

# Quality and Statistics:

Total  
Quality  
Management

Milton J. Kowalewski, Jr.  
editor



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# *Quality and Statistics: Total Quality Management*

*Milton J. Kowalewski, Jr., Editor*

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The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

## Foreword

This publication, *Quality and Statistics: Total Quality Management*, contains papers presented at the symposium of the same name held in Atlanta, GA on 4–5 May, 1993. The symposium was sponsored by ASTM Committee E-11 on Quality and Statistics. Milton J. Kowalewski, Jr., of E G & G Rocky Flats, Inc. in Golden, CO presided as symposium chairman and is also the editor of the resulting publication.

# Overview

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It was a warm and balmy time in Atlanta where 16 total quality individuals presented their dreams, messages, and stories to ASTM members and friends. Dorothy Savini and Scott Orthey provided a warm Atlanta welcome and southern style food in addition to their incomparable planning and coordination success. Nancy Trahey, the ASTM Chairman of the Board opened the E11 Symposium by awarding the ASTM Award of Merit and Fellow recognition to Dr. Ricardo Stone for his contributions and persistence. She was followed by E11 Chairman, Duncan McCune, who presented the Harold F. Dodge Award to Dr. Edward G. Schilling for reflecting the spirit and integrity of his late graduate advisor, Dr. Dodge.

These exciting award presentations set the stage for the 2 day marathon of presentations on Total Quality Management in standardization. Kumar-Misir opened the 16 paper series by describing his global-ready business model. His presentation was both informative and appropriate. Zott followed by telling the International Standards Organization (ISO) registration story as it relates to Underwriter's Laboratories (UL) in the United States and other accreditation bodies worldwide. Vardys set the foundation for the following 13 speakers by emphasizing the necessity to plan, control, and prepare documentation systems.

Locke, President of the American Association for Laboratory Accreditation (A2LA), opened the technical section of the morning by sharing his case-study of statistical measurement control for the evaluation of laboratory test results of automobile parts. Octogenarian, Daly, showed us the importance of formal design review, failure mode effects analysis (FMEA), and fault tree analysis (FTA) procedures. He was followed by Tulay who explained the Energy Program Research Institute (EPRI) guide for sampling procured items for the nuclear industry.

Since Mandel was visiting his homeland overseas, McCune aptly read and interpreted Dr. Mandel's paper on the ASTM Guide for Interlaboratory Studies (E 691) and its computer software capabilities. An additional step for enhancing the application of the standard was proposed for use. Lindow closed day one with examples of construction projects where Total Quality Control (TQC) was not used and should have been used.

Day 2 was opened by McCune and Levine presenting the do's and don'ts of control charts. They were followed by Moyer who shared the frustrations and need for quality standards in the manufacture of magnetic products that were identified as functional throughout our homes and automobiles. His interlaboratory study revealed startling results. He was followed by Schilling's transitional paper and easy to apply ABC plan for initiating, establishing, and maintaining both capability and control of processes.

Farrar and yours truly, the symposium chairman, lightened up the morning in preparation for lunch with a philosophical and practical combination of organizational frames and TQM in a road design agency. Bernstein helped us digest lunch by his after meal tour through the "belly" of the chemistry lab at Bridgeport Hospital in Massachusetts. Winding down the last quarter of the marathon of papers on day 2 was Yeung speaking on the results of surveys and quality assurance systems designed for small clothing establishments in Hong Kong where the expectation of the return to Chinese rule in 1997 has retarded the development of quality systems.

Lau spoke about the advantages of continuous process flow analyzers in the Canadian oil industry, and Ping paved the way for us to understand a research project conducted on

Texas highways.

My personal thanks are due the ASTM staff, the speakers, each of the authors, the superb service of the Hyatt Regency Hotel, the ASTM manager of Acquisitions and Review, Kathy Dernoga, for this special collection of leading edge information in the sciences of quality, statistics, and Total Quality Management.

*Milton J. Kowalewski, Jr.*

E. G. & G. Rocky Flats, Inc.,  
Golden, CO;  
Symposium chairman and editor.

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Leslie M. Kumar-Misir (1)

## **INTERNATIONAL COMPETITIVENESS AND BUSINESS EXCELLENCE**

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**REFERENCE:** Kumar-Misir, Leslie M. "International Competitiveness and Business Excellence", Quality and Statistics: Total Quality Management, ASTM STP 1209, Milton J. Kowalewski, Jr., Ed., American Society for Testing and Materials, 1994.

**ABSTRACT:** The road to international competitiveness and business excellence is paved with good intentions. Nevertheless, its elusive nature and mystery can be peeled away, firstly, by a fuller understanding of certain unrelenting economic forces that govern growth and development and the realities of watershed technology, and, secondly, by harnessing the power of the pillars of international competitiveness, viz., globalization of the enterprise, globalization of markets and marketing, the pursuit of superior processing and the practice of business excellence.

**KEY WORDS:** Unbalanced growth, watershed technology, global company, global marketing, external minima, processing advantage, CQI, Triple-CIM, concurrent engineering.

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### **SEARCHING FOR THE WAY**

In our rapidly changing global output and trade environment, the international competitiveness and business excellence of world industry is the key to the continued growth and prosperity of the group of More Developed

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(1) Industry Analyst, Textiles, Apparel and Leather Directorate, Consumer Products Branch, Industry Canada, Ottawa, Ontario K1A 0H5, Canada.



Countries (MDCs), and at the same time , the gateway to economic growth, economic development, economic progress and never-ending prosperity for the Lesser Developed Countries (LDCs). Promoting significantly improved performance by a country's commercial-industrial complex in the global marketplace must be a central element of the mandates of governments, industry et al.

Everyone everywhere in the world is interested in understanding and achieving international competitiveness and business excellence. To meet this worldwide interest, a veritable deluge of information has been generated, appearing in text books, articles in learned journals, etc. But much remains to be clarified and made simple.

Here are some examples of this great interest and its various interpretations. In Canada,

*"To take advantage of the immense opportunities opening up in the new global market-place, Canadians must improve their ability to compete. The "Action Plan for Canada's Prosperity" makes clear that the keys to achieving this are innovation and quality management practices combined with technological mastery and growing productivity", (Inventing Our Future: An Action Plan for Canada's Prosperity, 9-60).*

In the United States of America,

*"Globalization is the effective deployment and utilization of worldwide resources, integrated with opportunities, to achieve competitive advantage and superior business results", (Globalization: The Forces Behind, 5).*

In Mexico,

*"Observers point to four strategies to improve the prospects for long-term competitiveness and market power of the Mexican textile industry: cost reduction, foreign investment, strategic/ technological improvements, and expanded demand", (Competitiveness of the Mexican Textile Chain, 40).*

## TYRANNY OF THE STATUS QUO

All situations default (or seem to default) to the status quo. Indeed, the status quo is a most loyal companion and, its tyranny is acknowledged repeatedly with the common observation: "...but we've always done it this way!"

How then does this gentle tyrant exercise its rule over industry?

Canada's great manufacturing industries are rich with examples of sectors remaining home-market bound. Indeed, it is frustrating to note that, despite Canada's long manufacturing history, currently two-thirds of Canadian companies do not sell their products outside Canada.

Canada's spunky textile industry is but one case. From rather humble beginnings, namely, the start-up of a small cotton yarn and fabric mill in Sherbrooke in 1844 and another in Montreal in 1853, the Canadian textile industry today is found across the land, busily producing an impressive range of textiles and textile products for domestic consumption and export markets. Currently, the industry comprises some 1 065 firms, employs around 51 000 workers and annually ships some \$5.7 billion, of which a mere 19.3 percent is exported.

Table 1 summarizes the default condition. While external market shares generally have risen in the latest two year period shown below, except for floor tile, linoleum and coated fabrics, and manmade fibres and yarns, to date, the external market shares of this long-established industry are far from what are desirable for Canada to be considered a textile exporting country, i.e., a country with a global textile industry.

**TABLE 1 -- NOT REALLY A GLOBAL INDUSTRY, TEXTILE MARKET SHARES BY SECTORS, CANADA, 1988 TO 1990**

	External Markets		Domestic Markets	
	1988	1990	1988	1990
	-%-			
Floor Tile, Linoleum and Coated Fabrics .....	45.8	67.3	54.2	32.7
Manmade Fibres and Yarn .....	28.1	42.1	71.9	57.9
Miscellaneous Textiles and Tire Cord .....	15.5	23.0	84.5	77.0
Natural Fibre Processing and Felt Products .....	34.5	21.8	65.5	78.2
Wool Yarn and Woven Fabrics .....	12.8	19.3	87.2	80.7
Other Spun Yarn & Woven Fabrics .....	11.5	15.0	88.5	85.0
Narrow Fabrics .....	5.3	10.6	94.7	89.4
Carpet, Mats and Rugs .....	8.3	10.1	91.7	89.9
Textile Hygiene Products .....	3.1	4.5	96.9	95.5
Broadknitted Fabrics .....	1.6	4.4	98.4	95.6
Textile Home furnishings .....	17.9	3.2	82.1	96.8
Canvas and Related Products .....	2.0	1.7	98.0	98.3
Contract Dyeing and Finishing .....	0	0	100.0	100.0

**SOURCE:** Textiles and Leather Directorate, Consumer Products Branch, ISTC.

#### **PRECONDITIONS FOR INTERNATIONAL COMPETITIVENESS**

Preconditions for achieving goals, business and otherwise, abound. Two preconditions are especially relevant to the drive to international competitiveness and business excellence of nations. They are: (a) unbalanced growth and (b) technological watersheds.

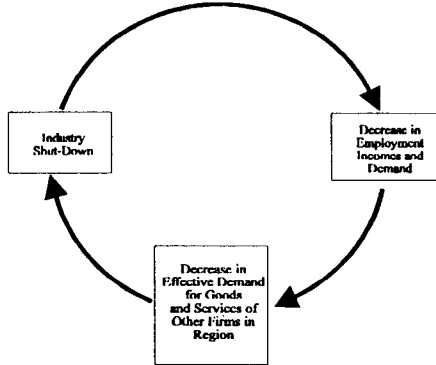
### Unbalanced Growth versus Balanced Growth

Put simply, the experience of nations culminating in the rise of a smaller number of industrialized countries argue in favour of a theory of unbalanced growth, when analyzing the break-up of nations into more developed countries (MDCs) and less developed countries (LDCs), and, in turn, that of an MDC into rapid-growth regions and slow-growth regions.

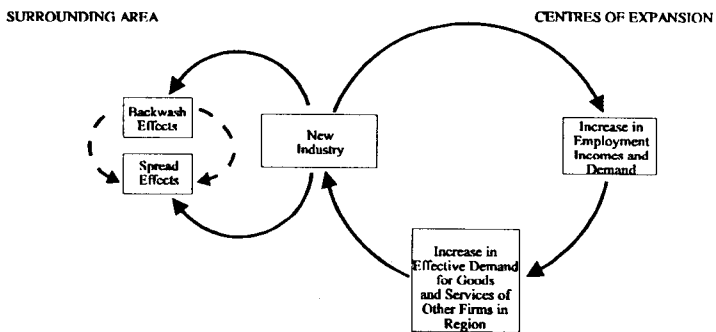
To explain, unbalanced growth theory states that economic growth stems from the interplay of three forces: a) cumulative causation defined as a "circular constellation of forces tending to act and react upon one another in such a way as to keep a poor country in a state of poverty", b) back-wash effects defined as "all relevant adverse changes, caused outside that locality, of economic expansion in a locality", and c) spread effects defined as "certain centrifugal "spread effects" of expansionary momentum from the centres of economic expansion to other regions", (Economic Theory and Underdeveloped Regions, 11, 30-31). Indeed, economic change is not normally accompanied by countervailing changes but, instead, by supporting changes which not only move the system in the same direction as the first change but much further, (Figures 1 and 2).

# FIGURE 1

## THE DECLINING REGION IN THE DRIFT TOWARDS REGIONAL ECONOMIC INEQUALITIES



SOURCE: Based on Gunnar Myrdal, *Economic Theory and Under-Developed Regions* (London: Gerald Duckworth and Co. Ltd., 1957)

**FIGURE 2****REGIONAL CENTRES OF ECONOMIC EXPANSION IN THE DRIFT TOWARDS REGIONAL ECONOMIC INEQUALITIES**

SOURCE: Based on Gunnar Myrdal, *Economic Theory and Under-Developed Regions* (London: Gerlad Duckworth and Co. Ltd., 1957)

TECHNOLOGICAL WATERSHEDS

From the dawn of civilization to the present day, technological watersheds continue to occur bringing decline certainly but more importantly, giving rise to the conditions for nations to achieve sustained international competitiveness and business excellence, (Figure 3).

FIGURE 3  
TECHNOLOGICAL WATERSHEDS, 7000 BCE TO PRESENT AND BEYOND

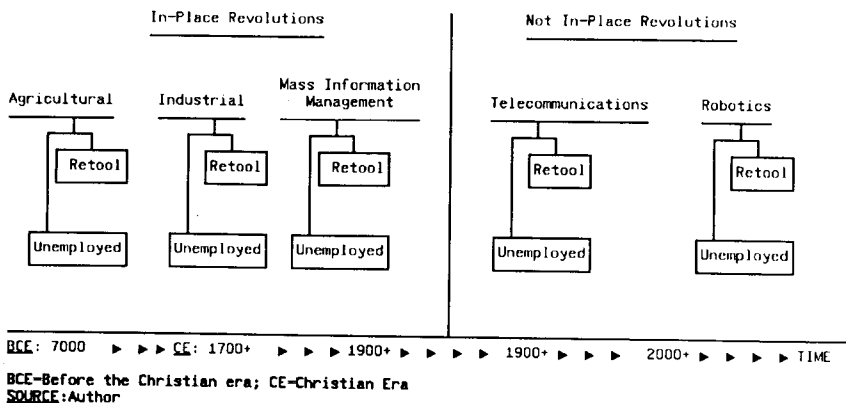


Figure 3 suggests that socio-economic progress and the satisfaction of ever-changing human wants and desires are maximized when quantum leap-type technology revolutions, past and imminent, are recognized and incorporated fully into the business culture, i.e., when the retool phenomenon path is followed. Alternatively, when technology revolutions are ignored or served less than fully, the phenomenon of the "pools of unemployed" will prevail. Indeed, international competitiveness and business excellence may forever remain just beyond one's grasp.

**INTERNATIONAL COMPETITIVENESS AND BUSINESS EXCELLENCE**

The shift to a North American market, accelerated, on the one hand, by the U.S.-Canada Free Trade Agreement of 1989 and the actions by the United States, Canada and Mexico to implement a North American Free Trade Agreement (NAFTA), and the unrelenting globalization of enterprise and trade, on the other, demand that concerned countries everywhere complete effective reconstruction and development towards achieving sustained international competitiveness (IC) and business excellence (BE).

What is this thing called international competitiveness? What and how many are the pillars of international competitiveness? Do they converge to form a practical model of international competitiveness?

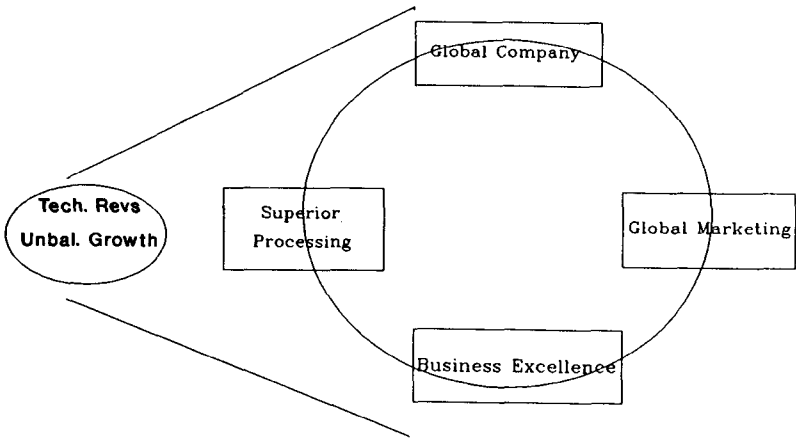
International competitiveness may be defined as the power of a global company to undertake sustained production and/or marketing of customer-quality driven products in one or more of the four smaller markets of the single global market, viz., local, regional, national and external, in which competing products, perfect or otherwise, may also be offered, or to be global market-ready, i.e., ready to enter on a sustained basis any smaller market of the single global market anywhere at any time.

Recalling the earlier overview of unbalanced growth and technological watersheds, as is the case with the rise of rapid-growth regions, a circular constellation of forces tend to act and react upon one another in such a way as to bring international competitiveness and business excellence to the responsive enterprise. These irresistible forces separate to yield four pillars of international competitiveness, namely, the global company, global marketing, superior processing and business excellence. Their workings are circular, interactive, interdependent and



convergent. Schematically,

FIGURE 4  
THE FOUR PILLARS OF INTERNATIONAL COMPETITIVENESS



SOURCE: Author

The four pillars of international competitiveness are explained below.

Global Company

A global company is neither a multi-national enterprise (MNE) nor a subsidiary as currently (and historically) recognized. Rather, a global company is a newly evolved business enterprise (NEB) that:

- 1) produces and/or distributes an economic good or service which is in demand worldwide,
- 2) is engaged in sustained international marketing,