0.1082
FAC1JIT	0.0649	-0.0558	0.2294	0.0614
FAC3JIT	-0.0539	-0.1003	-0.0043	-0.1416
FAC2JIT	-0.1124	-0.1246	0.0865	0.0573

Correlations Among the 'WITH' Variables

	FAC5TQM	FAC6TQM	FAC7TQM	FAC8TQM
FAC1TQM	-0.0000	-0.0000	0.0000	-0.0000
FAC2TQM	0.0000	0.0000	-0.0000	0.0000
FAC3TQM	-0.0000	-0.0000	0.0000	0.0000
FAC4TQM	0.0000	-0.0000	0.0000	-0.0000
FAC5TQM	1.0000	-0.0000	0.0000	-0.0000
FAC6TQM	-0.0000	1.0000	-0.0000	0.0000
FAC7TQM	0.0000	-0.0000	1.0000	0.0000
FAC8TQM	-0.0000	0.0000	0.0000	1.0000
FAC9TQM	0.0000	0.0000	0.0000	-0.0000
FAC1WT	0.0286	0.0889	0.1739	0.0943
FAC2WT	0.0565	0.2594	-0.0118	-0.0029
FAC3WT	0.0675	0.0297	0.3540	0.1022
FAC4WT	0.1567	0.0398	-0.0259	0.2915
FAC1JIT	-0.1507	0.0734	0.0040	0.1518
FAC3JIT	-0.0076	0.2664	-0.0001	-0.0308
FAC2JIT	0.0322	-0.0459	-0.0298	-0.1967

Correlations Among the Original Variables

Correlations Among the 'WITH' Variables

	FAC9TQM	FAC1WT	FAC2WT	FAC3WT
FAC1TQM	0.0000	0.2620	0.2657	0.1512
FAC2TQM	0.0000	0.3076	0.0851	0.2943
FAC3TQM	-0.0000	0.3036	0.3550	-0.0735
FAC4TQM	0.0000	0.3689	0.1846	-0.1313
FAC5TQM	0.0000	0.0286	0.0565	0.0675
FAC6TQM	0.0000	0.0889	0.2594	0.0297
FAC7TQM	0.0000	0.1739	-0.0118	0.3540
FAC8TQM	-0.0000	0.0943	-0.0029	0.1022
FAC9TQM	1.0000	0.1102	0.2710	-0.0536
FAC1WT	0.1102	1.0000	0.0000	-0.0000

FAC2WT	0.2710	0.0000	1.0000	-0.0000
FAC3WT	-0.0536	-0.0000	-0.0000	1.0000
FAC4WT	0.0666	-0.0000	0.0000	0.0000
FAC1JIT	-0.2115	0.2359	-0.0252	-0.0948
FAC3JIT	0.1464	-0.0589	0.0731	0.0155
FAC2JIT	0.0014	-0.0969	0.0694	-0.2145
FAC1TQM	-0.0663	0.0649	-0.0539	-0.1124
FAC2TQM	0.1001	-0.0558	-0.1003	-0.1246
FAC3TQM	0.1094	0.2294	-0.0043	0.0865
FAC4TQM	0.1082	0.0614	-0.1416	0.0573
FAC5TQM	0.1567	-0.1507	-0.0076	0.0322
FAC6TQM	0.0398	0.0734	0.2664	-0.0459
FAC7TQM	-0.0259	0.0040	-0.0001	-0.0298
FAC8TQM	0.2915	0.1518	-0.0308	-0.1967
FAC9TQM	0.0666	-0.2115	0.1464	0.0014
FAC1WT	-0.0000	0.2359	-0.0589	-0.0969
FAC2WT	0.0000	-0.0252	0.0731	0.0694
FAC3WT	0.0000	-0.0948	0.0155	-0.2145
FAC4WT	1.0000	0.1258	-0.0346	-0.0986
FAC1JIT	0.1258	1.0000	0.0000	-0.0000
FAC3JIT	-0.0346	0.0000	1.0000	-0.0000
FAC2JIT	-0.0986	-0.0000	-0.0000	1.0000

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC1TQM	FAC2TQM	FAC3TQM	FAC4TQM
R1	0.1702	-0.0767	0.1808	0.3276
R2	0.1676	0.1388	0.3712	0.1460
R3	0.0460	-0.0550	0.1382	0.0232
R4	0.2438	0.1016	0.1099	0.1667
R5	-0.0105	-0.1080	0.0404	0.0550
R6	0.0959	-0.0003	0.1121	0.1055
R7	0.2429	0.0208	0.3978	0.1666

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC5TQM	FAC6TQM	FAC7TQM	FAC8TQM
R1	0.2018	0.2438	0.0632	0.0388
R2	0.1802	0.1304	0.0783	-0.0503
R3	0.1296	0.0622	0.0977	-0.0920
R4	-0.0280	0.1122	0.0723	-0.0732
R5	-0.0833	0.1064	0.1898	0.0924
R6	-0.0801	0.2136	0.2077	0.1381
R7	0.0494	0.2034	0.0873	0.1000

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC9TQM	FAC1WT	FAC2WT	FAC3WT
R1	0.0560	0.3359	0.2733	-0.0788
R2	0.1958	0.2808	0.3634	0.0533
R3	0.0392	0.1259	0.0455	0.0227
R4	0.2199	0.1916	0.2662	0.1307
R5	0.1482	0.0526	0.0907	-0.0351
R6	0.1224	0.2221	0.2258	-0.0309
R7	0.1818	0.3314	0.4320	0.1043

Correlations Between the 'VAR' Variables and the 'WITH' Variables

	FAC4WT	FAC1JIT	FAC3JIT	FAC2JIT
R1	0.0637	-0.0566	-0.0650	-0.0260
R2	0.0391	-0.0431	0.0765	-0.0138
R3	0.1218	0.0759	0.0021	0.1627
R4	-0.1269	-0.0169	0.0460	-0.0692
R5	0.0424	0.1340	0.0513	-0.0028
R6	0.0485	0.0452	-0.0527	-0.1035
R7	-0.0134	0.0447	0.0318	-0.1763

Canonical Correlation Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation
1	0.725001	0.663631	0.043125	0.525627
2	0.525574	0.394966	0.065797	0.276228
3	0.429672	0.282316	0.074126	0.184618
4	0.337843	0.120504	0.080533	0.114138
5	0.297185	.	0.082880	0.088319
6	0.247790	.	0.085327	0.061400
7	0.201149	.	0.087231	0.040461

Canonical Correlation Analysis

Eigenvalues of INV(E)*H
= CanRsq/(1-CanRsq)

	Eigenvalue	Difference	Proportion	Cumulative
1	1.1080	0.7264	0.5407	0.5407
2	0.3817	0.1552	0.1862	0.7269
3	0.2264	0.0976	0.1105	0.8374
4	0.1288	0.0320	0.0629	0.9002
5	0.0969	0.0315	0.0473	0.9475
6	0.0654	0.0232	0.0319	0.9794
7	0.0422	.	0.0206	1.0000

Canonical Correlation Analysis

Test of H0: The canonical correlations in the
current row and all that follow are zero

	Likelihood Ratio	Approx F	Num DF	Den DF	Pr > F
1	0.20362691	1.6191	112	649.7168	0.0002
2	0.42925488	1.0259	90	568.9736	0.4212
3	0.59308054	0.8035	70	484.9438	0.8709
4	0.72736526	0.6543	52	397.1552	0.9693
5	0.82108180	0.5847	36	305.0527	0.9737
6	0.90062369	0.5080	22	208	0.9685
7	0.95953913	0.4428	10	105	0.9220

Canonical Correlation Analysis

Multivariate Statistics and F Approximations

S=7 M=4 N=48.5

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.20362691	1.61906	112	649.717	0.0002
Pillai's Trace	1.290790545	1.48371	112	735	0.0018
Hotelling-Lawley Trace	2.049417803	1.78017	112	681	0.0001
Roy's Greatest Root	1.108045912	7.27155	16	105	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'VAR' Variables

	V1	V2	V3	V4	V5	V6	V7
R1	0.2572	-0.8104	-0.5668	-0.4263	0.3728	0.0788	-0.3163
R2	0.2947	-0.2352	0.6099	0.3071	-0.3065	-0.7733	-0.4899
R3	-0.1842	-0.5155	0.4561	0.3455	0.2904	0.1911	0.6837
R4	0.1280	0.5785	0.0870	-0.6532	0.6085	-0.1705	0.3693
R5	-0.1506	0.2720	0.0096	0.4785	0.7502	0.2507	-0.7885
R6	0.2969	0.3412	-0.5591	0.3294	-0.5123	-0.7223	0.6567
R7	0.5422	0.3171	0.1460	0.1486	-0.2936	0.9738	0.1122

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W1	W2	W3	W4
FAC1TQM	0.1913	0.1928	0.2248	-0.3518
FAC2TQM	-0.0486	0.4075	0.3864	-0.2051
FAC3TQM	0.4086	0.1142	0.6374	0.1086
FAC4TQM	0.2251	0.1095	0.0327	-0.5324
FAC5TQM	0.1009	-0.4577	0.2796	-0.1139
FAC6TQM	0.2688	-0.0153	-0.2486	0.0113
FAC7TQM	0.0990	0.2123	-0.1484	0.5130
FAC8TQM	0.1071	0.2550	-0.3453	0.1220
FAC9TQM	0.1373	0.4837	0.3391	0.0747
FAC1WT	0.2680	-0.6391	-0.4056	0.1856
FAC2WT	0.3491	-0.1011	-0.2935	0.2143
FAC3WT	0.0041	0.0313	0.3673	-0.1890
FAC4WT	-0.1328	-0.4814	-0.0420	0.4381
FAC1JIT	-0.1879	0.3231	0.2222	0.2811
FAC3JIT	-0.0558	0.0837	0.3430	-0.0122
FAC2JIT	-0.2523	-0.3341	0.2269	0.1432

Canonical Correlation Analysis

Standardized Canonical Coefficients for the 'WITH' Variables

	W5	W6	W7
FAC1TQM	0.3316	-0.2124	0.0547
FAC2TQM	-0.2004	-0.9074	-0.2775
FAC3TQM	-0.1484	0.0491	-0.4823
FAC4TQM	0.5967	-0.1106	-0.6836
FAC5TQM	0.1088	-0.0447	-0.4248
FAC6TQM	0.2640	-0.1984	0.0476
FAC7TQM	0.2919	-0.5656	-0.1562
FAC8TQM	-0.1988	0.0719	-0.4321
FAC9TQM	0.5801	-0.1935	-0.2320
FAC1WT	-0.3201	0.3124	0.8499
FAC2WT	-0.4025	0.1921	0.3421
FAC3WT	0.1167	0.6693	0.5281
FAC4WT	-0.0918	-0.0491	0.3450
FAC1JIT	0.4306	0.2836	-0.0337
FAC3JIT	0.0516	-0.0015	-0.4384
FAC2JIT	0.3255	-0.1754	0.2603

Canonical Structure

Correlations Between the 'VAR' Variables and Their Canonical Variables

	V1	V2	V3	V4	V5	V6	V7
R1	0.6695	-0.5292	-0.3778	-0.0975	0.3405	-0.0197	-0.0566
R2	0.6853	-0.1428	0.5439	0.0792	0.0257	-0.3948	-0.2265
R3	0.1190	-0.4033	0.2853	0.4507	0.4653	0.0285	0.5669
R4	0.4975	0.3249	0.2718	-0.4063	0.5533	-0.2212	0.2298
R5	0.1573	0.2300	-0.2140	0.6581	0.6231	-0.0159	-0.2344
R6	0.4714	0.1338	-0.5060	0.5377	0.1451	-0.3050	0.3173
R7	0.8629	0.1056	0.1339	0.1406	-0.0544	0.4485	0.0494

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W1	W2	W3	W4
FAC1TQM	0.3829	0.0891	0.0692	-0.3011
FAC2TQM	0.0990	0.1785	0.2655	-0.1738
FAC3TQM	0.5344	-0.1258	0.4476	0.3798
FAC4TQM	0.3555	-0.2123	-0.2459	-0.3249
FAC5TQM	0.1284	-0.6151	0.2408	-0.0783
FAC6TQM	0.3609	-0.0552	-0.2543	0.1060
FAC7TQM	0.1532	0.1371	-0.0903	0.4613
FAC8TQM	0.1159	0.1701	-0.3789	0.2621
FAC9TQM	0.2836	0.2956	0.1959	0.1315
FAC1WT	0.5629	-0.1848	-0.0473	0.0267
FAC2WT	0.6768	0.1184	0.1125	0.0559
FAC3WT	0.0836	0.2439	0.3050	-0.1155
FAC4WT	-0.0138	-0.3296	0.0084	0.4267
FAC1JIT	-0.0358	0.1392	0.0500	0.3961
FAC3JIT	0.0071	0.1261	0.2863	0.1000
FAC2JIT	-0.2419	-0.3645	0.2480	0.1381

Canonical Structure

Correlations Between the 'WITH' Variables and Their Canonical Variables

	W5	W6	W7
FAC1TQM	0.1531	0.0632	0.4175
FAC2TQM	-0.3777	-0.5967	0.2165
FAC3TQM	-0.2804	0.2074	-0.0872
FAC4TQM	0.4168	-0.0456	-0.2641
FAC5TQM	0.0156	-0.0358	-0.2746
FAC6TQM	0.1614	-0.0744	0.1101
FAC7TQM	0.2767	-0.2690	0.1577
FAC8TQM	-0.2429.	0.2325	-0.2412
FAC9TQM	0.3403	-0.2066	-0.1077
FAC1WT	0.0697	-0.0961	0.2715
FAC2WT	-0.0295	-0.0640	-0.0490
FAC3WT	-0.0023	0.2003	0.4062
FAC4WT	-0.0646	-0.0716	-0.0298
FAC1JIT	0.2293	0.3659	0.0683
FAC3JIT	0.1249	0.0411	-0.3482
FAC2JIT	0.3442	-0.1862	0.0753

Canonical Structure

Correlations Between the 'VAR' Variables and the Canonical Variables of the 'WITH' Variables

	W1	W2	W3	W4	W5	W6	W7
R1	0.4854	-0.2781	-0.1623	-0.0329	0.1012	-0.0049	-0.0114
R2	0.4968	-0.0750	0.2337	0.0268	0.0077	-0.0978	-0.0456
R3	0.0863	-0.2119	0.1226	0.1523	0.1383	0.0071	0.1140
R4	0.3607	0.1708	0.1168	-0.1373	0.1644	-0.0548	0.0462
R5	0.1140	0.1209	-0.0919	0.2223	0.1852	-0.0039	-0.0471
R6	0.3418	0.0703	-0.2174	0.1817	0.0431	-0.0756	0.0638
R7	0.6256	0.0555	0.0575	0.0475	-0.0162	0.1111	0.0099

Correlations Between the 'WITH' Variables and the Canonical Variables of the 'VAR' Variables

	V1	V2	V3	V4
FACITQM	0.2776	0.0468	0.0297	-0.1017
FAC2TQM	0.0718	0.0938	0.1141	-0.0587
FAC3TQM	0.3874	-0.0661	0.1923	0.1283
FAC4TQM	0.2577	-0.1116	-0.1057	-0.1098
FAC5TQM	0.0931	-0.3233	0.1035	-0.0265
FAC6TQM	0.2617	-0.0290	-0.1093	0.0358
FAC7TQM	0.1110	0.0721	-0.0388	0.1559
FAC8TQM	0.0840	0.0894	-0.1628	0.0886
FAC9TQM	0.2056	0.1554	0.0842	0.0444
FAC1WT	0.4081	-0.0971	-0.0203	0.0090
FAC2WT	0.4907	0.0622	0.0483	0.0189
FAC3WT	0.0606	0.1282	0.1310	-0.0390
FAC4WT	-0.0100	-0.1732	0.0036	0.1441
FAC1JIT	-0.0259	0.0732	0.0215	0.1338
FAC3JIT	0.0052	0.0663	0.1230	0.0338
FAC2JIT	-0.1754	-0.1916	0.1066	0.0467

Correlations Between the 'WITH' Variables and the Canonical Variables of the 'VAR' Variables

	V5	V6	V7
FAC1TQM	0.0455	0.0157	0.0840
FAC2TQM	-0.1123	-0.1478	0.0435
FAC3TQM	-0.0833	0.0514	-0.0175
FAC4TQM	0.1239	-0.0113	-0.0531
FAC5TQM	0.0046	-0.0089	-0.0552
FAC6TQM	0.0480	-0.0184	0.0221
FAC7TQM	0.0822	-0.0666	0.0317
FAC8TQM	-0.0722	0.0576	-0.0485
FAC9TQM	0.1011	-0.0512	-0.0217
FAC1WT	0.0207	-0.0238	0.0546
FAC2WT	-0.0088	-0.0159	-0.0099
FAC3WT	-0.0007	0.0496	0.0817
FAC4WT	-0.0192	-0.0177	-0.0060
FAC1JIT	0.0681	0.0907	0.0137
FAC3JIT	0.0371	0.0102	-0.0700
FAC2JIT	0.1023	-0.0461	0.0151

Canonical Redundancy Analysis

Raw Variance of the 'VAR' Variables Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.3210	0.3210	0.5256	0.1687	0.1687
2	0.0884	0.4094	0.2762	0.0244	0.1931
3	0.1357	0.5451	0.1846	0.0251	0.2182
4	0.1534	0.6985	0.1141	0.0175	0.2357
5	0.1355	0.8339	0.0883	0.0120	0.2477
6	0.0773	0.9112	0.0614	0.0047	0.2524
7	0.0888	1.0000	0.0405	0.0036	0.2560

Canonical Redundancy Analysis

Raw Variance of the 'WITH' Variables Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.1046	0.1046	0.5256	0.0550	0.0550
2	0.0626	0.1673	0.2762	0.0173	0.0723
3	0.0564	0.2237	0.1846	0.0104	0.0827
4	0.0670	0.2907	0.1141	0.0076	0.0904
5	0.0558	0.3465	0.0883	0.0049	0.0953
6	0.0506	0.3971	0.0614	0.0031	0.0984
7	0.0534	0.4505	0.0405	0.0022	0.1006

Canonical Redundancy Analysis

Standardized Variance of the 'VAR' Variables Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.3102	0.3102	0.5256	0.1630	0.1630
2	0.0929	0.4031	0.2762	0.0257	0.1887
3	0.1305	0.5336	0.1846	0.0241	0.2128
4	0.1609	0.6945	0.1141	0.0184	0.2312
5	0.1502	0.8447	0.0883	0.0133	0.2444
6	0.0715	0.9162	0.0614	0.0044	0.2488
7	0.0838	1.0000	0.0405	0.0034	0.2522

Canonical Redundancy Analysis

Standardized Variance of the 'WITH' Variables Explained by

	Their Own Canonical Variables			The Opposite Canonical Variables	
	Proportion	Cumulative Proportion	Canonical R-Squared	Proportion	Cumulative Proportion
1	0.1046	0.1046	0.5256	0.0550	0.0550
2	0.0626	0.1673	0.2762	0.0173	0.0723
3	0.0564	0.2237	0.1846	0.0104	0.0827
4	0.0670	0.2907	0.1141	0.0076	0.0904
5	0.0558	0.3465	0.0883	0.0049	0.0953
6	0.0506	0.3971	0.0614	0.0031	0.0984
7	0.0534	0.4505	0.0405	0.0022	0.1006

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'VAR' Variables and the First 'M' Canonical Variables of the 'WITH' Variables

M	1	2	3	4	5	6	7
R1	0.2356	0.3130	0.3393	0.3404	0.3506	0.3506	0.3508
R2	0.2468	0.2525	0.3071	0.3078	0.3079	0.3174	0.3195
R3	0.0074	0.0524	0.0674	0.0906	0.1097	0.1098	0.1228
R4	0.1301	0.1593	0.1729	0.1918	0.2188	0.2218	0.2239
R5	0.0130	0.0276	0.0361	0.0855	0.1198	0.1198	0.1220
R6	0.1168	0.1218	0.1690	0.2020	0.2039	0.2096	0.2137
R7	0.3914	0.3945	0.3978	0.4001	0.4003	0.4127	0.4128

Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and the First 'M' Canonical Variables of the 'VAR' Variables

M	1	2	3	4
FAC1TQM	0.0770	0.0792	0.0801	0.0905
FAC2TQM	0.0052	0.0140	0.0270	0.0304
FAC3TQM	0.1501	0.1545	0.1915	0.2079
FAC4TQM	0.0664	0.0789	0.0900	0.1021
FAC5TQM	0.0087	0.1132	0.1239	0.1246
FAC6TQM	0.0685	0.0693	0.0813	0.0825
FAC7TQM	0.0123	0.0175	0.0190	0.0433
FAC8TQM	0.0071	0.0151	0.0416	0.0494
FAC9TQM	0.0423	0.0664	0.0735	0.0755
FAC1WT	0.1666	0.1760	0.1764	0.1765
FAC2WT	0.2407	0.2446	0.2470	0.2473
FAC3WT	0.0037	0.0201	0.0373	0.0388
FAC4WT	0.0001	0.0301	0.0301	0.0509
FAC1JIT	0.0007	0.0060	0.0065	0.0244
FAC3JIT	0.0000	0.0044	0.0196	0.0207
FAC2JIT	0.0308	0.0675	0.0788	0.0810

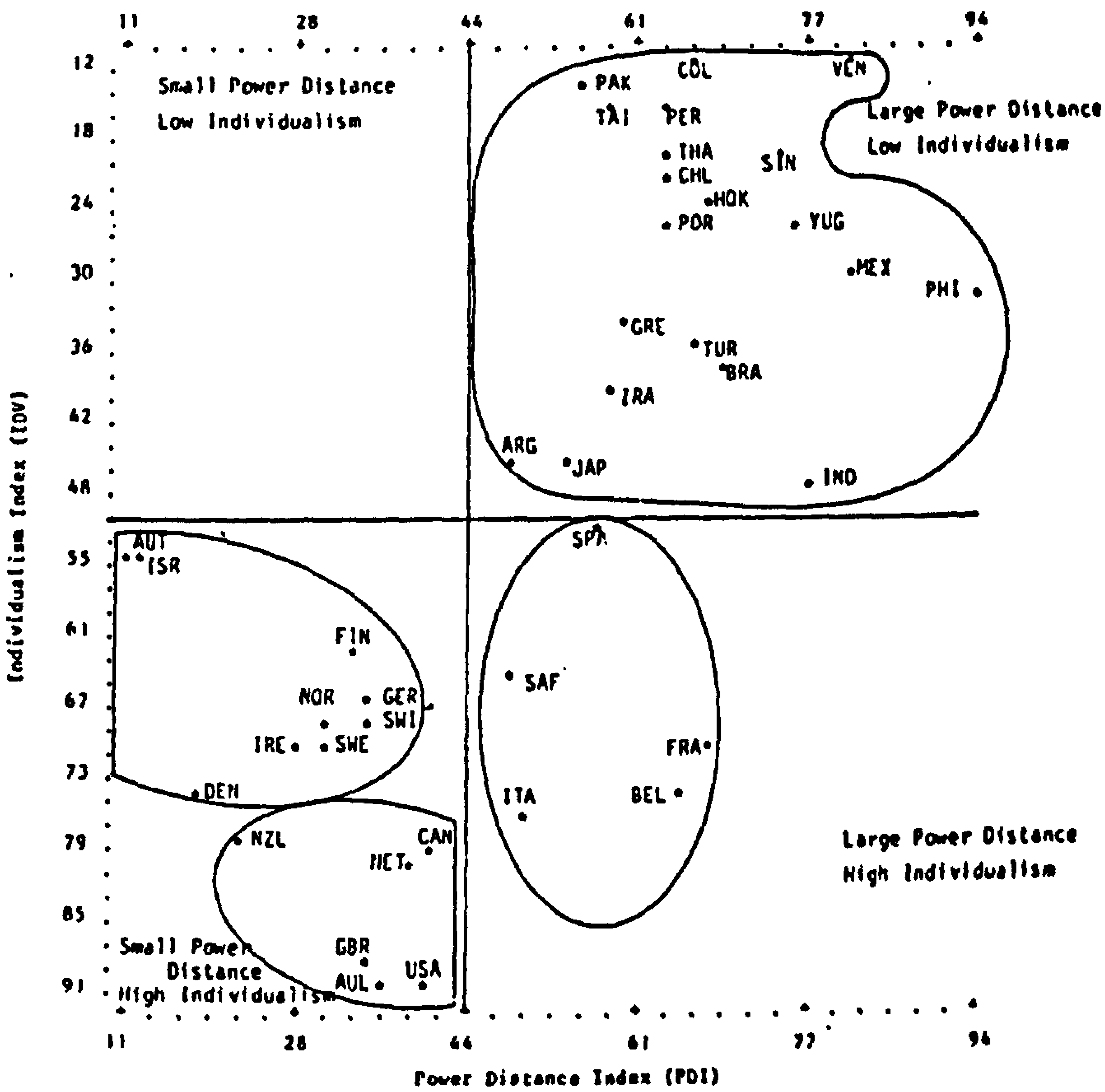
Canonical Redundancy Analysis

Squared Multiple Correlations Between the 'WITH' Variables and the First 'M' Canonical Variables of the 'VAR' Variables

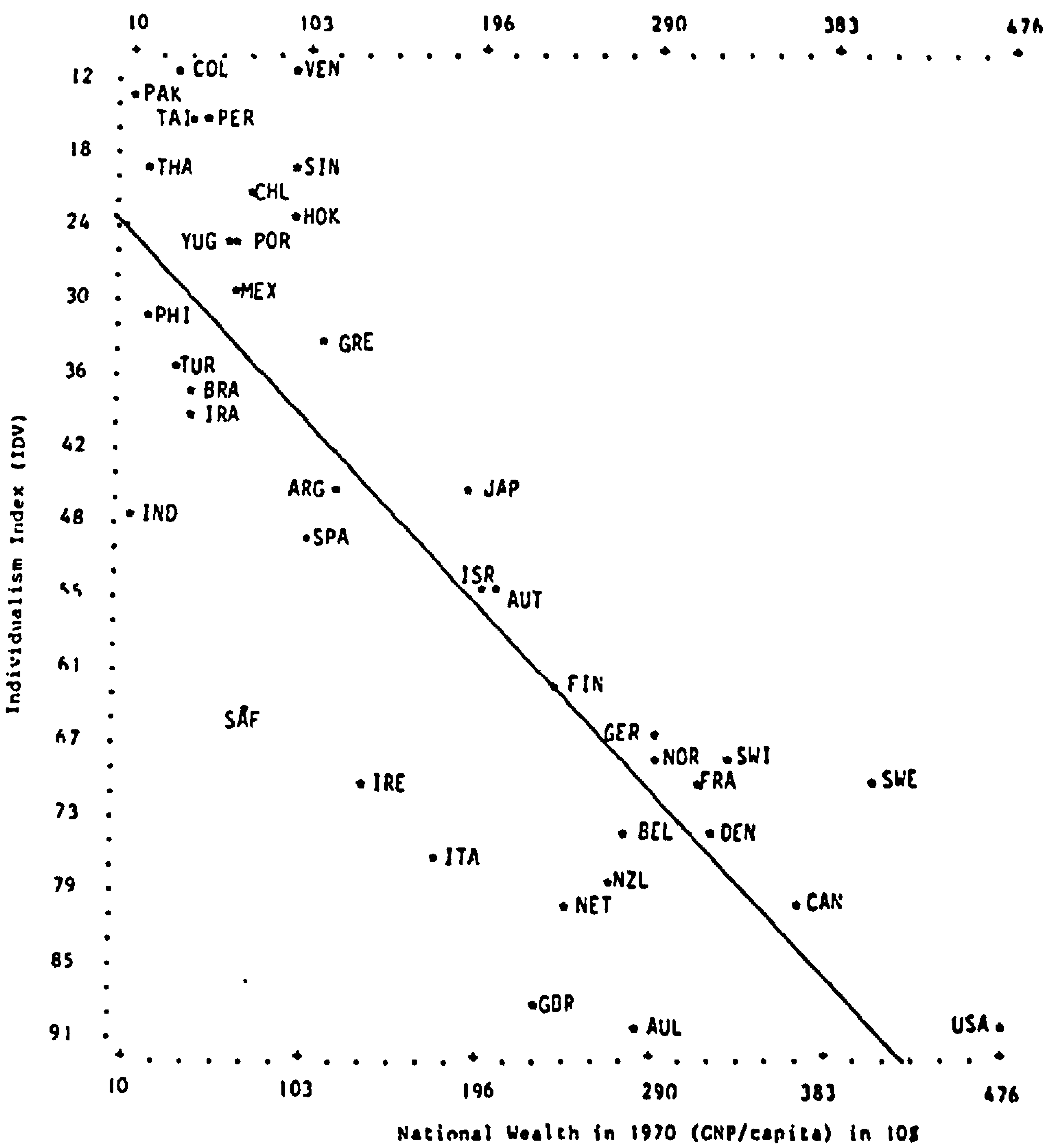
M	5	6	7
FAC1TQM	0.0925	0.0928	0.0998
FAC2TQM	0.0430	0.0649	0.0668
FAC3TQM	0.2149	0.2175	0.2178
FAC4TQM	0.1174	0.1176	0.1204
FAC5TQM	0.1246	0.1247	0.1277
FAC6TQM	0.0848	0.0852	0.0857
FAC7TQM	0.0501	0.0545	0.0555
FAC8TQM	0.0546	0.0579	0.0603
FAC9TQM	0.0857	0.0883	0.0888
FAC1WT	0.1769	0.1775	0.1805
FAC2WT	0.2474	0.2476	0.2477
FAC3WT	0.0388	0.0413	0.0479
FAC4WT	0.0513	0.0516	0.0516
FAC1JIT	0.0290	0.0373	0.0374
FAC3JIT	0.0221	0.0222	0.0271
FAC2JIT	0.0915	0.0936	0.0938

APPENDIX 5: HOFSTED'S ILLUSTRATIONS OF 4 DIMENSIONS OF WORK-RELATED VALUES

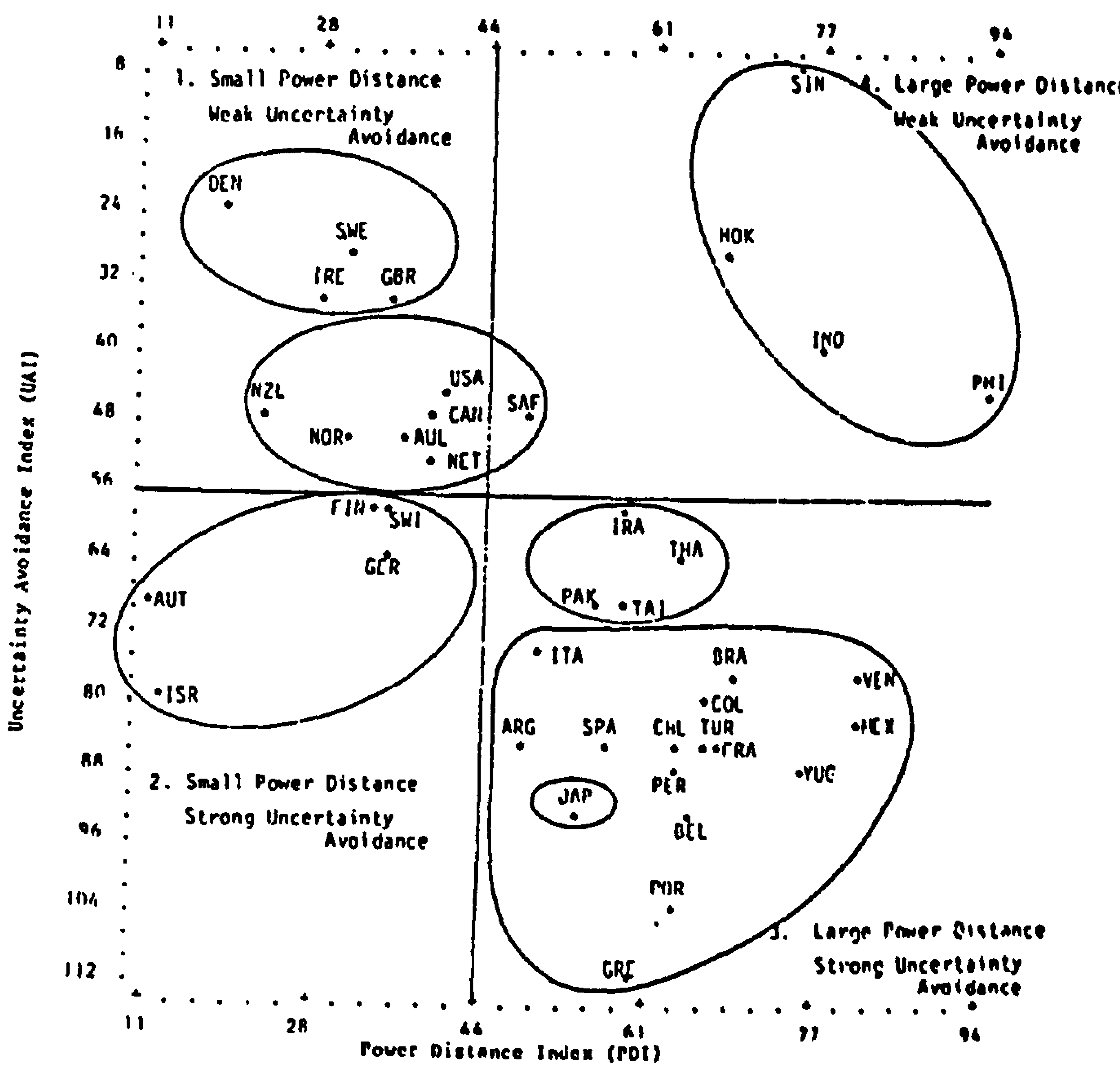
Position of 40 countries on the Power Distance and Individualism Scales
Position of 40 countries on their Individualism Index Versus their 1970 National Wealth
Position of 40 countries on the Power Distance and Uncertainty Avoidance Scales
Position of 40 countries on the Uncertainty Avoidance and Masculinity Scales



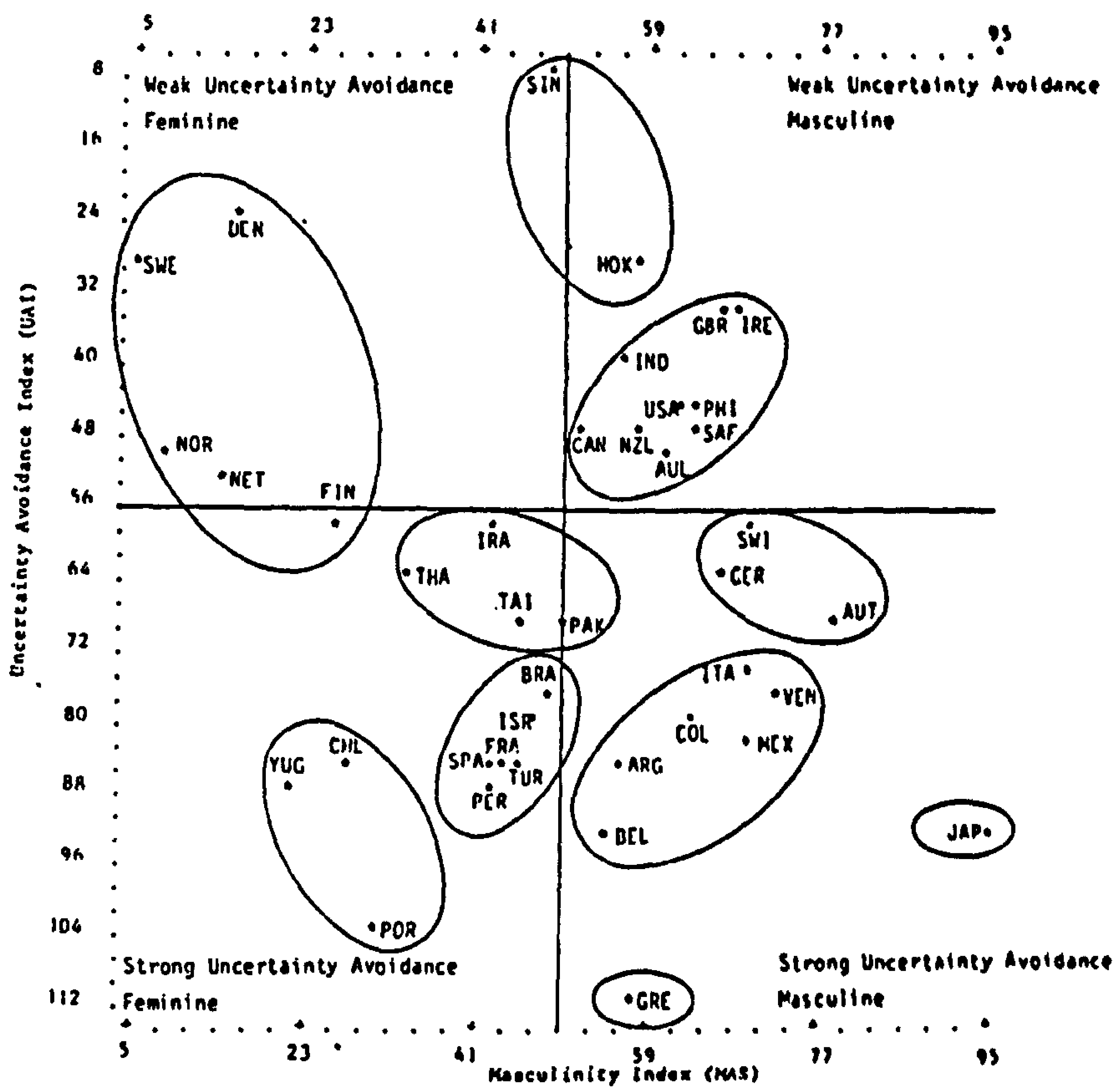
Position of the 40 Countries on the Power Distance and Individualism Scales (Hofstede, 1984)



Position of the 40 Countries on their Individualism Index (IDV) Versus their 1970 Nationa Wealth (Hofstede, 1984)



Positions of the 40 Countries on the Power Distance and Uncertainty Avoidance Scales (Hofstede, 1984)



Positions of the 40 Countries on the Uncertainty Avoidance and Masculinity Scales (Hofstede, 1984)

REFERENCES

Adam, Jr., E.E., "Alternative quality improvement practices and organisation performance," Journal of Operations Management, 12, 1994, pp.27-44.

Adler, P.S., "Managing Flexible Automation," California Management Review, 30(3), 1988, pp.34-56.

Ahire, S.L., and Golhar, D., "Quality Management in Large vs Small Firms: An Empirical Investigation," Journal of Small Business Management, April 1996, pp.1-13.

Ahire, S.L., Golhar, D., and Waller, M.A., Effect of Quality Management on Product Quality, Working Paper. Department of Management, Western Michigan University, 1994

Ahire, S.L., Golhar, D.Y., and Waller, M.A., "Development and Validation of TQM Implementation Constructs", Decision Sciences, 27(1), Winter 1996, pp.23-56

Alper, Mark I., and Peterson, R., "On the interpretation of Canonical Analysis," Journal of Marketing Research, Vol. 9, May 1972, p.187.

Alper, Mark I., Peterson, R., and Warren S. Martin, "Testing the significance of Canonical Correlations," Proceedings, American Marketing Association, Vol. 37, 1975, pp. 117-119.

Amba-Rao, S., and Pendse, D., "Human Resource Compensation and Maintenance Practices," American Journal of Small Business, Fall 1985, pp.19-29.

American Quality Foundation and Ernst & Young, The International quality study best practices report: An analysis of management practices that impact performance, 1992.

Anastasi, A., Psychological Testing, New York: Mcmillan, 1988.

Anderson, J., and Gerbing, D., "Predicting the performance of measures in a confirmatory factor analysis with an pretest assessment of their substantive validities," Journal of Applied Psychology, 76(5), 1991, pp.732-740.

Ansari A., and Heckel, J., "JIT Purchasing: Impact of Freight and Inventory Costs," Journal of Purchasing and Materials Management, 1987, pp.24-28.

Arnold, U., and Bernard, K.M., "Just-In-Time: Some marketing issues raised by a popular concept in production and distribution," Technovation, 9, 1989, pp.401-431.

Ashmore, G.M., "Better Information Means Better Quality," Journal of Business Strategy, 13(1), 1992, pp.57-60.

Bagozzi, R.P., Phillips, L.W., "Requesting and testing organisational theories: A holistic construct," Administrative Science Quarterly, 27, 1982, pp. 459-489.

Balakrishnan, R., Linsmeir, T.J., and Venkatachalan, M., Sharing financial benefits from improved inventory utilisation: Impact of product-market characteristics, Working Paper, University of Iowa, July 1993.

Bandyopadhyay, J.K., "Production Design to facilitate JIT Production," Production and Inventory Management Journal, 1990, pp. 71-76.

Banker, R.D., Field, J.M., Schroeder, R.G., and Sinha, K.K., "Impact of Work Teams on Manufacturing Performance: A Longuitudinal Field Study," Academy of Management Journal, 39(4), 1996, pp. 867-890

Bartezzaghi, E., and Turco, F., "The impact of Just-In-Time on production system performance: An analytical framework," International Journal of Operations and Production Management, 9(9) 1989, pp.40-61.

Bartlett, M.S., "The Statistical Significance of Canonical Correlations," Biometrika, Vol. 32, 1991, p.29.

Billesbach, T.J., "A study of the Implementation of Just-In-Time in the United States," Production and Inventory Management Journal, 32(3), 1991, pp.1-4.

Boddy, D., and Buchanan, D.A., Managing New Technology, Basil Blackwell, Oxford, UK., 1986.

Bonilla, L.S., Mexico Hacia la Globalizacion, Diana, S.A., Mexico, 1992.

Bourgeois, L.J.,III and Boltvinik, M. ,"Organisational Development in cross-cultural Setting: Latin America," California Management Review, 1981, pp.75-81.

Boyett, J.H., and Conn, H.P., Workplace 2000: The revolution reshaping American business, New York: Penguin.

Brown, M., "The Baldrige Award: How do you win?", Automation, October 1991

Burnham, J.M., "Improving manufacturing performance- Management's vital challenge," Production and Inventory Management, 9(9), 1984, pp.1-20

Business Week, "High tech to the rescue," June 16, 1986, pp.100-108

Celley, A.F., Clegg, W.H., Smith, A.W., and Vonderembse, M.A., "Implementation of JIT in the United States," Journal of Purchasing and Materials Management, 22, 1986, pp.9-15.

Clutterbuck, D., "What makes Japanese car manufacturers so productive?," International Management, 33(4), 1978, pp.17-20.

Cohen, A.J., "The Rise of the Maquiladoras," Business Mexico- Special Edition, 1994, pp. 52-55.

Cohen, S., Teece, D.J., Tyson, L., and Zysman, J., Competitiveness, Center for Research in Business, University of California-Berkeley, November, 1984.

Cole, R.E., "Introduction to the Special Issue on Total Quality Management," California Management Review, 32(3), 1993, pp.7-11.

Cole, R.E., Work, Mobility, and Participation: A Comparative study of Japanese and American Industry, Berkley University Press, 1979.

Comrey, A.L., The Comrey Personality Scales, San Diego, CA: Educational and Industrial Testing Service, 1970.

Crawford, K.M., and Cox, J.F., "Addressing Manufacturing problems through the implementation of Just-In-Time," Production Inventory Management Journal, 32(1), 1991, pp.33-36.

Cronbach, L.J., "Coefficient Alpha and the Internal Structure of Tests," Psychometrika, Vol.16, 1951, pp.297-334.

Cunningham, J.B., and Ho, J., "Assessing the impact of Total Quality Management-Related Programmes: A Singaporean Case," Quality Management Journal, 3, 1996, pp.51-65.

Chang, D.,and Lee, S.M., "Impact of JIT on organisational performance of U.S. firms", International Journal of Production Research, 33(11), 1995, pp. 3053-3068

Churchill, G.A., Jr., "A Paradigm for Developing Better Measures of Marketing Constructs," Journal of Marketing Research, Vol. 16, February 1979, pp.64-73.

Dale, B.G., and Duncalf, A.J., "Quality related decision making: A study in six British companies," International Journal of Operation and Production Management, 5(1), 1984, pp.15-25.

Davy, J.A., White, R.E., Merritt, N.J., and Gritzmacher, K., "A derivation of underlying constructs of Just-in-Time management systems," Academy of Management Journal, 35, 1992, pp.653-670

Dean, J.W., and Snell, S.A., "Integrated manufacturing and job design: Moderating effects the organisational inertia," Academy of Management Journal, 34, 1991, pp.776-804.

Dean, J.W., and Snell, S.A., "The Strategic Use of Integrated Manufacturing: An Empirical Examination," Strategic Management Journal, 17, 1996, pp.459-480.

Delone, W.H., and McLean, E.R., "Information system success: The quest for the dependent variable," Information System Research, Vol. 3, 1992, pp.60-95

Deming, W.E., Out of Crisis, Cambridge: MIT Center for Advanced Engineering Study, 1986.

Denton, D.K., "Lessons on Competitiveness: Motorola's Approach," Production and Inventory Management Journal, 32(3), 1991, pp.22-25.

Dilon, W.R., and Goldstein, M., Multivariate Analysis: Methods and Applications, New York, John Wiley, 1984.

Doing Business in Mexico, Price waterhouse, USA, 1991.

Dore, R.P., "Japanese version of Managerial Capitalism," Transformation Organisation, 1992, pp.17-27.

Draper, N.R., and Smith, H., Applied Regression Analysis, 2nd ed., New York: Wiley, 1981.

Drucker, P.F., "The emerging theory of Manufacturing," Harvard Business Review, 90(3), 1990, pp. 94-102.

Durity, A., "Everyone is a Winner in the Baldrige Stakes," Management Review, 80(11), 1991, pp.36-39.

Ebrahimpour, M., "An Empirical Study of American and Japanese Approaches to Quality Management in the United States," International Journal of Quality and Reliability Management, 5(5), 1988, pp.5-24.

Ebrahimpour, M., "An examination of quality management in Japan: Implications for management in the United States," Journal of Operations Management, 1985, pp.419-431.

Ebrahimpour, M., and Lee, S.M., "Quality Management Practices of American and Japanese Electronics Firms in the United States," Production and Inventory Management Journal, 29(4), 1988, pp.28-31.

Ebrahimpour, M., and Schonberger, R.J., "The Japanese Just-In-Time/ Total Quality Control production system: Potential for developing countries," International Journal of Production Research, 22(3), 1984, pp.421-430.

Ebrahimpour, M., and Withers, B.E., "A Comparison of Manufacturing Management in JIT and non-JIT firms," International Journal of Production Economics, 32, 1993, pp.355-364.

Ebrahimpour, M., and Withers, B.E., "Employee Involvement in Quality Improvement: A Comparison of American and Japanese Manufacturing Firms Operating in the US," IEEE Transaction on Engineering Management, 39(2), 1992, pp.142-148.

Eccles, R.G., "The Performance Measurement Manifesto", Harvard Business Review, January-February 1991, pp.131-137.

Echeverri-Carrol, E., "The future of the Maquiladora industry: Lessons from Asia......" Texas Business Review, Jan 1994, pp. 1-3.

Edosomwan, J.A., "Improving productivity and quality at the source," International Industrial Engineering Conference Proceedings, Atlanta, GA.., 1988.

Elkins, J., "Positioning Mexican Companies for the Future," Business Mexico- Special Edition, 1994, pp.6-8.

Ernst & Young Quality Improvement Consulting Group, Total Quality: An Executive's Guide for the 1990s, Homewood Ill: Irwin, 1990

Ettlie, J.E., Taking Charge of Manufacturing, San Francisco: Jossey-Bass, 1988.

Everett, R.J., and Sohal, A.S., "Individual Involvement and Intervention in Quality Improvement Programmes: Using the Andon System," International Journal of Quality and Reliability Management, 8(2), 1991, pp.21-34.

Fatemi, K., The Maquiladora Industry, Praeger, New York, 1990

Feigenbaum, A.V., "International Quality Leadership," Quality Progress, 19(9), Sept. 1986, pp.21-23.

Feigenbaum, A.V., Total Quality Control, 3rd ed., New York: McGraw-Hill, 1983.

Feldman, J.M., and Lynch, J.G., "Self-Generated Validity and other Effects of Measurement on Belief, Attitude, Intention, and behaviour," Journal of Applied Psychology, 73, 1988, pp.421-435.

Ferdows, K., and Demeyer, A., "A lasting improvements in manufacturing performance: In search of a new theory," Journal of Operations Management, 9(2), 1990, pp.168-183.

Finch, B.J., "Japanese Management Techniques in Small Manufacturing Companies: A strategy for Implementation," Production and Inventory Management, 27(3), 1986, pp.30-38.

Flynn, B.B., Sakakibara, S., and Schroeder, R., "Relationship between JIT and TQM: Practices and performance," Academy of Management Journal, 38(5), 1995, pp.1325-1360.

Flynn, B.B., Sakakibara, S., and Schroeder, R.G., "Empirical research methods in operations management," Journal of Operations Management, 9(2), 1990, pp.250-284.

Flynn, B.B., Schroeder, R.G., and Sakakibara, S., "A framework for quality management research and an associated instrument," Journal of operations Management, 1994, II, pp.339-366.

Fogarty, D.W., Blackstone, J.H., and Hoffman, T.R., Production and inventory management, Cincinnati,: South- Western, 1991.

Forest, M.E., "Thinking of a plant in Mexico," Academy of Management Executive, 8(1), 1994, pp.33-40.

Freeland, J.R., "A survey of Just-In-Time Purchasing Practices in the U.S.," Production and Inventory Management Journal, 1991, pp.43-49.

Fuchsberg, G., "Quality Programmes show Shadow Results," Wall Street Journal, May 15, 1992, P.B1

Garvin, D.A., "How the Baldrige Award Really Works", Harvard Business Review, Nov./Dec. 1991, pp.80-93

Garvin, D.A., "Japanese quality management," Columbia Journal of World Business, 19(3), 1984, pp.3-12.

Garvin, D.A., "Quality on the line," Harvard Business Review, 61(5), 1983, pp.65-75.

Garvin, D.A., "Quality problems, policies, and attitudes in the United States and Japan: An exploratory study," Academy of Management Journal, 29(4), 1986, pp.653-673.

Goodman, P.S., Devadas, R., and Hughson, T.L.G., Groups and Productivity: Analysing the effectiveness of self-managing teams, San Francisco: Jossey-Bass, 1988, pp.295-327.

Gorsuch, R.L., Factor Analysis, Philadelphia: W.S. Saunders, 1974.

Greenberg, L.A., Practical Guide to Productivity Measurement, Washington, D.C., Bureau of National Affairs, 1973.

Griffin, R., "Consequences of quality circles in an industrial setting: A longitudinal assessment," Academy of Management Journal, 31(2), 1988, pp.338-358.

Gruben, W., "Mexican Maquiladora Growth : Does it cost US Jobs?," Economic Review, January 1990, pp.16.

Grunwald, J., "Opportunity Missed: Mexico and Maquiladoras....," Brookings Review, Vol. 9, 1991, pp.44.

Gunn, T.G., Manufacturing for competitive advantage: Becoming a World Class manufacturer, Cambridge, MA: Ballinger, 1987.

Gupta, A., "SBU Strategies, Corporate-SBU Relations, and SBU Effectiveness in Strategy Implementation," Academy of Management Journal, September, 1987, pp.477-500.

Gutierrez, J., "Mexico's Total Quality Effort," Quality Progress, May 1994, pp.75-76.

Hahn, G.J., and Boardman, T.J., "The Statistician's role in quality improvement," AMSTAT News, 113, 1985, pp.5-7.

Hair, J., Anderson, R., Tatham, R., and Black, W.C., Multivariate Data Analysis with readings, MacMillan, New York, 1986.

Hair, J., Jr., Anderson, R.E., Tatham, R.L., and Black, W.C., Multivariate Data Analysis with Readings, Third Edition, MacMillan, New York, 1991.

Harrington, H.J., The improvement process: How America's leading companies improve Quality, New York: McGraw-Hill, 1987

Hart, Ch., "What's Wrong-and Right with the Baldrige Awards", Chief Executive, Nov./Dec. 1993, pp.36-47.

Hay, E.J., The Just-In-Time breakthrough: Implementing the new manufacturing basics, New York: Wiley, 1988

Hayes, R.H., "Why Japanese factories work?," Harvard Business Review, 59(4), 1981, pp.56-66.

Hayes, R.H., and Clark, K.B., "Why some factories are more productive than others," Harvard Business Review, 64(5), 1986, pp.66-73.

Hayes, R.H., Wheelwright, S.C., and Clark, K.B., Dynamic Manufacturing: Creating the Learning Organisation, Free Press, New York, 1988.

Hitcher, E., "Quality Works!", National Productivity Review, Spring 1993.

Hofstede, G., "Motivation, Leadership, and Organisations: Do American Theories Apply Abroad?", Organisational Dynamics, 5,1980, pp.42-63

Hofstede, G., Culture's Consequences: International Differences in Work-related Values, Sage Publications, 1984.

Hornsby, J., and Kuratko, D., "Human Resource Management in Small Business: Critical Issues for the 1990's," Journal of Small Business Management, 28(3), 1990, pp.9-18.

Huang, P.Y., Press, L.P., & Taylor, B.W.,III, "A simulation analysis of the Japanese just-in-time technique (with Kanbans) for a multiline, multistage, production system", Decision Sciences, 1983, pp.326-344.

Hughes, M.A., Price, R.L., and Marrs, D.W., "Linking Theory construction and Theory Testing: Models with Multiple Indicators of Latent Variables," Academy of Management Review, 11(1), 1986, pp.128-144.

Huson, M., and Nanda, D., "The impact of Just-In-Time manufacturing on firm performance in US," Journal of Operations Management, 12, 1995, pp.297-310

Ichniowski, C., Shaw, K., and Prennishi, G., "The impact of human Resource management practices on productivity," working paper 014, Columbia University, Carnegie Mellon University, and World Bank, 1994.

Im, J., and Lee, S.M., "Implementation of Just-In-Time Systems in US manufacturing firms," International Journal of Operations and Production Management, 9, 1989, pp.5-14.

INEGI (National Institute of Statistics and Geography), and Banco de Mexico, 1997.

Inman, R.A., and Mehra, S., "Potential Union Conflict in JIT Implementation," Production and Inventory Management Journal, 1989, pp. 19-21.

Inman, R.A., and Mehra, S., "The Transferability of Just-In-Time Concepts to American Small Businesses," Interfaces, 20: March-April 1990, pp.30-37.

Ishikawa, K., "How to apply companywide quality control in Foreign countries", Quality Progress, Sept. 1989, pp.70-74

Jaikumar, R., "Postindustrial Manufacturing," Harvard Business Review, 64(6), 1986, pp.69-76.

Japanese Union of Scientists and Engineers, The Deming Prize Guide for overseas companies, Tokyo, Japan, 1990.

Johnson Sevier, A., "Managing employee resistance to JIT: Creating an atmosphere that facilitates implementation," Production Inventory Management Journal, 1992, pp.83-87.

Juran, J.M., "Big Q" Drives Productivity, from Productivity-Where We Stand, McGraw-Hill, 1996

Juran, J.M., and Gryna, F.M., Quality Planning and Analysis," New York: McGraw-Hill, 1980.

Kaplan, R.S., "Measuring Manufacturing Performance: A New Challenge for Managerial Accounting Research," The Accounting Review, 18(4), Oct.1983, pp.686-705.

Katz, H.C, Kochan,T.A., and Keefe, J.H., Industrial relations and productivity in the U.S. automobile industry, Brookings Paper on Economic Activity, 3, 1987, pp.685-727.

Kerlinger, F.N., Foundations of Behavioural Research, New York: Holt, Reinhart, Winston, 1978.

Kim, J,S., and Miller, J.G., Building the Value Factory: A Progress Report for US Manufacturing, A Research Report of the Boston University School of Management Manufacturing Roundtable, Boston, MA., 1992.

Kim, J.S., and Mueller, C.W., Factor Analysis: Statistical Methods and Practical Issues, Beverly Hills, California: sage Publication, 1978.

Klein, J.P., "A Re-examination of autonomy in light of new manufacturing practices," Human Relations, 44, 1991, pp.21-38.

Knotis, R., Tomlin, S., " A Comparison of TQM practices in U.S. and Mexican companies", Production and Inventory Management Journal, First Quarter, 1994.

Knotts, U.S., Parrish, L.G., and Evans, C.R. "What Does U.S. Business community really think about the Baldrige Award", Quality Progress, May 1993, pp.49-53.

Krafcik, J.F., "Triumph of the lean production system," Sloan Management Review, 30(1), 1988, pp.41-52.

Krajewski, L.J., and Ritzman, L.P., Operations Management: Strategy and Analysis, New York: Addison-Wesley, 1993.

Kras, E.S., Management in Two Cultures: Bridging the Gap Between US and Mexican Managers, Yarmouth, ME: Intercultural Press Inc. 1989.

Kumar, S., and Gupta, Y., "Cross Functional Teams Improve Manufacturing at Motorola's Austin Plant," Industrial Engineering, 23(5), 1989, pp.32-36.

Lacktriz, J.R., "TQM with FORTUNE 500 Corporations," Quality Progress, Feb.1997, pp.69-72

Lambert, Z., and Durand, R., "Some Precautions in Using Canonical Analysis," Journal of Marketing Research, Vol. 12, Nov. 1975, pp. 468-475.

Lawrence, J., and Lewis, H.S., "JIT Manufacturing in Mexico: Obstacles to Implementation", Production and Inventory Management Journal, Third Quarter, 1993, pp.31-35.

Lawrence, J.J., Hottenstein, M.P., "The strategic implications of manufacturing in a developing country: The case of Mexico", Academy of Management, 1992, pp.300-304.

Lazaroff, L., "Desert Capitalism," Business Mexico, September 1992, pp.24-27.

Leonard, F.S., and Sasser, W.E., "The Incline of Quality," Harvard Business Review, Sept.-Oct. 1982, pp.163-171.

Longenecker, J., and Moore, C., Small Business Management, Cincinnati, Ohio: south-western Publishing Company, 1987.

Luchs, R., "Successful Businesses compete on Quality- Not Costs," Long Range Planning, 19(1), Feb. 1986, pp.12-17.

Macbeth, D.K., "Supplier management in support JIT activity: A research agenda," International Journal of Operations and Production Management, 7, 1987, pp.53-63.

MacDuffie, J.P., "Human Resource bundles and manufacturing performance: Organisational logic and flexible production systems in the world auto industry," Industrial and Labour Relations Review, 48(2), Jan. 1995, pp.197-221.

Majchrzak, A., The Human Side of Factory Automation, Jossey-Bass, San Francisco, CA., 1988.

Malcolm Baldrige National Quality Award- 1991 application Guidelines.

Malcolm Baldrige National Quality Award- 1994 application Guidelines.

Manoochehri, G.H., "Improving Productivity with the Just-In-Time System," Journal of Systems Management, January 1985, pp.23-26.

Manoochehri, G.H., "JIT for Small Manufacturers," Journal of Small Business Management, Oct.1988, pp.22-30.

Manoochehri, G.H., "Suppliers and the Just-In-Time concept," Journal of Purchasing and Materials Management, 20(4), 1984, pp.16-21.

Manufacturing Studies Board, Human Resource Practices for Implementing Advanced Manufacturing Technology, Washington, D.C., National Academy Press, 1986.

Markham, I.S., and McCart, C.D., "The Road to Successful Implementation of Just-In-Time Systems," Production and Inventory Management Journal, Third Quarter, 1995, pp.67-70.

Maskell, B., "Performance measurement for world class manufacturing: pt1", Management Accounting, May 1989, pp.32-33.

Maskell, B., "Performance measurement for world class manufacturing: pt2", Management Accounting, July/Aug. 1989, pp.48-50.

Maskell, B., "Performance measurement for world class manufacturing: pt3", Management Accounting, Sept. 1989, p.66.

McClintock, W., Directory of in-bond plates (Maquiladoras) in Mexico, Mexico Communication, 1988.

McCracken, M.J., and Kaynak, H., "An Empirical Investigation of the Relationship between Quality and Productivity," Quality Management Journal, 2, 1996, pp.36-51

McEvoy, G., "Small Business Personnel Practices," Journal of Small Business Management, Oct. 1984, pp.1-8.

Mefford, N.R., "Quality and Productivity: the linkage", International Journal of Production Economics, 1991, pp.137-145.

Mefford, R.M., "The productivity nexus of new inventory and quality control techniques," Engineering Costs and Production Economics, 17, 1989, pp.21-28

Meredith, J.R., "what is Empirical Research?," Decision Line, 26(2), 1995, pp.10-11.

Mexican Investment Board, Total Quality in Mexico: Case Histories in Success, Mexico City, Mexico, 1993.

Miltengurg, J., and Sinnamon, G., "Scheduling mixed-model multi-level Just-In-Time production systems," International Journal of Operations and Production Management, 27(9), 1989, pp.1487-1509

Miller, D., "State in the Saddle: CEO Tenure and the March between Organisation and Environment," Management Science, 37(1), January 1991, pp.34-51.

Miller, J.G., "The new activity performance measures", CMA Magazine, April 1992, p.34.

Miller, J.G., Factories of the Future, Boston University, Boston, 1991.

Modarres, B., and Ansari, A., "Quality Control Techniques in US Firms: A Survey," Production and Inventory Management Journal, 30(2), 1989, pp.58-62.

Mohrman, S.A., and Novelli, L., Jr., "Beyond Testimonials: Learning from a quality circles programme," Journal of Occupational Behaviour, 6, 1985, pp.93-110.

Monden, Y., "What makes the Toyota production system really tick?," Industrial Engineering, 13(1), Jan. 1981, pp.36-46.(a)

Monden, Y., "Adaptable Kanban system helps Toyota maintain just-in-time production," Industrial Engineering, 13(5), May 1981, pp.20-30.(b)

Monden, Y., "Smoothed production lets Toyota adapt to demand changes and reduce inventory," Industrial Engineering, 13(8), August 1981, pp.42-51.(c)

Monden, Y., "How Toyota shortened supply lot production time, waiting time, and conveyance time," Industrial Engineering, 13(9), Sept. 1981, pp.22-30.(d)

Monden, Y., Toyota production system: Practical approach to production management, Atlanta: Industrial Engineering and Management Press, 1983.

Monden, Y., Toyota Production System, New York: American Institute of Industrial Engineers, 1982

Monden, Y., Toyota Production System, Norcross, Ga.: Institute of Industrial Engineers, 1983.

Morrison, A., A Strategic Strategies in Global Industries, New York: Quorum Books, 1990

Muller, R.O., Basic Principles of Structural Equation Modelling, New York, Springer-Verlag, 1996.

Nakhai, B., and Neves, J., "The Deming, Baldrige, and European Quality Awards", Quality Progress, April 1994, pp.33-37

Newman, R., "The Buyer-Supplier Relationship Under Just-In-Time," Production and Inventory Management, 29(3), 1988, pp.45-49.

Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., and Bent, D.H., SPSS: Statistical Package for the Social Sciences, 2nd ed. new York: McGraw-Hill, 1975.

Nunnally, J.C., Psychometric Theory, New York, McGraw-Hill, 1978.

O'Grady, S., "Doing Business in Mexico: The human resource challenges.....," Business Quarterly, 60, Jan. 1995, pp.42-53.

Oliver, N., "Employee Commitment and Total Quality Control," International Journal of Quality and Reliability Management, 7(1), 1988, pp.73-81.

Oliver, N., and Davis, A., "Adopting Japanese-style manufacturing methods: A tale of two (UK) factories", Journal of Management studies, 1990, pp.555-570.

Osterman, P., "How common is workplace transformation and who adopts it?," Industrial and Labour Relations Review, 17, 1994, pp.173-188.

Paek, J.H., A study of an enlarged JIT and its impact on JIT implementation and performance of the production system, PhD Thesis, University of Nebraska-Lincoln. 1989

Parthasarathy, R., and Sethi, S.P., "Relating strategy and structure to flexible automation: A test of fit and performance implications," Strategic Management Journal, Vol. 14, 1993, pp.529-549

Peak, M., "Maquiladoras: Where Quality is a Way of Life," Management Review, March 1993, pp.19-23.

Peter, J.P., "Reliability: A Review of Psychometric Basics and Recent Marketing Practices," Journal of Marketing Research, Vol. 16, February 1979, pp.6-17.

Placek, Ch., "Baldrige Award as a Quality Model", Quality, Feb. 1992, pp.17-20.

Porter, M.J., "The Competitive advantage of nations", Harvard Business Review, March/April 1990.

Premio Nacional de Calidad, Mexico,.1996

Premio Nuevo Leon a la Calidad, Nuevo Leon, Mexico, 1996

Randolph, W., A., Sapienza, H.J., and Watson, M.A., "Technology-Structure Fit and Performance in Small Business: An Examination of the Moderating Effects of Organisational States," Entrepreneurship Theory & Practice, Fall 1991, pp.27-41.

Reddy, J., and Berger, A., "Three essentials of Product Quality," Harvard Business Review, July-August 1983, pp.153-159.

Riggs, J., and Felix, G., Productivity by Objectives, Englewood, Cliffs, NJ: Prentice-Hall, 1983.

Rohrer, T.C., Employee commitment to the organisation: Analysis of Composition and Effects on Job Performance, PhD. Dissertation, The University of Auckland, 1990.

Roth, A.V., and Miller, J.G., "Success factors in Manufacturing," Business Horizons, 35(4), 1992, pp.73-81.

Sanderson, S.W., and Hayes, R.H., "Mexico- Opening Ahead of Eastern Europe," Harvard Business Review, Sept.-Oct. 1990, pp.32-42.

Saraph, J.V., Benson, P.G., and Schroeder, R.G., "An instrument for measuring the critical factors of quality measurement," Decision Sciences, 20(4), 1989, pp.810-829.

SAS, Institute, Inc., SAS User's Guide: Basics Version 6, Gary, N.C., 1990.

Schiller, D., "The Maquila Industry- Where to Now?," Business Mexico, December 1991, pp.48-51.

Schonberger, R.J., "Just-In-Time production system: Replacing complexity with simplicity in manufacturing management," Industrial Engineering, 18(10), 1984, pp.52-63.

Schonberger, R.J., "Some observations of the advantages and implementation issues of Just-In-Time production systems," Journal of Operations Management, 3(1), 1982, pp.1-11.

Schonberger, R.J., "Work Improvement Programmes: Quality Control Circles compared with traditional western approaches," International Journal of Operations and Production Management, 3(2), 1983, pp.18-32.

Schonberger, R.J., World class manufacturing: The lessons of simplicity applied, New York: Free Press, 1986.

Schonberger, R.J., Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity. New York: The Free Press , 1982.

Schroeder, R.G., Sakakibara, S., Flynn, E.J., and Flynn, B.B. "Japanese Plants in US: How Good are They?", Business Horizons, 35(4), 1992, pp.66-72.

SECOFI, Directorio de la Industria Maquiladora de Exportación, 1996.

Senge, P.M., Quality Management: Current State of the Practice, Keynote Speech of the American Quality Congress, ASQC, May 24, 1993.

Senge, P.M., "The leader's new work: Building learning organisations," Sloan Management Review, 32(1), 1990, pp.7-23.

Sepehri, M., and Walleigh, R., "Quality and inventory go hand in hand at Hewlett Packard's computer systems division," Industrial Engineering, 18(2), 1986, pp.44-51.

Shaiken, H., "The Universal Motors Assembly and Stamping Plant- Transferring high-tech Production to Mexico," Columbia Journal of World Business, 1991, pp.124-137.

Sheridan, J.H., "How do you stack up?," Industry Week, 23(4), 1994, pp.53-56.

Shetty, Y.K., "Quality, Productivity, and profit performance: Learning from research and practice," National Productivity Review, 5, 1986, pp.166-173.

Shetty, Y.K., "The Quest for Quality Excellence: Lessons from the Malcolm Baldrige Quality Award", Sam Advanced Management Journal, Spring 1993, pp.34-40.

Shingo, S., A study of the Toyota Production System from an Industrial Engineering Viewpoint, Productivity Press, Cambridge, 1989.

Sironopolis, N., Small Business Management: A guide to Entrepreneurship, Fifth edition. Boston: Mass.: Houghton Mifflin Company, 1994.

Skinner, W., "The Productivity Paradox," Harvard Business Review, 64(4), 1986, pp.55-59

Sluti, D.G., Linking process quality with performance: An empirical study of New Zealand manufacturing plants, Ph.D. Dissertation, The University of Auckland, Auckland, NZ., 1992.

Smolowitz, I., "The Paradox of Team Organisation in the Workplace," Production and Inventory Management Journal, 1995, p.85

Snell, S.A., and Dean, Jr., J.W., "Integrated manufacturing and human resource management: A human capital perspective," Academy of Management Journal, 35(3), 1992, pp.467-504.

Sonfield, M., "Can Japanese Management Techniques be Applied to American Small Businesses?," Journal of Small Business Management, July 1984, pp.18-23.

Sprow, E.E., "Deming Prizes for Baldrige Seekers", Manufacturing Engineering, July 1992, pp.12-16

Stalk, G., Evans, p., and Schulman, L.E., "Competing on capabilities: The new rules of corporate strategy," Harvard Business Review, 70(2), 1992, pp.57-69.

Sterrs, R.M., "Problems in the Measurement of Organisational Effectiveness," Administrative Science Quarterly, December 1975, pp.546-558.

Stewart, D., and Love, W., "A General Canonical Correlation Index," Psychological Bulletin, Vol. 70, 1968, pp.160-163

Swamidass, P.M., Technology on the Factory Floor II, The Manufacturing Institute, 1994

Tabachnick, B.G., and Fidell, L.S., Using Multivariate Statistics, Harper & Row, Publishers, New York, 2nd edition, 1988.

Takeuchi, H., and Quelch, J.A., "Quality is more than making a good product," Harvard Business Review, July-August 1983, pp.139-145.

The Economist, "Factory of the Future," May 30, 1987, pp.3-18

The Economist, "The Ceiling Out of America," December, 1994, P.63

The Economist, "The Trouble With Teams," January 1995, P.61.

The European Quality Award 1993 Application Brochure, Eindhoven, Netherlands: European Foundation for Quality Management, 1993

Thompson, G., "TQM: Forging Ahead or Falling Behind ?", Business Strategy, July 1993, p 24

Thore, C.G., A Complete Productivity and Quality Measurement System, Managers (1) Notebook Houston: American Productivity & Quality Center, May 1988.

Trevor, M., "Quality Control: Learning from the Japanese," Long Range Planning, 19(5), 1986, pp.46-53.

US Department of Commerce, 1991 Application Guidelines Malcolm Baldrige National Quality Award, 1991.

United States General Accounting Office, Management Practices- U.S. companies improve performance through quality efforts, Washington, DC.; U.S. Government Printing Press, 1991.

US Department of Labour, Bureau of Labour Statistics, Office of Productivity and Technology, Hourly Compensation Costs for Production Workers in Manufacturing, 34 countries, unpublished data, April 1990.

Vargas, G.A. and Johnson, T.W., "An analysis of operational experience in the US/Mexico production sharing (Maquiladoras) programme," Journal of Operations Management, March 1993, pp. 17-34.

Venkatraman, N., "Strategic orientation of business enterprises: The construct, dimensionality and measurement," Management Science, 35(8), 1989, pp.93-99.

Venkatraman, N., and Ramanujam, V., "Measurement of Business Performance in Strategy Research: A Comparison of Approaches," Academy of Management Review, October 1986, pp.801-814.

Verser, T., Owners' Perceptions of Personnel Problems in Small Business, Sept. 1987, pp.13-17.

Vickery, S.K., "International Sourcing: Implications for Just-In-Time Manufacturing," Production and Inventory Management Journal, 1989, pp.66-71.

Voss, C.A., and Robinson, S.J., "Application of Just-In-Time manufacturing techniques in the United Kingdom," International Journal of Operations and Production Management, 7(4), 1987, pp. 46-52.

Wheelwright, S.C., "Restoring the competitive edge in U.S. manufacturing," California Management Review, 1985, pp.26-42.

Wilkinson, B., and Oliver, N., "Power, control and the Kanban," Journal of Management Studies, 26, 1989, pp.47-58

Williams, J.R., and Tice, H.S., Jr., A programme for communicating Just-In-Time concepts to smaller manufacturing vendors, Readings in Zero Inventory, Annual International Conference of the American Production and Inventory Control Society, 1984, pp.17

Williams, M., "Some Plants tear Out Long Assembly Lines, Switch to Craftwork," The Wall Street Journal, October 1994, P.A1

Womack, J.P., Jones, D.T., and Roos, D., The Machine that changed the World: The story of Lean Production, Harper Perennial, 1990