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Continuous Improvement in Puebla, Mexico: A Survey

Luis A. J. Borges

Saint Xavier University, Chicago, USA, [borges@sxu.edu](mailto:borges@sxu.edu)

Jaime E. Contreras Diaz

Consultant. Puebla/Coatepec, Mexico, [jecontreras58@hotmail.com](mailto:jecontreras58@hotmail.com)

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## **ABSTRACT**

*In search of Excellence companies must use techniques and tools to analyze and then improve their processes. The paper starts with a theoretical background, including a literature review, then with a survey conducted in the industrial area of Puebla, Mexico asking about the techniques and tools used in order to accomplish their objective of improvement. It follows a longitudinal survey on selected respondents. The respondents are directors and managers. The results show where organizations in Puebla have decided to put their resources in order to achieve such improvements. In the end, some ideas will be formulated for future applications, such as comparison with other industrial areas in Mexico and in other countries.*

**Keywords:** continuous improvement, operations strategy, technique applications

## **INTRODUCTION**

In search of Excellence companies must use techniques and tools to analyze and then improve their processes. Companies have to struggle to stay in business doing many strategic options in the growing competition from every part of the world.

Continuous improvement is an approach to quality assurance which supports the importance of a new culture creation in which concern for quality is an integral part of the product/service delivery (Collins & Porras, 1994).

Companies must use several techniques: first, to remain in business, and secondly, to increase their market share. Those techniques that are in use include the Total Quality Management approaches, Lean Concepts (JIT), ISO 9000, Six-Sigma Approach, and Award Criteria items.

The authors of the present article conducted a survey in the Puebla area in Mexico between December 2011 and January 2012. From 90 questionnaires, 22 answers were compiled. The respondents were directors, managers, and professionals from MBA courses.

The authors examine, process, and analyze the data of the survey, and present the results, with some conclusions.

## **THEORETICAL BACKGROUND**

There are several techniques and tools that aim at process improvement. The techniques and tools were total quality management philosophies and approaches, statistical process control, quality control tools, design of experiments, kaizen, lean manufacturing, six-sigma approach, and empowerment. Some of the national award criteria such as customer focus, strategic planning, information & analysis, and process analysis were introduced in the questionnaire.

### **Total Quality Management – TQM**

The quality philosophies of Deming (1982, 1986); Juran (1964, 1988, 1989); Ishikawa (1986, 1990); Feigenbaum (1951); Crosby (1979) are based on customer focus. According to Stephanou and Spiegel (1992), the total quality management process was based on Deming's principle, Juran's approach to quality improvement, and Feigenbaum's company-wide approach to quality control. Ishikawa (1986, 1990) added some contributions in Japan such as the Cause-and-Effect diagram and quality control circles. Crosby (1979) introduced the "zero defects" concept. Howe et al (1995) state that, despite some successes, TQM has shown that 60-70% of the programs fails to achieve their stated objectives.

### **Seven Quality Control Tools**

According to Ishikawa (1986, 1990), the Seven Quality Control tools are Check sheets, Pareto Diagram, Cause-and-Effect Diagram, Histogram, Scatter Diagram, Control Charts, and Flow charts.

### **Statistical process control**

Ishikawa (1990) states that the main areas of application of statistical process control (SPC) are for control, for analysis, for adjustment, for inspection, and for a useful graphical representation

of the data. Periodic samples of the output of a production process are taken, and then compared with the control limits to see whether the process is in control or out of control.

### **Design of experiments**

Design of experiments consists of all efforts to use analysis of variation, in many cases applying experimental designs and Taguchi techniques. According to Montgomery (1997), the application of experimental design techniques early in process development can result in (a) improved process yields, (b) reduced variability and closer conformance to nominal or target requirements, (c) reduced development time, and in (d) reduced overall costs. Moreover, it can be used to evaluate and compare basic design configurations and material alternatives.

### **The National Quality Award criteria**

Mexico formally started to encourage continuous improvement by creating its National Quality Award soon after the Americans created the Malcolm Baldrige National Quality Award. The authors chose the following criteria items for the survey:

Customer Focus - Market and customer requirements, expectations and preferences.

Human Resources - Training and Motivation to reach the worker's maximum potential.

Strategic Planning – The development and deployment of objectives and action plans.

Information and Analysis - Systems management for performance measurement.

Processes - Process development management for operation units.

### **Kaizen**

Imai (1986) states that a Kaizen workshop deals with ongoing improvement involving everyone in the company: from top to middle management, from supervisors to workers. Kaizen seeks to encourage the active participation of all department members involved in a process within a non-blame company culture. It is a problem solving process approach used to obtain gradual

improvements. Immediate actions are carried out and follow-up meetings are scheduled for the more time-consuming suggestions.

### **Lean Concepts**

Jones (1992) proposes that lean production emphasizes five elements of plant organization: (i) the delegation of responsibilities to front-line workers; (ii) their organization into work teams; (iii) employee involvement in continuous improvement; (iv) the use of visual factory controls; and (v) the use of just-in-time to eliminate in-process buffers and waste.

### **Six-sigma Approach**

Pande et al (2000) state that the six-sigma approach, based on the statistical theory, was launched by Motorola and popularized by Jack Welch, GE's C.E.O. It consists of the application of DMAIC – Design, Measure, Analyze, Implement, and Control – projects supported by a consistent training basis and applications aimed at reducing defects and improving process productivity.

### **Empowerment**

Empowerment consists in giving responsibility and allowing participation in the decision-making process to lower levels of employees. Rayner (1994) states that many U.S. corporations are trying to increase the level of workforce participation and involvement in the decision-making process. Employee empowerment aims at the development of the capability of the workforce. In doing so, the organization can be more flexible and prepared to adapt to change.

## **METHODOLOGY**

The methodology consisted of the analysis of data collected from the cities of the Puebla area in Mexico. The survey involved some general questions about the companies' location, age, products, size, and nationality (whether they are regional or international). The respondents were directors, managers, and qualified professionals from MBA courses.

The questionnaire (see Appendix) asked about techniques and tool applications on a scale from 1 to 5, with 1 meaning successful application, 2 meaning implementing waiting for results, 3 meaning implementation planned but in the future, 4 meaning not successful, and 5 meaning no interest in applying. The techniques and tools were: total quality management, statistical quality control, quality tools, design of experiments, kaizen, lean manufacturing, six-sigma approach, ISO 9000, and empowerment. The Award criteria were customer focus, human resources, strategic planning, information and analysis, and process.

The data were collected between December 2011 and January 2012. From 90 questionnaires, 22 answers were compiled, giving a response of 24.4% return.

Besides, the survey presented a short definition for each and every one of the techniques and tools, in order to facilitate the understanding of them. Therefore, the authors could identify whenever there were inconsistencies in the application of the above mentioned techniques.

## **RESULTS**

From the total of answers, 86% were from manufacturing companies, and 14% were from service. Due to the random nature of the survey, there was not a predominant manufacturing sector: from heavy industries, and appliances industries 21% each; 15% from car industries, 10% from wood manufacturers and the remained from processed food, shoes, and toys companies. Services were represented by tourism, bakery, and photocopy companies in equal parts.

From the total of respondents, 50% were small companies (11-100), 32% were medium-sized companies (101-250), 13% were micro companies (less than 11 employees), and only 5% were big companies (more than 250 employees), which is justified by being an area with predominance of SMEs (small and middle enterprises).

Besides, all companies were local, with 46% between 11 and 20 years old, 36% older than 20 years old, and the remained 18% less than 11 years old.

As it is seen in Table 1, a majority of companies applied or are applying the techniques: a combination of the scale classification 1 and 2 depicts Total Quality Management (83%), Statistical Process Control (68%), ISO 9000-2000 certification (68%), and Empowerment (50%). The criteria items of the Malcolm Baldrige Award had majority of use but information and analysis (46%). Leading the use is Human Resources (100% combined), Strategic Planning (91%), Customer Focus (81%), and Process (90%). The majority of them, however, are not interested in using Design of Experiments (90%), Quality Controls Tools (54%), Kaizen (77%), Lean Manufacturing Concepts (78%), and Six-Sigma (100%). However, there is a gray area between TQM and Quality Control Tools, which the authors think there is a justification of the low percentage (46%) of the latter.

Other questions asked received interesting results such as 82% of the companies have website. The ones that have website uses for several reasons like 11% of the companies use for advertisement only, 39% use to sell products to the customers, 44% use to sell products and to order their suppliers, and 6% add to the previous reasons to auction for their suppliers also.

Other results given that the completion will be tougher in the future (86%), 91% the competition will intensify in the future, and all respondents believe that self-organization will be possible with their companies, and 86% agree that cooperation will increase in the future.

## **CONCLUSIONS**

One could assume that it should be encountered some increase in the percentage of companies applications the various techniques and Quality criteria items. However, there is some room for improvement in several areas such as Kaizen, Lean Manufacturing concepts, and Design of

*Table 1 – Questionnaire results in %*

<b>Techniques/Tools</b>	1	2	3	4	5
<b>TQM</b>	32	41	27	0	0
<b>SPC</b>	32	36	32	0	0
<b>QCTools</b>	23	23	36	5	13
<b>DOE</b>	5	5	50	0	40
<b>Customer Focus</b>	59	32	9	0	0
<b>HR</b>	41	59	0	0	0
<b>Strategic Plan</b>	68	23	9	0	0
<b>Information</b>	23	23	41	0	13
<b>Process</b>	45	45	10	0	0
<b>Kaizen</b>	13	10	50	0	27
<b>Lean Mfg</b>	9	13	41	5	32
<b>6-Sigma</b>	0	0	59	0	41
<b>Empowerment</b>	32	18	50	0	0
<b>ISO-9000-94</b>	5	0	0	86	9
<b>ISO-9000-2000</b>	41	27	23	0	9

1. Successful; 2. Implemented, waiting results; 3. To implement in the future; 4. Unsuccessful; 5. Not interested

Experiments. One must bear in mind that the sample is basically in SMEs, which generally lack resources to implement such techniques. Local authorities could use their power by working with local chambers of commerce to implement training programs for the small and medium organizations. On the other hand, big companies could help the suppliers to reach quality improvements. This might be the case for the high percentage of companies getting, or trying to get the ISO 9000-2000 certification. Big companies could help their suppliers to pursue improvement in other areas.

### **FURTHER RESEARCH**

To elaborate more the answers the authors would do a longitudinal survey in the future to find the reasons behind the answers why they are doing well in some techniques, and why they are not doing that good in other applications. It could be selected five companies to perform this complementary survey.

Other research suggestion is to apply the same questionnaire in other part of Mexico, and in other countries. It may be conducted the same questionnaire in the same area in the near future to compare to this results in order to see whether and where there will be some improvement in the use of such techniques and tools.

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# CUESTIONARIO DE MEJORAMIENTO CONTINUO

## Introducción

Las técnicas de mejoramiento están teniendo un rápido crecimiento en las empresas, y esto es debido a los desarrollos e innovación tecnológicos. Por lo mismo, este cuestionario forma parte de una nueva estrategia a fin de evaluar que tan desarrolladas están dichas técnicas de mejoramiento continuo en el medio empresarial de la región de Puebla. La información que usted nos proporcione será tratada con la más estricta confidencialidad y será solamente usada para propósitos de investigación, por lo que no se mencionarán ni identificarán empresas en particular ni sus razones sociales. Si quisiera saber más o tener información acerca de los resultados, por favor no dude en contactar a las personas mencionadas al final de la encuesta. Agradecemos de antemano su cooperación para llenar este cuestionario, el cual le enviamos en idioma inglés a fin de no alterar el significado de las preguntas. Muchas gracias.

*Instructions 1: This questionnaire consists of three main sections. Please read the questions carefully before answering them. Where appropriate, tick in the box or write the answer in the space provided.*

## SECTION 1 – INFORMATION ABOUT YOUR ORGANIZATION

1. What are the main products you make / services you offer: \_\_\_\_\_

2. What is the approximate number of employees in your company?

Less tan 10       11-100       101 – 250       more than 250

3. Where is the facility location?

National       International

4. How old is it? \_\_\_\_\_

## **SECTION 2 - INFORMATION OF IMPROVEMENT REACHED**

**Please score the following concepts according to the following scoring system (1-5) and Percentage of Improvement reached and in what period wherever applicable:**

- 1. Successfully applied**
- 2. Implemented, waiting results**
- 3. To implement in the future**
- 4. Not successful**
- 5. Not interested in implementing at this time**

<b>Concept</b>	<b>Score</b>	<b>% of Improvement</b>	<b>Period</b>
Total Quality Management (company wide continuous improvement for customer satisfaction)			
Statistical Quality Control (use of process control charts)			
Use of 7 quality control tools (check sheets, Pareto diagram, cause and effect diagram, histograms, scatter diagrams, run charts, flow charts)			
Design of Experiments (use of DOE for process optimization)			
Customer Focus (market and customers requirements, expectations and preferences)			
Human Resources (training and motivation to reach the worker's maximum potential)			
Strategic Planning (mission, objectives and action plans - development and deployment)			
Information and Analysis (systems management for performance measurement)			
Processes (process development management for operation units)			
Kaizen Workshops (use of kaizen workshops for continuous improvement)			
Lean Manufacturing (use of Just-In-Time, Lean concepts, cell manufacturing etc.)			
Six-Sigma Tools (use of 6-sigma methodology to improve process or products)			
Empowerment (Operational autonomy for different teams to make a decision)			
ISO-9000:1994 Certification			
ISO-9000:2000 Certification			
Other? Please, specify - Use the verse of the page if needed			

## **SECTION 3 - INFORMATION IN GENERAL**

1. **Does your company have a website?**

Yes

No

If Yes, please go to Question 2

If No, please go to Question 3

2. **How do you use your website?**

advertise only

sell to customers

order to your suppliers

auction for your suppliers

Others (specify):

3. **Is the competition very tough in your market segment?**

Yes

No

I do not know

4. **Is the trend for competition to intensify in the near future?**

Yes

No

I do not know

5. **Do you think that self-organization is possible within your company?**

Yes

No

I do not know

6. **Will cooperation increase in the market in the near future?**

Agree

Disagree

Why? \_\_\_\_\_

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**THANK YOU VERY MUCH FOR YOUR PARTICIPATION. ALL RESPONSES WILL BE TREATED WITH THE UTMOST CONFIDENCE.**

Please return the questionnaire to:

**Dr. Jaime E. Contreras Díaz**  
Zamora 19  
Coatepec, Veracruz C.P. 91500

**Questionnaire designer:**  
**Dr. Luis Borges**  
lborges@sxu.edu

Tel. 01 (228) 816 0909  
Cel. 2221 107334  
jecontreras58@hotmail.com