QUALITY, MANUFACTURING STRATEGY AND GLOBAL COMPETITION: AN EMPIRICAL ANALYSIS

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ABSTRACT

QUALITY, MANUFACTURING STRATEGY AND GLOBAL COMPETITION: AN EMPIRICAL ANALYSIS

Over the past ten years, intense global competition has forced many firms to examine their business practices and to evaluate how to meet the challenges economic globalization has presented. Underlying these efforts has been an examination of strategic priorities and in particular recognition of the need to improve product and process quality. While quality improvement has become a pervasive element of business strategy, allowing some companies to respond to increasing competitive pressures, it has not been universally effective. This study uses a survey of over three hundred senior quality personnel to identify the challenges businesses face from globalization and how strategic initiatives, and in particular, quality improvement efforts, are used to respond to them.

Key Words: Manufacturing Strategy, Quality Management, Economic Globalization.
INTRODUCTION

Intense global competition has forced many firms to examine their core business processes and to devise plans to respond to an increasingly competitive marketplace. Several factors have come together to cause this increase in competition. Foremost amongst these have been the shortening of product life cycles, rapidly changing demand patterns, the increasing presence of Japanese and European producers, and the emergence of producers from countries of the Pacific Basin as significant players in world markets. These forces have forced North American companies to critically assess their key competencies and to develop strategies to compete effectively in a global economy. At the forefront of these efforts have been attempts to improve flexibility and quality, stimulate innovation, and reduce lead times, while simultaneously keeping costs down.

Underlying responses to global competition has been the recognition of the role of product and process improvement in business strategy. Throughout the 1990s, firms examined and, in many cases, changed their quality focus. Instead of relying on inspecting quality into products, they emphasized improving product and process design, implementing process control, and continually improving processes (Symons and Jacobs, 1995). Total Quality Management became a major element in corporate strategy (Malhotra et al., 1994). Indeed significant numbers of large firms adopted quality programs during the nineties (Hiam, 1993) though with mixed results.

Quality improvement is but one way for an organization to improve its competitiveness. Even in the absence of competition, improvements in quality can facilitate an organization's competitiveness, though as witnessed over the last decade, competition has for many organizations been the driver of quality improvement efforts. This study examines the impact changes in the global economy have had on North American companies, and in particular the role quality has played in responding to them. It also identifies consistencies and inconsistencies between organizational
responses to competition and how quality is used for strategic advantage.

METHODODOLOGY

Measures of Global Competitive Pressure

Much has been written in recent years about the impact of global competition. To operationalize this impact, five measures of global competition were identified. These are increases in an organization's ability to (1) enter and develop global consumer markets and (2) exploit regional advantages (e.g., lower production costs, obtain higher quality materials), increases in competitive pressure encountered, and in the challenge faced from foreign companies on the basis of (1) low cost, and (2) quality, flexibility, innovation or service. Survey questions based on these indicators were structured using a seven point Likert scale (high scores indicate agreement with statements that competition had increased).

To identify the impact of regional differences in competition, four geographic regions of the world were delineated; the United States and Canada, Western Europe, Japan and the Pacific Basin, and Other, defined to consist of Mexico, Latin America, Southeast Asia, Central and Eastern Europe. Respondents were asked to estimate the percentage of sales from each geographic region, and, using a seven point Likert scale, the extent of competition encountered from competitors based in each region (high scores indicate high levels of competition).

Measures of Strategic/Quality Priorities

For the purpose of this study, top management’s strategic priorities are defined as management’s strategic orientation towards achieving competitive advantage and how their organization competes in the market place. Five priorities frequently cited in the literature were identified: manufacturing flexibility, quality-based differentiation, low-cost production, innovation,
and time-based competition. Respondents were asked to allocate one hundred points to the priorities in relation to the relative importance each is given in strategic planning.

As described earlier, quality management has played an increasingly prominent role in strategic planning in recent years. While a plethora of approaches to quality management have been used, little agreement exists on how to deploy them, what programs work, and how specific initiatives relate to broader strategic objectives (Greene, 1993). Evidence in fact suggests that the lack of well-defined linkages between deployment and performance has resulted in organizations using quality programs ineffectively, helping to explain the mixed results of quality initiatives (Schaffer and Thomson, 1992, Cole, 1993). Handfield (1989) classified quality management efforts into four interdependent strategies: designing quality into the product, process control, process improvement, and inspection. Given the lack of consensus on the deployment of quality strategies, these categories were used as the basis for asking respondents about their orientation towards quality. Respondents were asked to allocate one hundred points to the four categories in relation to the relative importance each is given in their organization. In addition, respondents were asked to define quality in their own words.

Survey Instrument and Sample Characteristics

A survey instrument based on the constructs above was developed and pre-tested on a number of senior quality managers at firms in the United States and Europe that competed globally. As a result of the pre-testing, changes were made to the instrument to improve its validity and clarity. The revised instrument was sent to 1,469 quality directors and vice presidents of manufacturing firms identified from an American Society of Quality membership database. The organizations represented by these individuals came from a cross section of manufacturing industries. Of the 313 companies to respond to the survey, 22.5% employed less than 100 employees, 14.7% employed between 101 and
200 employees, and 9.2% employed more than 8,000 employees. Approximately 81% of the firms’ sales were in the United States and Canada, 7% in Western Europe, 5% in Japan and the Pacific Basin, and 7% in others. Seventy nine percent of firms used written quality plans. These plans had been in place for an average of seven years. The typical planning horizon for the quality plans was 3.5 years. Sixty-four firms did not have a specific written quality plan. Seventy-three firms were ISO 9000 certified but of the two hundred and thirty six non-ISO 9000 certified firms, 145 intended to seek certification.

SURVEY RESULTS

Summary Results

Based on a Likert scale of 1 (low) to 7 (high), Bonferroni multiple comparisons indicate that respondents faced the greatest competition from North American companies (\( \bar{x} = 6.12 \)) followed by companies from Western Europe (\( \bar{x} = 3.75 \)), and Japan and the Pacific Basin (\( \bar{x} = 3.71 \)). They faced the least competition from companies from Central and Eastern Europe, Mexico, Latin America and Southeast Asia (\( \bar{x} = 2.55 \)), suggesting that low cost producers in less developed nations are not considered to be a competitive threat. In terms of how globalization had affected organizations, the greatest impact was in increased competitive pressure (\( \bar{x} = 4.75 \)), ability to enter and develop global consumer markets (\( \bar{x} = 4.59 \)), and challenge from low cost competitors (\( \bar{x} = 4.58 \)). Increased challenge from foreign competitors based on quality (\( \bar{x} = 4.01 \)) and increased ability to reap regional advantages (\( \bar{x} = 3.59 \)) had the least impact on organizations. The observation that companies face greater challenge from foreign competitors based on cost than quality, combined with the lack of perceived threat from developing nations, suggests that companies are concerned about the ability of more advanced foreign competitors to use cost for competitive advantage.

When asked to allocate 100 points among five business practices, three distinct groups of
strategic priorities emerge from the survey. Low cost production \( (\bar{x} = 25.5) \) and quality-based differentiation \( (\bar{x} = 23.2) \) are deemed to be most important priorities. This is consistent with the observation regarding high quality/low cost foreign competitors though causality cannot be inferred from survey results. Innovation \( (\bar{x} = 19.3) \) and manufacturing flexibility \( (\bar{x} = 18.8) \) are the next most important priorities. Somewhat surprisingly, time-based competition is the least important strategic priority \( (\bar{x} = 13.2) \). What is not clear is whether this is because respondents do not consider time-based competition to be important, or, more likely, whether they are satisfied with their time based performance.

Two hundred and twenty-eight respondents provided a single definition of quality, while another fifty-eight respondents provided multiple definitions (Figure 1). Approximately 28% defined quality as meeting or exceeding customers’ specific written product requirements. Another 22% defined quality as meeting or exceeding customers’ expectations. Little over than 17% defined quality as customer satisfaction. Only 2.8% defined quality primarily as low cost/fair price though this rises to 4.4% when multiple responses are considered.

When asked to allocate 100 points among four approaches to indicate how specifically their organizations achieved quality, the use of process control to monitor process performance \( (\bar{x} = 27.4) \), and product design to build quality into products \( (\bar{x} = 25.9) \), appear to receive the most attention. The use of inspection was the least likely to be used \( (\bar{x} = 22.6) \).

Impact of Globalization

Correlation of sales and level of competition indicates a statistically significant positive correlation \( (\alpha = 0.05) \) between the region where a company sells its products and the level of
competition from companies in that region (Table 1). This is consistent with organizations encountering significant competition from local and regional competitors, and with this competition stimulating sales. However, analysis of competition from other regions reveals interesting outcomes. Sales volume in North America correlates negatively with competition from other regions of the world. Companies with a strong North American sales focus do not appear to perceive foreign competition to be a threat. In contrast, companies with relatively high overseas sales consider companies from all other regions of the world to pose significant competition. This suggests differences in perceptions about competition between companies with an export focus and those with a more domestic focus. When examining sales outside North America however, the results change. Relative sales volume in Western Europe correlates positively with competition from all regions except North America. North American companies appear not to be considered major competitors in Western Europe. This may reflect the fact that North American companies have not made the same effort to establish themselves as a presence or reaped the same rewards in Western Europe that Japanese and other Asian companies for example have. Relative sales volume in Japan and the Pacific Basin correlates positively with competition from North America (as well as from companies from Japan and the Pacific Basin). This is consistent with the significant efforts North American companies have made to enter the Japanese and Pacific markets. It may also be an indication that only Japanese and North American companies can meet the quality standards required to compete in Japan in particular. Relative sales volume for the remaining geographic region correlates positively with competition from all regions of the world except North America. This indicates that companies from Western Europe, Japan, and the Pacific Basin are demonstrating a greater commitment than
North American companies to entering developing markets.

Not surprisingly, global competition has placed new challenges on organizations. However, it is only non-North American based competition that has had this effect (Table 2). This suggests either complacency towards North American competitors or, more likely, that it is overseas competition that poses the present challenge.

**Role of Quality**

Correlation analysis reveals interesting observations regarding how quality is used to achieve strategic priorities. A significant negative correlation exists between the importance of time-based competition and the use of process control to achieve quality (Table 3). One would expect that companies competing on time would be concerned with process reliability. The results however suggest that since process control does not actively reduce lead-time and is a passive approach to quality improvement, it is not a preferred device of time based competitors. This is to some degree substantiated by the observation that product design and process improvement, which more actively reduce lead times, correlate positively (though not at $\alpha = 0.05$) with time based competition as a strategic priority. Innovation as a strategic priority correlates positively with product design as one might expect. Not surprisingly, inspection correlates negatively with innovation. Producers of innovative products understand that quality must be built into the product and cannot be inspected in. Inspection does however correlate positively with a strategy based on low cost. This suggests that
organizations that focus on cost reduction are not willing to make the commitment to product and process improvement to meet the competitive challenge, but are willing to rely on short term fixes that require smaller outlays of capital. A strategy based on low cost does in fact correlate negatively with the use of product design and process improvement as vehicles for quality improvement, though the correlation with process improvement is not significant.

Strategic Responses to Global Competition

To identify relationships between strategic priorities, in particular those based on quality, and responses to global competition, correlation of the impact of competition and (a) strategic priorities and (b) how quality is achieved, was conducted. While these highlight some relationships, they indicate surprisingly little by way of linkages between competition and strategy. Of the five strategic priorities, only innovation, which correlates positively with three of the five indicators of competition, appears to relate consistently to measures of competition (Table 4). This is noteworthy given that innovation is not considered by respondents to be the most important of the five priorities. The result suggests that while innovation has been advantageous to companies trying to enter new markets, innovation cannot be compromised by inadequate quality. The importance of innovation in entering new markets is substantiated by the observation that the ability to enter new markets correlates positively with the use of a quality strategy based on product design but negatively with one based on inspection (Table 5). These are clear indications of the impact of product development in establishing a presence in new markets. Notably, a quality strategy based on inspection is the only one that correlates significantly with more than one indicator of competition, and in each case, the correlation is negative.
CONCLUSIONS

North American companies have in the past responded to the influx of foreign made products by emphasizing the need for greater product quality. As these same companies strive to compete in increasingly competitive global markets, it is natural to view quality as one way by which they can do so. It is apparent however that a lack of clarity exists regarding the strategic use of quality and responses to global competition. Survey results indicate that innovation and effective product development are crucial to providing a response to global competition. However, while companies strive to improve the quality of their products, they cannot overlook the threat from companies that have been able to reduce costs while maintaining high quality standards. Results also suggest that as North American companies enter new overseas markets, they may well encounter competitors that they do not currently perceive to pose an obstacle. Overseas markets represent opportunity for North American companies. However, as companies from other advanced economies with established manufacturing infrastructures and competitive quality standards exploit their absence, North American competitors will face additional hurdles in establishing a presence in these new markets.
References


![](image-url)  
**Figure 1: Definitions of Quality**
Table 1: Correlation of Sales and Level of Competition

<table>
<thead>
<tr>
<th>Percent of Sales in</th>
<th>Level of Competition From</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S. &amp; Canada</td>
</tr>
<tr>
<td>U.S. &amp; Canada</td>
<td>0.124*</td>
</tr>
<tr>
<td>Western Europe</td>
<td>-0.061</td>
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<tr>
<td>Japan &amp; Pacific Basin</td>
<td>0.279*</td>
</tr>
<tr>
<td>Others</td>
<td>-0.084</td>
</tr>
</tbody>
</table>

* indicates statistically significant at $\alpha = 5\%$

Table 2: Correlation of Impact of Globalization and Level of Competition

<table>
<thead>
<tr>
<th>Economic Globalization has increased</th>
<th>Level of Competition From</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S. &amp; Canada</td>
</tr>
<tr>
<td>Competitive pressure</td>
<td>-0.037</td>
</tr>
<tr>
<td>Ability to enter and develop global consumer markets</td>
<td>-0.004</td>
</tr>
<tr>
<td>Challenge from low cost competitors</td>
<td>-0.014</td>
</tr>
<tr>
<td>Challenge from foreign competitors based on quality</td>
<td>-0.074</td>
</tr>
<tr>
<td>Ability to use regional comparative advantages</td>
<td>-0.019</td>
</tr>
</tbody>
</table>

* indicates statistically significant at $\alpha = 5\%$

Table 3: Correlation of Quality Strategy and Strategic Priority

<table>
<thead>
<tr>
<th>Quality Achieved by</th>
<th>Strategic Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Cost Production</td>
</tr>
<tr>
<td>Process Control</td>
<td>0.081</td>
</tr>
<tr>
<td>Product Design</td>
<td>-0.196*</td>
</tr>
<tr>
<td>Process Improvement</td>
<td>-0.016</td>
</tr>
<tr>
<td>Inspection</td>
<td>0.114*</td>
</tr>
</tbody>
</table>

* indicates statistically significant at $\alpha = 5\%$
Table 4: Correlation of Impact of Globalization and Strategic Priority

<table>
<thead>
<tr>
<th>Economic Globalization has increased</th>
<th>Strategic Priority</th>
<th>Low Cost Production</th>
<th>Quality-Based Differentiation</th>
<th>Innovation</th>
<th>Manufacturing Flexibility</th>
<th>Time-Based Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive pressure</td>
<td></td>
<td>0.112*</td>
<td>-0.048</td>
<td>0.007</td>
<td>-0.002</td>
<td>-0.119*</td>
</tr>
<tr>
<td>Ability to enter and develop global consumer markets</td>
<td></td>
<td>-0.062</td>
<td>-0.019</td>
<td>0.240*</td>
<td>-0.107</td>
<td>-0.074</td>
</tr>
<tr>
<td>Challenge from low cost competitors</td>
<td></td>
<td>0.064</td>
<td>-0.021</td>
<td>0.063</td>
<td>-0.092</td>
<td>-0.053</td>
</tr>
<tr>
<td>Challenge from foreign competitors based on quality</td>
<td></td>
<td>0.006</td>
<td>0.022</td>
<td>0.016*</td>
<td>-0.300</td>
<td>-0.015</td>
</tr>
<tr>
<td>Ability to use regional comparative advantages</td>
<td></td>
<td>-0.046</td>
<td>0.061</td>
<td>0.156*</td>
<td>-0.088</td>
<td>-0.096</td>
</tr>
</tbody>
</table>

* indicates statistically significant at \( \alpha = 5\% \)

Table 5: Correlation of Impact of Globalization and Quality Strategy

<table>
<thead>
<tr>
<th>Economic Globalization has increased</th>
<th>Quality Achieved by</th>
<th>Process Control</th>
<th>Product Design</th>
<th>Process Improvement</th>
<th>Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive pressure</td>
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<td>0.005</td>
<td>-0.022</td>
<td>0.101</td>
<td>-0.060</td>
</tr>
<tr>
<td>Ability to enter and develop global consumer markets</td>
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<td>0.013</td>
<td>0.120*</td>
<td>0.038</td>
<td>-0.147*</td>
</tr>
<tr>
<td>Challenge from low cost competitors</td>
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<td>0.005</td>
<td>0.010</td>
<td>0.101</td>
<td>-0.080</td>
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<td>Challenge from foreign competitors based on quality</td>
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<td>-0.007</td>
<td>0.019</td>
<td>0.170*</td>
<td>-0.126*</td>
</tr>
<tr>
<td>Ability to use regional comparative advantages</td>
<td></td>
<td>0.001</td>
<td>0.078</td>
<td>0.045</td>
<td>-0.096</td>
</tr>
</tbody>
</table>

* indicates statistically significant at \( \alpha = 5\% \)