COMPETITIVE PRIORITIES: INVESTIGATING THE NEED FOR TRADE-OFFS IN OPERATIONS STRATEGY*

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A heated debate continues over the need for trade-offs in operations strategy. Some researchers call for plants to focus on a single manufacturing capability and devote their limited resources accordingly, while others claim that advanced manufacturing technology (AMT) enables concurrent improvements in quality, cost, flexibility, and delivery. Yet there is little empirical evidence for or against the trade-off model. In response, this study addresses the question: “To what extent do manufacturing plants view competitive priorities as trade-offs?” We employ survey data collected from managers and operators in 110 plants that have recently implemented AMT. Our findings suggest that trade-offs remain. However, perceived differences in competitive priorities are subtle and may vary across levels of the plant hierarchy.

(COMPETITIVE PRIORITIES; OPERATIONS STRATEGY; SURVEY RESEARCH/DESIGN)

1. Introduction

Competitive priorities are a key decision variable for operations managers and researchers. Competitive priorities denote a strategic emphasis on developing certain manufacturing capabilities that may enhance a plant’s position in the marketplace. Such emphasis may guide decisions regarding the production process, capacity, technology, planning, and control (Skinner 1969; Hayes and Wheelwright 1984; Ward, McCreery, Ritzman, and Sharma 1998). Reviewing research published since 1960, Swink and Way (1995) found that competitive priorities have become an increasingly important factor in empirical studies. Yet accumulating research suggests both growing consensus and debate in operations strategy literature.

Over the past two decades, a relatively shared framework of the content of operations strategy has emerged. Most researchers view operations strategy as defined by the relative weighting of manufacturing capabilities, including low cost, quality, flexibility, and delivery. Although some conceptual studies suggest innovativeness and service as additional priorities, empirical research and strategy theories consistently stress the four basic capabilities (Schmenner and Swink 1998; Ward, McCreery, Ritzman, and Sharma 1998). Similarly, there is general agreement that the effectiveness of an operations strategy is determined by the degree of consistency between emphasized competitive priorities and corresponding decisions regarding operational structure and infrastructure (Leong, Snyder, and Ward 1990). In
essence, fitting a plant’s practices (e.g., technological investments, human resource systems, inventory controls) to its competitive priorities is crucial to developing operations as a competitive advantage. Figure 1 illustrates the prevailing model of the content of operations strategy and conveys the idea that operating decisions such as capacity, technology, workforce issues, and quality systems must be carefully matched with the organization’s key competitive priorities.

Yet while the general framework for operations strategy is fairly well defined, debate continues over the relationship between competitive priorities. This debate involves three perspectives: the trade-off, cumulative, and integrative models. The trade-off model is the most established, first posited by Skinner (1969). This model proposes that companies must make choices regarding which competitive priorities should receive the greatest investment of time and resources. Companies are generally forced to make trade-offs between various priorities, based on their relative importance. Managers must choose a manufacturing priority, then allocate their scarce resources accordingly (Hayes and Wheelwright 1984; Garvin 1993). In contrast, advocates of the cumulative model claim that trade-offs are irrelevant in a world of intense competition and advanced manufacturing technologies (e.g., Corbett and Van Wassenhove 1993; Noble 1995). Competitive priorities are considered complementary, rather than mutually exclusive, as an existing capability (e.g., quality) may aid development of other capabilities (e.g., flexibility). “World Class Manufacturers” serve as exemplars, excelling along multiple dimensions. The integrative perspective seeks to reconcile differences between trade-off and cumulative models. Proponents claim that these models address varied facets of operations strategy, allowing theorists to link their disparate insights (e.g., Hayes and Pisano 1996; Schmenner and Swink 1998).

Despite this heated debate, there is little empirical evidence supporting approaches that promote, negate, or integrate the trade-off model (Swink and Way 1995; Szwejczewski, Mapes, and New 1997). In response, this study investigates the need for trade-offs in operations strategy. We begin by briefly reviewing trade-off, cumulative, and integrative models to summarize their varied arguments. The next section presents the design of this study, addressing the methodological challenges of trade-off research. We employ empirical data collected from managers and operators in 110 manufacturing plants that have recently implemented advanced manufacturing technology. Our findings suggest that trade-offs remain. However, recognizing trade-offs may require methods sensitive to subtle differences in respondents’ rankings and to varied perceptions of competitive priorities throughout a plant. We conclude by discussing implications for operations decision makers and researchers.

**Trade-Offs Between Competitive Priorities: Vital or Irrelevant?**

Skinner (1969, 1974) proposed the trade-off model in a series of conceptual studies. His work calls for managers to choose their plant’s competitive priority, then design and operate the manufacturing system accordingly, concentrating efforts on developing assets and practices that help achieve their goals. Plants should focus on one priority at a time, because cost,
flexibility, quality, and delivery capabilities require different operational structures and infrastructures for support. Hayes and Wheelwright (1984) further stress the importance of focused manufacturing:

It is difficult (if not impossible) and potentially dangerous for a company to try to compete by offering superior performance along all of these dimensions, since it will probably end up second best on each dimension to some other company that devotes more of its resources to developing that competitive advantage (Hayes and Wheelwright 1984, p. 141).

Trade-off studies examine the need for plants to prioritize their strategic objectives and devote resources to improving those manufacturing capabilities. For example, researchers frequently claim that plants must make choices between achieving low costs or high flexibility (e.g., Hayes and Wheelwright 1984; Garvin 1993; Hill 1994). Low cost producers seek to reduce waste and improve productivity, often designing efficient line flow systems comprised of relatively fixed machinery and standardized operator tasks. In contrast, highly flexible plants may choose a job shop design, seeking rapid response to changing customer demands and product specifications. Ward, McCreery, Ritzman, and Sharma (1998) recently found support for this claim, linking line flow and job shop manufacturing processes to cost and flexibility priorities, respectively.

Advocates of the cumulative model, however, claim that trade-offs are neither desirable nor necessary for two reasons. First, global competition has intensified the pressure on plants to improve along all four dimensions. “World Class Manufacturers” set the standard, developing capabilities that reinforce one other. The most quoted example is of high quality enabling plants to become more responsive to customer needs (flexibility), more reliable (delivery), and more efficient (cost) (Schonberger 1990; Szweczyzewski, Mapes, and New 1997). Second, advanced manufacturing technology (AMT)—flexible manufacturing systems, computer-integrated manufacturing, and other programmable automation—helps plants develop multiple capabilities simultaneously. According to Corbett and Van Wassenhove (1993), AMT may allow production of widely varied or customized products with greater precision, speed, and efficiency.

In one of the first cumulative studies, Nakane (1986) proposes that Japanese plants follow a pre-specified order for developing manufacturing capabilities. Ferdows and De Meyer (1990) extend this notion, advocating that plants apply a “sand cone model.” Plants should build capabilities sequentially, first seeking high quality, then dependable delivery, followed by low costs and flexibility. Each successive capability becomes the primary focus once minimum levels of the preceding capabilities have been achieved. Their sample of 187 European manufacturers lent some support to the model, depicting the cumulative effect of quality. Studies by Roth and Miller (1992) and Noble (1995) also suggest that priorities are positively correlated and that high-performing plants are more likely to compete on multiple dimensions.

Yet proponents of integrative models stress that there remains little “proof” that either the trade-off or cumulative model is more correct. Indeed, elements of both may be applicable. Skinner (1996) claims that his original ideas have been interpreted too rigidly, stating: “Naturally, the particular trade-offs are quite different from those of 25 years ago, but trade-offs are still facts in technologically based systems” (p. 9). Managerial and technological advances, however, change the nature of trade-offs by advancing the overall performance frontier. For example, airplane manufacturers today must make choices between producing faster (i.e., the Concorde) or more economical (i.e., Boeing 747) planes. Yet both products are substantially “better” on several dimensions than their predecessors of 30 years ago. Similarly, Hayes and Pisano (1996) separate static, first-order trade-offs from dynamic, second-order trade-offs. They contend that “managers are still faced with critical trade-offs, but these are more subtle than those addressed by early writers on manufacturing strategy: they involve not only the competitive dimensions themselves, but also their rates of improvement” (p. 37).
Schmenner and Swink (1998) propose that the two models examine operations strategy from different, but potentially complementary perspectives. They explain: “The law of trade-offs is reflected in comparisons across plants at a given point in time, whereas the law of cumulative capabilities is reflected in improvements within individual plants over time. The two laws are not in conflict” (1998, p. 107). To integrate the models, they argue that plants possess both an operating and an asset frontier. The asset frontier is the maximum performance possible based on a plant’s structure (i.e., physical investments), while the operating frontier denotes the performance made possible by infrastructural choices (i.e., operating policies), given a set of assets. The farther plants are from operating on their asset frontier, the more operational choices available. For example, major technological changes extend the asset frontier, providing more room for improvement and thereby enabling plants to enhance multiple capabilities concurrently. This premise fits the cumulative model. Yet, as a plant approaches its asset frontier (i.e., becomes fully utilized), building capabilities requires more resources and intensifies the need for focus. Thus, the trade-off model is most applicable to firms operating near their asset frontier.

The research presented here contributes to existing literature by addressing the question: “To what extent do manufacturing plants view competitive priorities as trade-offs?” We employ data from a survey of 110 plants that have recently implemented AMT. This sample provides a particularly difficult test of the trade-off model for two reasons. First, advocates of the cumulative model claim that AMT may help plants develop multiple capabilities concurrently (Corbett and Van Wassenhove 1993). Second, following Schmenner and Swink’s (1998) integrative model, AMT implementation may distance plants from their asset frontiers, increasing operational choice and reducing the need for trade-offs.

Research Design

Critics claim that existing empirical studies of operations strategy are plagued by various methodological weaknesses (e.g., Swink and Way 1995; Szwejczewski, Mapes, and New 1997; Boyer and McDermott 1999; Boyer and Pagell 2000). In particular, level of analysis, sample size, and survey respondent issues pose considerable challenges. We seek to address these three challenges in the design of this research.

First, operations strategy has been examined at strategic business unit, plant, and department levels. However, level of analysis should be consistent with researchers’ objectives (Swink and Way 1995). Szwejczewski, Mapes, and New (1997), for example, criticized Ferdows and De Meyer (1990) for offering an exceptionally extensive, yet potentially biased test of the trade-off model. They examine large manufacturing companies that often included several plants, facilitating development of different capabilities within alternative sites. In contrast, we surveyed individual plants, because Skinner (1969, 1974) viewed trade-offs as a plant level phenomenon; individual factories prioritize their strategic goals, then devote scarce resources to their support.

Second, research designs ideally should yield generalizable findings and aid data interpretation. Yet, according to Swink and Way (1995), existing research often consists of richly detailed, but potentially idiosyncratic case studies, or small and convenient survey samples (i.e., between 6 and 40 respondents). At the other extreme, they note that large samples may foster generalizability, but create analytical challenges. Plants differing widely in their technology or infrastructure make it difficult for researchers to isolate the causes of variations.

For this study, we sought a large, yet focused sample. To identify potential survey respondents, we worked closely with Makino, a major manufacturer of AMT located in Mason, OH. The initial sample included 271 manufacturing plants that had purchased machinery from Makino within the past three years (1996–1998). This approach allowed us to control for a specific technology—high-performance die/mold machinery characterized by extremely fast spindle speeds and advanced computer integration. As noted previously, the
sample’s focus also enabled a test of the trade-off model in the contexts of cutting-edge AMT and extended asset frontiers.

Third, the choice of survey respondents has become an increasingly important methodological decision. Most studies of competitive priorities employ responses from a single manager within each site. This approach relies on the possibly flawed assumption that such managers have accurate and detailed information regarding operations strategy, decisions, and performance (Szwejczewski, Mapes, and New 1997). Furthermore, Swink and Way (1995) note that even if self-report biases can be overcome, respondents’ perceptions depend on how well plant priorities have been defined and communicated. In contrast, collecting data from multiple respondents may allow assessment of inter-rater reliability (Boyer and Verma 2000). Boyer and McDermott (1999) underscore the need to analyze responses from individuals at varied hierarchical levels. Surveying managers, who help develop an operations strategy, and operators, who apply emphasized priorities in their daily work, may provide insights into the degree of strategic consensus within a plant.

Following Boyer and McDermott’s (1999) suggestion, we sent a self-administered questionnaire to two contacts within each plant, typically the plant manager and an AMT operator. Both contacts received a cover letter (written by Makino) and a copy of the questionnaire. Data collection began on January 18, 1999. One week later, all 271 plants received a follow-up letter encouraging them to participate in the survey. Finally, a second follow-up letter and set of questionnaires was sent to plants that had not responded within 4 weeks. We received surveys from a total of 110 plants for a response rate of 40.6%.

**Competitive Priority Measures**

We investigate the competitive priorities of these plants using 16 Likert scale questions, which have been shown to be reliable and valid in prior research (see Miller and Roth 1994 and Boyer 1998, for further discussion of the measures). These items are averaged for each scale to form constructs that measure the relative importance of Cost, Flexibility, Quality, and Delivery to each of the participating plants. The items comprising each construct are shown in the Appendix. Table 1 provides the average for each construct (for both managers and operators), Cronbach’s alpha to measure inter-item reliability, and the Interclass Correlation (ICC) to assess inter-rater agreement.

As shown in Table 1, all of the competitive priority constructs possess good inter-item reliability for both the managers and operators, with flexibility and cost exceeding the 0.70 threshold generally considered acceptable. While quality has a lower alpha, this construct has been shown to possess good reliability in previous studies. In contrast, the ICC analysis suggests that the measures do not possess good inter-rater agreement. Only two of the constructs (Delivery and Cost) have significant ICC values, and even these are relatively low. The ICC analysis calculates the percentage of total variance that is explained by between-group variation rather than within-group variation. Values closer to one indicate that most of the variance is explained by inter-plant differences rather than manager versus operator

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<tr>
<td></td>
<td>Mean (Std. Dev.)</td>
<td>Alpha</td>
</tr>
<tr>
<td>Quality</td>
<td>6.49 (0.64)</td>
<td>0.65</td>
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<tr>
<td>Delivery</td>
<td>6.46 (0.70)</td>
<td>NA*</td>
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<tr>
<td>Cost</td>
<td>5.61 (0.96)</td>
<td>0.80</td>
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<tr>
<td>Flexibility</td>
<td>5.60 (1.01)</td>
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* Alpha is not applicable for a two-item scale.
differences. Boyer and Verma (2000) recommend that the ICC measure should be 0.50 or greater. Thus these measures do not exhibit good inter-rater agreement.

Comparing the construct averages in Table 1 reveals that managers and operators have comparable ratings for the competitive priorities on an aggregate level. Managers and operators have the same top two priorities: quality is most important, followed by delivery. The ratings of both groups are similar for cost, but operators place a greater emphasis on flexibility. Thus the nonsignificant ICC coefficients signify that differences in ratings exist on a more micro level (between respondents within a plant). In this sample, some managers and operators disagree as to their plant’s relative strategic priorities. Boyer and McDermott (1999) caution that this absence of strategic consensus can undermine a plant’s strategy and performance.

To examine the degree of inter-rater agreement or strategic consensus more closely, we analyze the correlations between manager and operator priorities. In Table 2, there should be a high correlation between manager and operator ratings for the same priority (i.e., correlations shown in bold along the diagonal). For example, it seems reasonable to expect that operators and managers would have similar ratings for quality, flexibility, etc. However, only two of the priorities (quality and flexibility) have significant correlations between managers and operators (i.e., the correlation between the manager rating for quality and the operator rating for quality is 0.37). Interestingly, delivery and cost have nonsignificant correlations despite being the only priorities that had significant ICC indices. These findings indicate that some variations exist within plants. Therefore, using a single respondent to assess a plant’s overall operations strategy might provide a skewed perception. According to Boyer and McDermott (1999), when plants lack a high degree of strategic consensus, researchers should avoid placing too much emphasis on any respondent’s ratings. To address this problem, we take an average of the manager and operator constructs for each plant on each priority for all further analysis.

**Relationships Among Competitive Priorities: Analysis and Results**

The correlations between competitive priorities are included in Table 3. Part A shows the correlations among priorities as reported directly from respondents. Part B shows transformed priorities, where we have recalculated the weights for each priority so that the highest ranked priorities receive a positive score and the lowest ranked priorities receive a negative score.

When the priorities are not transformed, correlations between every pair are significant. While advocates of the cumulative model expect this relationship, it also may represent a common problem in survey-based strategy research (see Boyer and Pagell 2000). Few, if any, businesses would state explicitly that a priority is not important. For instance, plants may hesitate to admit that quality is not important after hearing for two decades about the grave need to improve quality. However, quality might not be how the plant wins orders, preferring instead to offer the lowest cost product. Yet, the correlations in Table 3A suggest that respondents do not really prioritize

### Table 2

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<tr>
<td>Cost</td>
<td>0.08</td>
<td>0.16</td>
<td>0.07</td>
<td>0.06</td>
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<tr>
<td>Quality</td>
<td>0.21*</td>
<td>0.37**</td>
<td>0.16</td>
<td>0.26**</td>
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<tr>
<td>Delivery</td>
<td>0.01</td>
<td>0.24*</td>
<td>0.09</td>
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<tr>
<td>Flexibility</td>
<td>0.00</td>
<td>0.21*</td>
<td>0.13</td>
<td>0.26*</td>
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Note: * p < 0.05; ** p < 0.01.
their strategic goals. If everything is positively correlated, the implication is that respondents tend to rate everything either high or low. This outcome does not fit the implicit definition of operations strategy—the need to choose which capabilities should receive the most attention. Boyer and Pagell (2000) suggest that data patterns such as this are the result of measurement problems associated with the way competitive priority data are obtained.

There is an extensive literature base in the area of performance appraisal that deals with halo effects in which a group of ratings, or appraisals, are generally inflated and correlated with each other due to a general perception of the rater that is not tied to the specific characteristics being rated (Bretz, Milkovich, and Read 1992). A halo appears when, instead of differentiating between levels of performance on different dimensions, the rater assigns ratings on the basis of a global impression of the ratee (Borman 1975). The halo effect causes individuals to be rated as consistently good or consistently poor performers (Nathan and Lord 1983). This halo effect is ubiquitous in nature and represents a substantial hurdle in conducting performance appraisal research (Borman 1978; Cooper 1981; Pulakos, Schmitt, and Ostroff 1986). In general, the goal is to partial out “true” interdimension scores from halo effects (Pulakos, Schmitt, and Ostroff 1986). We believe that competitive priorities as measured in much of the operations strategy literature may produce a similar halo effect. This effect makes measurement of “true” competitive priorities difficult, and, to date, there have not been effective methods to address the problem (Boyer and Pagell 2000). Thus we propose a novel method for investigating and partialling out halo effects, as described in the following paragraphs.

An underlying assumption when using competitive priorities to measure operations strategies is that there should be a relative ranking of the importance of different priorities. According to Hayes and Pisano (1996), managers today face critical trade-offs, but there are now more subtle distinctions. Key differences involve rates of improvement rather than just static trade-offs among unchanging capabilities. Boyer and Pagell (2000) argue that existing measures of competitive priorities do not encourage respondents to make the hard choices regarding what is the most important strategic goal. They propose forcing respondents to differentiate among priorities—perhaps by allocating a fixed number of points (e.g., if there are 16 7-point items, then the total allocable points might be 64). This approach requires respondents to indicate which manufacturing capabilities, while important, may not be the highest priority.

We agree that competitive priorities measures need to be improved, but did not follow Boyer and Pagell’s (2000) approach. Instead, we rescaled the competitive priority measures for our data by transforming the measures within each plant. We transform the priorities constructs by computing the competitive priority (i.e., flexibility or cost, etc.) — the respondent average for all four constructs, then divide this difference by the standard deviation for all four constructs for that plant. The resulting transformed measures have

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<td>A.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Raw</td>
<td>0.55</td>
<td>0.30</td>
<td>0.39</td>
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<tr>
<td>B.</td>
<td>-0.13</td>
<td>-0.39**</td>
<td>-0.74**</td>
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<tr>
<td></td>
<td>-0.18*</td>
<td>-0.58**</td>
<td>-0.51</td>
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Note: in A, all priorities are significant (p < 0.01). In B, * p < 0.05, ** p < 0.01.
positive values for priorities that are above average in importance and negative values for priorities that are below average. This transformation provides a more sensitive weighting of priorities by identifying the relative importance of various priorities for respondents that have very similar ratings for all constructs (i.e., tend to rate things similarly, within a tight cluster).

Table 4 shows the descriptive data for the transformed priorities. Note that the aggregate rankings of the mean for each priority are the same as for the nontransformed priorities shown in Table 1 for the managers (quality, delivery, cost, and flexibility in decreasing order of importance). However, on a micro (within plant) level the transformed priorities accentuate differences in rankings. For example, although cost is rated as the least important priority on an aggregate basis, there are some plants that rate it as extremely important (maximum rating is 1.16). Similarly, delivery is the second highest aggregate priority, but there are some plants that give it a relatively lower priority (minimum is –1.42).

Transforming the competitive priority constructs helps make the trade-offs more apparent, as shown in Table 3B. In contrast to Table 3A, the correlations between transformed priorities are not all significant. Instead, some have highly significant negative correlations, the largest being the negative correlation between flexibility and cost. Figure 2A shows a graph of the nontransformed values for flexibility and cost. There is a noticeable positive correlation between flexibility and cost, but there is also a great deal of “noise.” In contrast, Figure 2B depicts the same graph using the transformed competitive priorities. This figure clearly shows that plants that strongly emphasize low costs place a much lower emphasis on flexibility. The trade-off between cost and flexibility is readily apparent. Similar trade-offs can be seen between delivery and flexibility, and delivery and quality (see Table 3B).

Our method of transforming competitive priorities does have some substantial limitations. Most importantly, by transforming across individual raters, there is automatically going to be some trade-off. This occurs because the method involves subtracting the mean for each rater on the four competitive priorities from each individual priority. As a result, the transformed priorities as seen in Tables 3B and 4 are no longer strictly independent. However, we conducted several simulations using random numbers to ascertain what effect such a transformation procedure would have if there really were no trade-offs in the raw data. We generated 4 columns of 1,000 random numbers using three different assumptions. One set of numbers was uncorrelated, with a uniform distribution between 1 and 7 for each variable. A second set of numbers was generated with a normal distribution with each variable having the same mean and standard deviation as our raw data (as shown in Figure 1), but with the four variables uncorrelated. Finally, we generated a set of data with the same means and standard deviations as in Table 1 and with an average inter-item correlation of 0.20. The next step involved transforming the data using the same methodology as used for our raw data. We did this 30 times for each data set, calculated the correlations between the transformed variables, and developed confidence intervals.

Our data from the simulations described above indicate that the transformation method does force trade-offs to occur. The 95% confidence intervals for the average inter-item correlation for three sets of data are (–0.329, –0.338) for the uniform distribution data set, (–0.297, –0.318) for the normal distribution data set, and (–0.306, –0.346) for the correlated normal distribution data set. From this data it is clear that our transformation

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<th>Mean</th>
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<tr>
<td>Quality</td>
<td>0.71</td>
<td>0.43</td>
<td>–0.35</td>
<td>1.46</td>
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<tr>
<td>Delivery</td>
<td>0.49</td>
<td>0.62</td>
<td>–1.42</td>
<td>1.48</td>
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<tr>
<td>Flexibility</td>
<td>–0.56</td>
<td>0.78</td>
<td>–1.50</td>
<td>1.35</td>
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<td>Cost</td>
<td>–0.64</td>
<td>0.69</td>
<td>–1.50</td>
<td>1.16</td>
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procedure does force some trade-offs (negative correlations) to occur. However, the data also suggest that there is a “true” effect for competitive priorities over and above any halo effect. Each of the three data sets had an average correlation between \(-0.308\) and \(-0.333\), in a fairly tight range. Thus it appears that the transformation procedure forces a correlation of around \(-0.33\) in random data. We can then compare this finding to the actual correlations from our data (Table 3B), as shown in Table 5. All six correlations of the correlations in Table 3B are outside any of the confidence intervals developed from our simulations. This suggests that our transformation technique is differentiating some true effect from halo effect for competitive priorities. Table 5 recenters the values from Table 3B by subtracting the average mean inter-item correlation from our simulations \((-0.33)\). Table 5 shows a variety of positive and negative correlations between our transformed correlations. The pattern makes intuitive sense in that competitive priorities that we expect to have trade-offs do have negative correlations, while those
that have long been held in the literature to be more synergistic have positive correlations. To illustrate, flexibility and cost have a correlation of $-0.41$ when transformed, a pattern that fits with general beliefs that these two priorities do not fit well together. In contrast, quality and flexibility have a positive correlation of 0.41, which supports the premise that these priorities complement each other and have a more synergistic relationship.

### Discussion

This research addresses the following question: Do manufacturing plants make trade-offs among competitive priorities, even in the context of AMT and extended asset frontiers? Our findings suggest that they do. However, perceived differences in competitive priorities are subtle and may vary across levels of the plant hierarchy. In conclusion, we examine these findings further, suggesting implications for operations practitioners and researchers.

As the cumulative model predicts, we found that plants increasingly consider all four manufacturing capabilities vital for competitive success. Yet distinctions among priorities signify that decision makers still perceive a need for trade-offs. Despite the potential for AMT to foster improvements in quality, delivery, costs, and flexibility, plants tend to focus on certain capabilities. Recognizing subtle trade-offs, however, requires sensitive methodologies, including approaches that force respondents to differentiate among priorities, as suggested by Boyer and Pagell (2000), or that transform resulting measures, as demonstrated in this study. We offer one potential methodology for parceling out true effects from “halo effects.”

Our transformation method illustrates that relationships between competitive priorities are fairly complex and that there is a substantial halo effect. The literature on competitive priorities and the competing strategy models (trade-off versus cumulative) both underestimate and ignore the effects of halo on priority measurement. While our methodology certainly has substantial limitations, it does represent a step forward in its recognition that measurement problems are typically very confounded. Researchers must work to develop better methods of assessing competitive priorities in order to provide clearer insight regarding operations strategy.

In addition, manufacturing managers and operators may perceive strategy differently. This suggests the need for plants to more clearly define and communicate competitive priorities to ensure that daily decision-making supports the operations strategy. Although managers may initiate a strategy, operations decisions are made continuously at all levels of the plant. With regard to future research, this finding demonstrates the need for multiple and varied respondents. Further studies then may examine the impacts of strategic consensus or disagreement on the development of manufacturing capabilities and plant performance. For example, Boyer and McDermott (1999) proposed that the critical factor in determining strategic success is not necessarily which priority is emphasized (e.g., flexibility or low costs), but whether the priority is translated into a consistent pattern of decisions that help develop the capability into a competitive advantage. A critical element of operations strategy involves translating competitive priorities into operational capabilities. Once managers have chosen their plant’s priorities or goals, they must carefully match their operating decisions (both structural and infrastructural) to develop appropriate capabilities. While trade-offs may exist among physical, technological, and management realities (depending on how close the

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<td>Delivery</td>
<td>0.20</td>
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<td>Flexibility</td>
<td>-0.41</td>
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<tr>
<td>Quality</td>
<td>0.15</td>
<td>-0.25</td>
<td>0.41</td>
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*TABLE 5*: Re-Centered Correlations (Correlations from Table 3B — Average Correlation of Transformed Data in Simulation [$-0.33$])

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operating and asset frontiers of an organization are), manufacturing organizations will not be successful unless appropriate operating decisions are made. Thus careful choice of competitive priorities is a critical, but not sufficient step, in the process of developing and implementing a successful operations strategy.¹

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Appendix: Competitive Priority Scales

For your manufacturing plant, how important is the ability to (rated on a 7-point scale with 1 = Not Important, 4 = Very Important, and 7 = Absolutely Critical):

**Cost**
- Reduce inventory
- Increase capacity utilization
- Reduce production costs
- Increase labor productivity

**Quality**
- Provide high-performance products
- Offer consistent, reliable quality
- Improve conformance to design specifications

**Delivery**
- Provide fast deliveries
- Meet delivery promises
- Reduce production lead time

**Flexibility**
- Make rapid design changes
- Adjust capacity quickly
- Make rapid volume changes
- Offer a large number of product features
- Offer a large degree of product variety
- Adjust product mix

References


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