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Strategic Consensus And Manufacturing Performance*

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Researchers have long been interested in the nature of the relationships that elicit superior firm performance. In organizations that manufacture a product, this interest has often centered on the relationships that exist between business-level strategy and the supporting elements of the organization's manufacturing strategies (Buffa, 1984; Hayes & Wheelwright, 1984; Hill, 1985). An aspect of this relationship that has been studied concerns the presence of consensus between SBU-level and manufacturing-level decision makers. This research examines the causal nature of direct and indirect influences that have been argued in the literature to affect manufacturing performance. Our results indicate that consensus on the firm's business-level strategy does not directly influence manufacturing performance, but does so through its influences on other variables. Consensus with respect to manufacturing specific tasks that support the firm's business-level strategy was shown to be important.

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Additional findings in our research concern the relationship of traditional product-process alignment and levels of manufacturing performance.

THEORETICAL FOUNDATION

Managerial Consensus: Strategic and Manufacturing Task Consensus

A major theme of the literature in strategic management and operations strategy is that consensus on the general strategic direction of the firm and on manufacturing task emphasis must exist between business-level strategic planners and functional-level manufacturing managers for effective business unit performance to occur. It is the responsibility of the manufacturing manager to develop a manufacturing strategy that supports the overall business-unit strategy (Schroeder *et al.*, 1986). Operations scholars have warned that a manufacturing business unit will have a decreased competitive advantage within its industry if it fails to develop a coordinated and supportive operations strategy (Buffa, 1984; Hayes and Wheelwright, 1984; Hill, 1985).

A good deal of research has examined the notion of consensus as it relates to the management process (Bourgeois, 1980; Dess, 1987; Schweiger and Sandberg, 1988; Wooldridge and Floyd, 1989; West and Schwenk, 1996; Homburg *et al.*, 1999). As pointed out by Floyd and Wooldridge (1992), senior managers often complain that middle- and operating-level managers fail to take the correct actions to implement strategy. These implementation problems are deemed to be the result of middle-level and operating managers' lack of understanding of and/or commitment to the chosen strategy. Guth and MacMillan (1986) found that middle-level managers will not only redirect a strategy and delay its implementation, but will also sabotage the strategy if they feel their self-interest is being compromised.

Other research has examined the relationship of consensus to performance. Wooldridge and Floyd (1990) found that the involvement of middle-level managers in the formation of business-level strategy was associated with improved organizational performance. St. John *et al.*, (1991) examined the relationships among various coordinating mechanisms, the degree of consensus between marketing and manufacturing groups, and marketplace performance reputation. They found firms using planning techniques experienced higher levels of interdepartmental consensus and this was related strongly to marketplace performance reputation.

The notion that manufacturing managers should develop a manufacturing strategy that supports the business-level strategy is consistent with the strategic management paradigm. A specific business-level strategy is formulated for the strategic business unit (SBU) in order to create a competitive advantage, and manufacturing managers are expected to translate this strategy into appropriate manufacturing performance goals, processes, and systems.

An issue of concern during this process is the extent to which consensus is developed between managers at the SBU level and managers at the manufacturing level with respect to the overall competitive strategy chosen for the business unit. The manufacturing manager's understanding of, and agreement with, business-level strategic choices will form the basis for subsequent manufacturing strategy development and execution. A unifying strategy is required (Schonberger, 1986) and a vision must be developed so manufacturing managers can clearly understand the requirements for implementation (Chase and Aquilano, 1989). It has been suggested that often this shared understanding does not occur. For example, Hambrick (1981) found evidence of rapid hierarchical decline in strategic awareness by second-level executives. Schroeder, *et al.* (1986) sampled manufacturing firms and found that only one-third of the firms had formulated a clear and well-developed manufacturing strategy (i.e., one consistent with the firm's business strategy). Swamidass (1986) found evidence of a general mismatch in strategic emphasis between CEO's and manufacturing managers concerning the appropriate role and performance objectives of the manufacturing function.

Hayes and Wheelwright (1984) strongly recommend a high level of involvement by manufacturing managers in the strategic planning process of business units for the attainment of superior competitive performance. Swamidass and Newell (1987) report finding evidence of a direct positive relationship between the level of involvement of manufacturing managers in the strategic planning process and firm performance. Dess (1987) examined the relationship between the degree of consensus within top management teams on business objectives and competitive methods and firm financial performance. His findings indicate general top managerial consensus on either competitive objectives or competitive methods to be positively related to firm financial performance. This finding is consistent with Bourgeois (1980), who found consensus on competitive methods to be related to firm financial performance. A review of other studies related to consensus can be found in Homburg *et al.* (1999).

Of interest in our research is the relationship between strategic consensus (consensus between SBU-level managers and manufacturing managers on the business unit's overall competitive strategy) and manufacturing performance. As noted by Hart and Banbury (1994), research must take into account measures from the point of view of organizational members, thus a nonfinancial measure of manufacturing performance was selected. Venkatraman and Ramanujam (1986) and Kaplan (1983) have also recommended the inclusion of operational outcomes (as compared to financial measures) with respect to performance. Based on our previous discussions of consensus, the following initial hypothesis can be developed:

> ***Hypothesis 1:*** *There is a direct positive relationship between SBU-level/manufacturing-level strategic consensus (SC) and manufacturing performance (MP).*

In addition to speculating that SBU-level and manufacturing-level managers should develop strategic consensus, it is further proposed that consensus with respect to manufacturing-specific task dimensions may be important. Intuitively strategic consensus, or agreement on a firm's business-level strategy, would be a logical precondition for a firm's management to reach consensus on manufacturing strategies because these strategies are developed to support the firm's chosen business-level strategy. Papadakis *et al.* (1998) suggest that decision-specific characteristics may have the most important influence on the strategic decision-making process. Therefore the following hypothesis is offered:

> ***Hypothesis 2:** There is a direct positive relationship between strategic consensus (SC) and manufacturing task consensus (MTC).*

Furthermore, it is reasonable to assume that manufacturing task consensus would similarly be related to manufacturing performance and therefore the following hypothesis can be tested:

> ***Hypothesis 3:** There is a direct positive relationship between manufacturing task consensus (MTC) and manufacturing performance (MP).*

Product-Process Linkage

A fundamental tenant of operations strategy is that manufacturing's choice of production process interacts with marketing's product goals, and this interaction affects the business unit's competitiveness within its industry. Hayes and Wheelwright (1979a,b) first proposed linking product and production process life cycles. Their theory states that the production process should evolve through a series of configurations related to changes in the product's life cycle.

The basis of the product-process alignment literature is that there exists a trade-off, or balance, between attainable levels of automation and flexibility. In the introductory and growth stages, for example, product variety is typically high, requiring flexibility in the manufacturing process. This flexibility, however, is achieved at the expense of higher unit manufacturing costs, as fully automated production processes cannot be employed. As products move through their life cycle, variety and flexibility lose importance, and the firm is able to attain lower operating costs through increased automation.

The product-process matrix described by Hayes and Wheelwright links product life cycle stages with theoretically correct general types of production processes (Hayes and Wheelwright 1979a,b, 1984; Wheelwright, 1984a,b). A firm's product can be characterized as occupying a particular region on the product-process matrix depending on the product's life cycle stage and choice of production process by manufacturing managers. Diagonal positioning on the matrix has been recommended (Hayes and Wheelwright, 1979a,b, 1984; Schmenner, 1985; Fine and Hax, 1985). For example, during the introductory stage of the life cycle, a job shop manufacturing process would be used; during the growth stage, a batch process; during maturity, an assembly line; and during continuance, a continuous process. In response to changes in competitive choices, manufacturing strategies may, by necessity, need to be changed as well in order to sustain the linkage between product characteristics and manufacturing processes (Voss, 1986). This positioning and repositioning of the production system in response to changes in the firm's business-level strategy is the primary responsibility of manufacturing managers (Buffa, 1984). Based on this discussion, the following hypotheses are offered:

> ***Hypothesis 4:** There is a direct positive relationship between the level of strategic consensus (SC) and the degree of traditionally-correct product-process alignment (PPA).*

> ***Hypothesis 5:** There is a direct positive relationship between the degree of traditionally- correct product-process alignment (PPA) and manufacturing performance (MP).*

Advanced Systems and New Technologies

A number of advanced systems and new technologies have been developed to improve manufacturing performance and competitive effectiveness. Computer-based and manual systems offer the promise of changing the ways business units compete and of helping business units to be more competitive in world markets (Voss, 1986). The potential benefits of advanced systems and other new technologies have received attention in the recent strategy and manufacturing literature. Sanchez (1995) proposes that two sets of related innovations, one technological and one managerial, are jointly creating and escalating the process of change that is diffusing and transforming competition. Kotha (1995) suggests that mass production and mass customization might be pursued simultaneously. Bettis and Hitt (1995) believe that in an era of rapid technological change and corresponding forecasting difficulties, sustainable advantages are likely to come from internal organizational competencies. Static models that dictate either/or choices have come into question. For example, Sanchez (1995) points out that firms trying to compete by adhering to traditional strategies of low cost, differentiation, or focus, may find themselves challenged by firms with superior flexibilities in terms of quicker response times, more new products, broader product lines, and rapid product upgrades.

As suggested by Jelinek and Goldhar (1984), Wharton (1987), and Meredith (1987), the use of new manufacturing technologies and advanced systems might enable manufacturing firms to operate outside of the product-process matrix prescriptions and still attain superior performance. New technologies and processes could distort the traditional trade-off between process flexibility and lower unit cost by providing additional operational benefits, such as increased flexibility, improved product quality, and lower unit costs. To test the influence of these new technologies and systems on traditional product-process alignment, the following hypotheses are proposed:

> ***Hypothesis 6:*** *There is an inverse (negative) relationship between advanced systems use (ASU) and the degree of traditionally-correct product-process alignment (PPA).*
>
> ***Hypothesis 7:*** *There is a direct positive relationship between advanced systems use (ASU) and manufacturing performance (MP).*

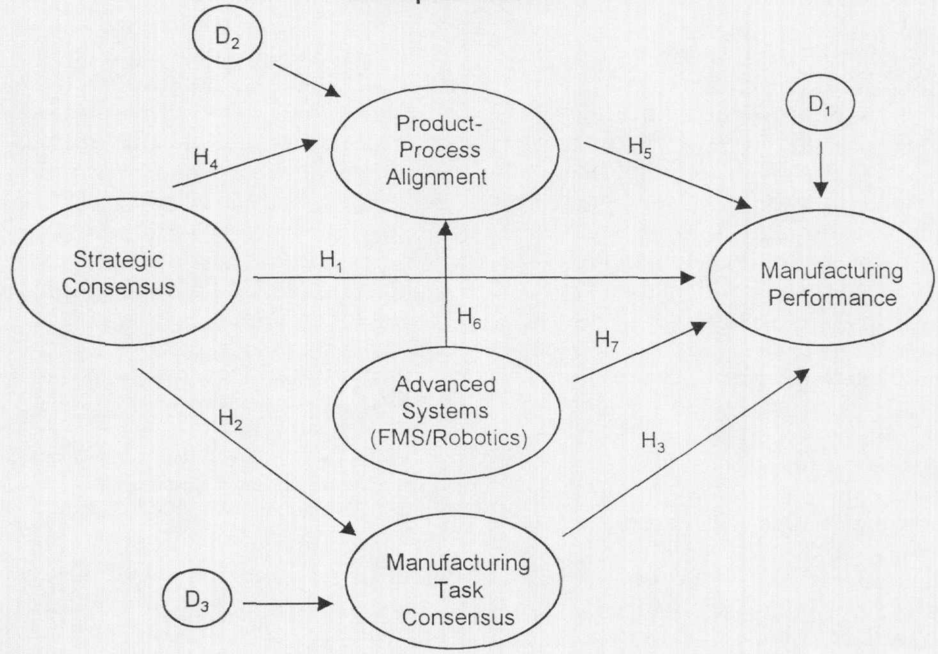
These seven hypotheses provided the basis for the development of the initial conceptual model presented in Figure I. The next section of this article discusses our research methodology and statistical analysis, followed by sections on results, discussion, and conclusions.

METHODOLOGY

Sample

Sample characteristics are presented in Table 1. The sample included 27 strategic business units (SBU) selected from three major multinational, U.S.-based electronics manufacturers. The electronics industry produces a variety of products in various stages of the life cycle for a diverse set of product markets, thus this industry was chosen to represent a suitable cross-section of strategies. A strategic business unit was defined as a product group, major product line, and/or group of smaller similar products that shared a common planning process, marketing strategy, product

Figure I
Conceptual Model



life cycle stage, production process, and production volume level. Questionnaires were used to survey individuals within each SBU and included responses from: (1) strategic planners, such as general managers, business planners, and marketing managers, and (2) operations managers, such as manufacturing managers, production control managers, and quality assurance managers. The sample included a total of 162 respondents. The products manufactured by the strategic business units include electronic products such as pagers, computer interface modules, and electronic automotive components.

Measurement Scales

Strategic Consensus (SC). The level of strategic consensus (SC) among SBU managers was measured using an augmented version of the Dess and Davis (1984) scale of strategic or competitive methods. The competitive method instrument consists of both marketing-related and operations-related competitive dimensions, thus the instrument provided the necessary bridge for measuring the degree of strategic consensus among SBU-level strategic planners and operations managers. Dess and Davis (1984) factor analyzed this scale to demonstrate its congruence with, and use as a measure of, Porter's (1980, 1985) generic strategies (low cost, product differentiation, focus). Furthermore, Dess (1987) successfully employed the instrument to determine the degree of consensus among top management

Table 1
Sample Characteristics

Industry	Electronics
Corporations Surveyed	Three Major US-Based Electronics Manufacturers
Level of Analysis	SBU (defined as product groups)
Sample Size	27 Product Groups

Individuals Surveyed within Each SBU

Strategic Planners
- General Manager
- Business Planner
- Marketing Manager

Operations Managers
- Manufacturing Manager
- Production Control Manager
- Quality Assurance Manager

regarding the relative importance of different aspects related to the firm's actual strategic emphasis. Factor analysis of the augmented SC scale produced the three factors representing Porter's (1980, 1985) generic strategies, thus the results were consistent with expectations for content criteria. Additionally, the assessed reliability of the measurement scale was high, with Cronbach's Alpha equal to .86.

Measurement of strategic consensus involved all six product group strategic and operations managers within each SBU (162 respondents). These managers were asked to indicate how important each of the 25 competitive methods was to their business unit's (product group's) overall competitive strategy. Responses were measured using a 5-point Likert scale. Following Dess (1987), the standard deviation of the team member responses for each item was computed. The sum of the item standard deviations then produced a total strategic consensus score (SC) for the manufacturing business unit.

Manufacturing Task Consensus (MTC). In addition to strategic consensus (SC) a second consensus measure, manufacturing task consensus (MTC), was employed. A 12-item manufacturing-specific task consensus measurement scale was developed to correspond to the four manufacturing strategic dimensions (low cost, flexibility, quality, and dependability) defined by Wheelwright (1978). Factor analysis of the MTC scale produced the expected four factors, consistent with expectations for content criteria. Cronbach's Alpha equaled .76.

The same 162 respondents who completed the strategic consensus scale were asked to indicate how important each of the 12 manufacturing task items was to the overall competitive strategy chosen by the business unit's general manager. Responses were measured on a 5-point Likert scale. Quantification of the MTC consensus score was then accomplished in the same manner as the strategic consensus measure (summing the standard deviations of scale item responses of the product group team members).

Flexible Manufacturing Systems/ Robotics (FMS/RB). The use of flexible automation was determined as follows. The manufacturing manager and the production control manager within each business unit were asked to supply a specific designation as to the extent to which flexible manufacturing systems and robotics were employed in the manufacture of the focal product (54 respondents). A 5-point Likert scale was employed (zero indicated no usage). Scores were summed creating a total measure of the degree of flexible automation use. Cronbach's Alpha was .65.

This measurement scale was originally designed to reflect a number of advanced systems and technologies, such as Optimized Production Technology (OPT), Flexible Manufacturing System (FMS), Materials Requirements Planning (MRP), and Just-In-Time Manufacturing (JIT). Unfortunately the measurement scale produced a very low level of reliability (Coefficient Alpha = .30). A subsequent factor analysis of the scale items produced two factors (FMS and Robotics) loading highly (.80) on a single common factor. Thus, a reduced advanced systems measurement scale (FMS/Robotics) was defined which provided a sufficient degree of reliability for statistical analysis.

Product-process Alignment (PPA). To determine the extent of product-process alignment, the SBU general manager was asked to determine the current life cycle stage (introductory, growth, maturity, continuation, or decline) for the focal product. Independent of this event, the manufacturing manager in the same SBU was asked to designate the dominant type of operational process (job shop, batch process, assembly line, or continuous process) used to manufacture the focal product. A subsequent comparison indicated whether or not a specific product-process match conformed to the prescriptive correct diagonal placement recommendations of Hayes and Wheelwright (1979a,b).

Originally designed to accommodate a wide range of potential product-process misalignment, the measurement scale was designed as a Likert-type interval scale with measures of 1 to 4 per item (4 implying a position on the diagonal, 1 implying a position furthest from the diagonal). The data obtained from the sample of twenty-seven product groups, however, showed the maximum level of product-process misalignment was limited to one interval of misalignment. Thus, the sample data produced only two values related to product-process alignment, aligned (on diagonal) and nonaligned (one stage off diagonal).

Table 2
Variable Measurement

Strategic Consensus (SC)	All six Strategic and Operations Managers
Manufacturing Task Consensus (MTC)	All six Strategic and Operations Managers
Product-Process Alignment (PPA)	SBU General and Manufacturing Managers
Advanced Systems Use (ASU)	Manufacturing and Production Control Managers
Manufacturing Performance (MP)	General Manager

SBU's were nearly equally represented among the two designations.

Manufacturing Performance (MP). A manufacturing performance measurement scale was designed to provide a non-financial manufacturing-specific measure of performance. The twelve-item, 7-point Likert scale reflected an equal balance of the manufacturing performance criteria of cost, flexibility, quality, and dependability (Wheelwright, 1978). Measurement scale items employed many of the items empirically tested by prior researchers (Swamidass, 1986; Huete and Roth, 1987; Sharma, 1987). Factor analysis produced the expected four factors, thus the scale was deemed consistent with expectations for performance criteria. A Coefficient Alpha level of .65 was obtained.

The procedure used to assess the business unit's manufacturing performance involved each SBU's general manager. The general manager was asked to assess the level of focal product manufacturing performance for each performance criteria specified. Response items were then weighted by the degree of importance (1-5) attached to that performance dimension, as separately and independently designated by the general manager. Weighted responses were summed producing a total measure of the business unit's manufacturing performance (MP).

Descriptive Statistics

The variables used in this research are summarized in Table 2. Descriptive statistics and correlation coefficients are provided in Table 3. Recall strategic consensus and manufacturing task consensus were measured by computing the standard deviation of the six product group team member responses for each questionnaire item, and then summing the standard deviations for all items (25 items on the SC scale and 12 items on the MTC scale). Since standard deviation measures the dispersion or differences in perception by the product group team members, a lower mean value indicates a higher level of consensus. The sample statistics indicate that product group team members achieved a much higher degree of consensus with respect to manufacturing tasks (μ = 7.71) than they did for the firm's overall business-level strategy (μ = 19.25).

The range of values for product process alignment (0,1) reflects the fact that the SBU's in our sample operated, at most, only one unit off the diagonal position. A mean value of 0.44 suggests our sample is nearly evenly distributed among firms operating on and one unit off the diagonal position. The use of flexible manufacturing systems and robotics was measured on a 5-point Likert scale (0 = does not use; 1 = little use; 5 = extensive use). A mean value of 2.39 and a standard deviation equal to 2.13 indicates our sample has a variety of usage levels from essentially absent to quite extensive. Manufacturing performance was measured using a twelve-item, 7-point Likert scale (1 = poor relative to the industry; 7 = exceptional relative to the industry). Responses were weighted by the degree of importance assigned to that dimension by the firm's general manager and then summed to produce a total measure of operational performance.

A correlation matrix is provided in Table 3. Of the ten potential variable combinations, four produced significant correlation coefficients (all positive). The relationship between FMS/RB and MP appears to be the strongest (.5116). It is interesting to note that the correlation coefficient between SC and MP is insignificant, implying that strategic consensus and manufacturing performance are not related. Of course, this simple comparison does not control for the confounding effects of other variables.

Path Analytic Model

Path analysis was employed to empirically ascertain the magnitude of the causal relationships among the operations strategy variables hypothesized to be related. In Figure I both strategic consensus and flexible manufacturing systems/robotics (SC, FMS/RB) are defined as exogenous variables, presumed to cause variation in the endogenous or dependent variables (PPA, MTC, MP). Assumptions of causal order, deduced from the literature, are represented by the arrows. Any variations in the exogenous variable are not to be explained by the model. D_1, D_2, and D_3, are disturbance terms associated with the three endogenous variables which account for variations not explicitly included in the model. The model does not deny the existence of other variables that may be relevant, but not included. Their impact is captured by the disturbance terms.

Figure I can be converted into a system of equations that reflects the linkages drawn. One structural equation can be written for each endogenous variable. The structural equations are linear in the path coefficients and do not have a constant term. The constant term can be omitted if the variables are standardized and if the unmeasured residuals are also assumed to be standardized. Included in each equation are those variables that directly affect the endogenous variable in question, weighted by the appropriate coefficients. Path coefficients, interpreted as structural parameters that represent the true causal structure linking the variables in the model, are most easily obtained by employing ordinary regression techniques (Asher, 1983). The general form of the system of structural equations for Figure I is:

Equation 1: $MP = f\,(SC, PPA, FMS/RB, MTC, D_1)$
Equation 2: $PPA = f\,(SC, FMS/RB, D_2)$
Equation 3: $MTC = f\,(SC, D_3)$

Variable Distribution Tests

Prior to estimation, the Kolmogorov-Smirnov test for distribution normality was performed to examine whether or not the sampled values of each variable approximated a normal

Table 3
Sample Statistics

A. Descriptive Statistics (original research data)

Variable	Mean	Std. Dev	Minimum	Maximum	N
SC	19.25	3.08	13.37	25.4	27
MTC	7.71	1.14	5.31	10.27	27
MP	242.04	34.6	161	315	27
PPA	0.44	0.51	0	1	27
FMS/RB	2.39	2.13	0	6	27

B. Correlation Matrix (original research data)

	SC	MTC	MP	PPA	FMS/RB
SC	1.0000 p = .000	0.3987 p = .020	0.1050 p = .301	0.1930 p = .167	0.2160 p = .140
MTC	0.3987 p = .020	1.0000 p = .000	0.4254 p = .013	0.2487 p = .105	0.2244 p = .130
MP	0.1050 p = .301	0.4254 p = .013	1.0000 p = .000	0.2054 p = .152	0.5116 p = .003
PPA	0.1930 p = .167	0.2487 p = .105	0.2054 p = .152	1.0000 p = .000	0.3147 p = .055
FMS/RB	0.2160 p = .140	0.2244 p = .130	0.5116 p = .003	0.3147 p = .005	1.0000 p = .000

Note: 1-tailed significance

distribution. The results indicated that the sampled distributions of four variables (SC, MTC, FMS/RB, MP) were approximately normal, while the distribution of one variable (PPA) appeared to be non-normal. This, however, was expected due to the bivariate nature of the PPA values in the sample, as previously described.

Due to the smaller size of the research sample (27 SBUs) and the non-normality of at least one of the measured variables (PPA), a nonparametric multiple regression approach was employed. Nonparametric statistical procedures are appropriate when the assumption of a normal distribution of variable measurements is not warranted, as they are distribution-free tests that do not require restrictive assumptions about the shape of the population and/or sample distributions.

We use the following for the extension of nonparametric regression methodology to multiple regression analysis; X- and Y-values are separately ranked from 1 to n and any usual multiple regression method is then employed on the ranked data. Thus, all causal modeling in this research was carried out using a combination of path analytic and nonparametric multiple regression procedures. Specifically, all path coefficients were estimated by means of a multiple regression approach on standardized ranked data.

RESULTS

Path coefficients (standardized regression coefficients) obtained from the original model's regression analysis are given in Table 4. Table 5 summarizes the outcomes of the hypothesized relationships (H_1-H_7). In accordance with a theory-trimming approach to path analysis, we excluded all coefficients not significant at the 0.10 level from the final estimation of path coefficients (James *et al.*, 1982; Wiersema and Bantel, 1993). The final model and estimated path coefficients are reported in Figure II. Three general results were obtained.

First, contrary to Hypothesis 1, strategic consensus did not directly influence manufacturing performance, rather its impact was indirect through its influence on manufacturing task consensus. Specifically, strategic consensus had a strong direct effect on managerial task consensus, supporting Hypothesis 2, and managerial task consensus had a strong direct effect on manufacturing performance, supporting Hypothesis 3.

Second, in support of Hypothesis 4, strategic consensus was found to be directly related to on-diagonal product-process alignment. Product-process alignment, however, did not have a significant influence on manufacturing performance, rejecting Hypothesis 5. Taken together the results suggest that, even though a higher level of strategic consensus facilitated the correct degree of product-process alignment, this influence did not ultimately result in superior manufacturing performance.

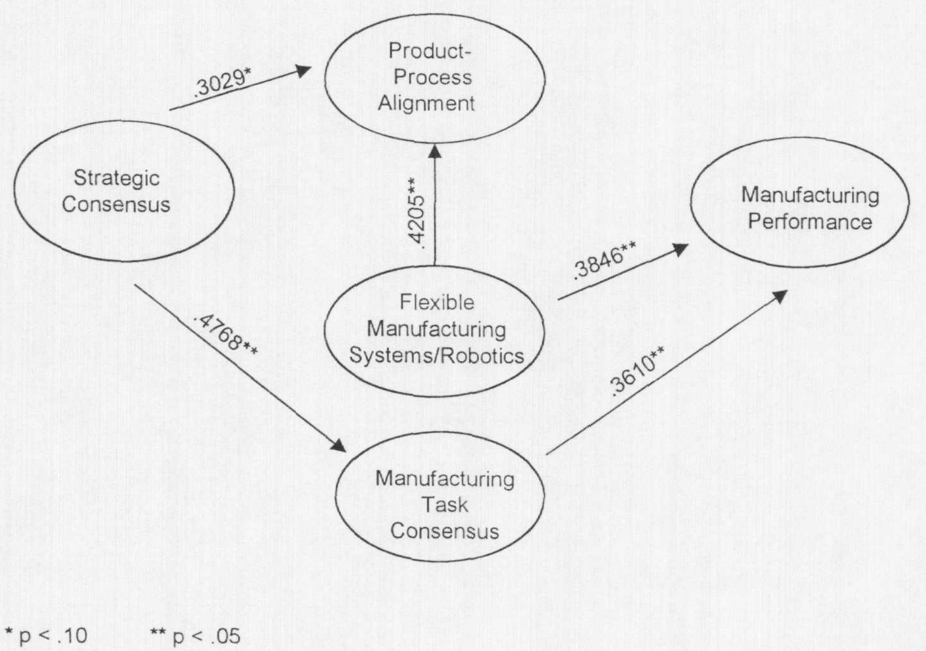
Finally, the use of flexible automation was found to impact both product-process alignment and manufacturing performance. The relationship between FMS/RB and PPA, while significant, was opposite in sign from that predicted by Hypothesis 6. Specifically, the use of flexible automation resulted in a more correct degree of product-process alignment. The use of flexible automation was found to be positively related to manufacturing performance, providing support for Hypothesis 7.

One advantage of path analysis is that it enables one to measure the direct and indirect effects that one variable has on another. We found that manufacturing performance is affected either directly or indirectly by all of the variables in the model. As illustrated by the decomposition analysis in Table 6, MTC and FMS have the greatest effects on manufacturing performance. Both of these are entirely composed of direct effects and are of similar magnitude (.36 and .38,

Table 4
Causal Model Structural Equations

Equation 1:	MP =	-.073614 SC	-	.089411 PPA	+	.39565 FMS/RB	+	.415032 MTC	F (p=.0253)	R^2 = .26
		(p=.7237)		(p=.6420)		(p=.0577)		(p=.0538)		
Equation 2:	MTC =	.476801 SC							F (p=.0103)	R^2 = .20
		(p=.0103)								
Equation 3:	PPA =	.302924 SC	+	.420469 FMS/RB					F (p=.0320)	R^2 = .18
		(p=.0964)		(p=.0243)						

Figure II
Final Path Analytic Model



respectively). The indirect impacts of SC and PPA on manufacturing performance, although smaller in magnitude relative to the direct effects, are similar in size to one another (.17 and .21, respectively). The strongest effect in our model was not related to manufacturing performance, rather it was related to the influence of SC on MTC.

DISCUSSION

Managerial Consensus and Manufacturing Performance

Our results provide important evidence toward the specification and clarification of the linkage between strategic consensus and manufacturing performance. Specifically, we found that consensus among business unit managers and manufacturing-level managers regarding the SBU's overall competitive strategy (SC) had no direct positive influence on manufacturing performance (MP). Rather, the effect of strategic consensus on manufacturing performance was indirect through an important intermediate variable, manufacturing task consensus (MTC).

The notion that strategic consensus, or agreement on the business unit's overall competitive strategy, does not directly influence manufacturing performance is intuitively appealing. Product group managers may agree on the method chosen to compete in the product group's industry; however, unless consensus is

Table 5
Hypothesis Outcomes

Hypothesis	Proposed Relationship	Result
1	Positive	Not Supported
2	Positive	Supported
3	Positive	Supported
4	Positive	Supported
5	Positive	Not Supported
6	Negative	Not Supported*
7	Positive	Supported

* Supported as a direct *positive* relationship

also obtained with respect to the manufacturing-specific tasks that are necessary to support that competitive method, high levels of manufacturing performance may not be obtained.

Our results did suggest that a high level of consensus on the business unit's overall competitive strategy (SC) was more likely to result in a high level of consensus on manufacturing-specific items (MTC) necessary to support the overall competitive strategy. For example, if SBU managers agreed that price was the superior method of competing in the product group's industry, then they would be more likely to agree that manufacturing-specific items such as high production volume or labor productivity should be emphasized. Alternatively, agreement that customer service was the optimal method of competing in the industry would imply manufacturing-specific items such as product reliability or product delivery speed should be given more emphasis at the manufacturing level.

While we found that consensus on the firm's general strategic direction (SC) was more likely to produce increased consensus on manufacturing-specific items (MTC), our results suggest that, in absence of this relationship, superior manufacturing performance (MP) was less likely to be attained. For example, agreement on product price as the competitive method of choice would not likely result in superior manufacturing performance if manufacturing-specific items such as product variety and features or new product introductions were emphasized at the manufacturing level. Thus, we found that strategic consensus (SC) served as a stimulus for the occurrence of a more manufacturing-specific, task-oriented form of managerial consensus (MTC), which

Table 6
Decomposition for Final Path Model

	Direct	Indirect	Total
		Effects on Performance	
SC - MP	0	(.4768)(.36099) = 0.17212	0.17212
MTC - MP	0.36099	0	0.36099
PPA - MP	0	(.30292)(.4768)(.36099)+(.42047)(.38458)=0.21384	0.21384
FMS - MP	0.38458	0	0.38458
		Other Strategic Relationships	
SC-MTC	0.47680	0	0.47680
SC-PPA	0.30292	0	0.30292
MTC-PPA	0	(.4768)(.30292)=0.1444	0.14440
FMS/RB-PPA	0.42047	0	0.42047

was a necessary condition for the attainment of high levels of manufacturing performance (MP).

Product Process Alignment, Flexible Manufacturing Systems, and Manufacturing Performance

We examined three hypotheses regarding the degree of product-process alignment. First, it was assumed that strategic consensus (SC) would be a logical precondition for a business unit to obtain correct product-process alignment (PPA). The design and implementation of production systems necessary to support the goals of the business unit result from strategic choices on competitive methods. Thus, consensus on competitive methods was hypothesized as a necessary requirement for choosing the correct production process for a given product or product line. Consistent with Hayes and Wheelwright's (1984) prescription for an early and extensive degree of manufacturing management involvement in the strategic planning process, we found that general strategic consensus (SC) was positively related to product-process alignment (PPA).

Second, the concept of a direct positive association of product-process alignment (PPA) and manufacturing performance (MP), while intuitively appealing, could not be substantiated in the present study. Wharton (1987) tested the relationship between product-process alignment and financial performance and found no significant relationship between the variables. Thus, although a higher level of strategic consensus (SC) resulted in a more correct degree of product-process alignment (PPA), there was no eventual impact on manufacturing performance (MP).

Finally, much has been written in the operations management literature regarding the use of flexible manufacturing systems to enable a manufacturing unit to potentially operate off the diagonal of the Hayes and Wheelwright product-process matrix (Jelinek and Goldhar, 1984; Wharton, 1987; Meredith, 1987). In line with this literature, the use of such automated systems (FMS/RB) was hypothesized to be negatively related to the degree of correct product-process alignment (PPA). A surprising result of our analysis was that, while the relationship between product-process alignment and the use of flexible manufacturing systems and robotics was significant, this association was positive rather than negative. Specifically, the use of flexible automation and robotics by the sampled business units was found to be positively related to correct, or on-diagonal, product-process matrix placement, as defined by Hayes and Wheelwright (1979a,b).

It should be noted that two of the three hypotheses regarding the degree of product-process alignment produced results contrary to those expected. The variable measuring product-process alignment was designed to accommodate a variety of product life-cycle stage and operational process combinations. Our data, however, produced a maximum level of misalignment to one interval off the prescriptive diagonal placement, thus the measured values of product-process alignment were bivariate in nature. More importantly, none of the production processes employed by the SBU's in our sample represented a substantial mismatch with respect to the product's life-cycle stage, and this lack of variation may have influenced our results.

Perhaps more important are the results related to the impact of flexible manufacturing systems and robotics (FMS/RB) on manufacturing performance (MP). We found the use of such advanced technologies was directly related to the attainment of high levels of manufacturing performance. Support for a positive relationship between manufacturing flexibility and performance has also been found by Swamidass and Newell (1987). Using Hall's (1983) definition of flexibility as the capability of switching very quickly from one product to another, or from one part to another almost instantly, Swamidass and Newell (1987) note that of the four dimensions of manufacturing strategy, flexibility offers the capability to cope with environmental uncertainty.

CONCLUSIONS

Managerial Implications

Overall, our results reinforce the central assumptions and beliefs of operations management scholars regarding the importance of a well-understood, coordinated manufacturing-specific strategy in support of the business unit's general competitive strategy. The importance of manufacturing functional involvement in the strategic planning process and an operationally-specific sense of strategic direction for the manufacturing firm cannot be over-emphasized. The implications are far-reaching as organizational decisionmakers strive to develop and implement multi-faceted strategic planning and decision-making processes that will foster the development of consensus. Reaching consensus on the firm's overall business-level strategy is not sufficient to ensure improved levels of manufacturing performance.

Limitations and Future Research

One of the limitations of our research concerns the sample of firms. Only three strategic business units were included in the electronics manufacturing industry. Future research should address the generalizability of our findings to other types of firms and industries. Additionally, our research focused on manufacturing performance levels. More research is needed to determine the impact of consensus on other performance variables. Finally, as new technologies become available, future studies should investigate their impact on the development of consensus and manufacturing performance.

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