Assessing the impact of the manufacturing executive’s role on business performance through strategic alignment

Karen E. Papke-Shields a,1, Manoj K. Malhotra b,*

a Department of Information and Decision Sciences, Perdue School of Business, Salisbury State University, Salisbury, MD 21801, USA
b Department of Management Science, The Darla Moore School of Business, University of South Carolina, Columbia, SC 29212, USA

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Abstract

Many researchers over time have stressed the importance of incorporating the manufacturing perspective in the formulation of business strategy. Prior work in this area has tended to focus primarily on the involvement of the manufacturing executive in strategic decision making processes, while relatively little attention has been given to the level of influence enjoyed by the manufacturing executives. This study jointly examines the role of both influence and involvement in achieving better business performance, which we posit is expected to occur through alignment between the organizational and manufacturing strategies rather than directly. A research model based on procedural justice and strategic information management literature is proposed to represent this phenomenon. Structural equation modeling is used to empirically test the research model and its related hypothesis on the basis of data collected from 202 senior manufacturing executives representing mid to large sized firms from diverse industry groups across the US. In addition, interviews with a sub-sample of respondents are used to further explore the contextual nature of these relationships. The results indicate that involvement and influence are indeed two different, but highly related, aspects of the manufacturing executive’s role. The interviews revealed numerous differences between the two with respect to achieving each and individual benefits derived from them. As expected, both involvement and influence are important determinants of strategy alignment with influence appearing to play a more substantive role. More importantly, it is this alignment that affects business performance. Implications of our findings for improving manufacturing practice, along with possible avenues for future research directions in this area, are also provided. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Manufacturing strategy; Empirical research; Structural equation modeling; Strategic decision-making

1. Introduction

Over the course of years, many researchers and practitioners have stressed the importance of incorporating the manufacturing perspective in the formulation of business strategy (Skinner, 1969; Anderson et al., 1991; Anderson et al., 1989; Hayes and Wheelwright, 1984; Hayes et al., 1988; Hill, 1994; Leong et al., 1990; Rafii, 1984; Swamidass and Newell, 1987). These authors have argued that the exclusion of manufacturing from strategic business planning results in lack of consideration of manufacturing’s capabilities and limitations in the decisions taken. This often leaves manufacturing in a reactive mode; it cannot support the business strategy as currently configured and cannot acquire the resources needed
to do so (Hayes et al., 1988; Hill, 1994; Ward et al., 1994). As summarized by Ward et al. (1994, p. 351):

“The nature of manufacturing management’s involvement in strategy making and ties between this issue and firm performance remain important process issues that are worthy of further empirical research.”

While there has been some evidence that the tendency to exclude manufacturing executives from business strategy decisions may be changing, there is room for substantial improvement (Anderson et al., 1991). For example, one of the vice presidents interviewed as part of this study described the lack of involvement of manufacturing in a new product introduction at his organization. Top-level managers, including those from marketing and research and development (but not from manufacturing), made a decision to substantially change a product. Such a change “would have had an enormous impact on manufacturing in terms of cost, retooling, etc. that had not really been thought of.” Manufacturing was finally brought in to the decision-making process, but at the “tail end”. Although that involvement did “change slightly how the product was eventually introduced”, the costs incurred were higher than necessary because manufacturing was left to operate in a reactive mode.

Prior theoretical work in this area has focused primarily on involvement of the manufacturing executive, defined as the extent to which the manufacturing executive actively participates in business-level strategic decision-making (Anderson et al., 1991; Swamidass and Newell, 1987; Ward et al., 1994). Within this research, the strong theoretical agreement that manufacturing involvement should lead to better economic performance has been supported by early anecdotal evidence (e.g. Anderson et al., 1991; Hayes and Wheelwright, 1984; Hayes et al., 1988; Hill, 1994). Yet empirical research that confirms or supports this idea has been limited and the results show a lack of consistency. Results of several of these studies indicate that a more substantive role is associated with greater economic performance (Ho, 1996; Rafii, 1984; Swamidass and Newell, 1987). However, another study examining involvement as one dimension of “manufacturing proactiveness” found that distinction between low and high performers existed only when involvement was also coupled with structural and infrastructural investments. Involvement alone, and by itself, was not enough (Ward et al., 1994). This result led them to conclude that further research is needed in this area to truly understand the role of involvement in shaping business performance.

Given prior work and reasoned expectations, involvement by itself may not be sufficient if it fails to influence decision-making. For example, during the mid-1990s Boeing chose a low-price strategy in competing with its rival, Airbus, in the small plane sector (Browder and Reinhardt, 1998; Greenwald, 1998). The strategy appeared to work with Boeing booking record orders for new planes in 1996. And to meet that increased demand, manufacturing was expected to ramp-up production to over twice the normal rate, cut costs by 25% over a 4-year period, and redesign a production system that had previously produced customized planes. The result was a “tailspin”, a reported loss of around US$ 400 million in 1997 caused by Boeing’s production backlogs, disruptions, and inability to meet delivery schedules. How could such a fiasco happen when the business anticipated record sales? Although manufacturing was represented in the strategic planning process, it was obvious that their influence was limited in affecting the eventual decision outcomes. This left the manufacturing function to operate in a reactive mode, struggling to overcome the lack of resources required to support the overall business strategy.

Relatively little explicit attention has been given in prior operations literature to the level of influence of the manufacturing executive, defined as the extent to which the manufacturing executive can directly affect the outcome of decisions that affect him/her (Keys and Case, 1990; Sapienza and Korsgaard, 1996). And in most cases, no clear distinction has been made between involvement and influence as different characteristics of the executive’s role. For example, Rafii (1984), Anderson et al. (1991) and Ward et al. (1994) referred to involvement and influence as if they are interchangeable. Yet Rafii (1984) focused on influence, while Anderson et al. (1991) and Ward et al. (1994) focused on involvement. Swamidass and Newell (1987) also focused specifically on involvement, but suggested that “intra-organizational power and influence” may be one factor affecting the role of the manufacturing executive in strategic decision making.

Literature in other business disciplines tends to differentiate between the level of involvement...
and influence in decision-making. For example, in
the procedural justice literature, which focuses on
decision-making processes, there is a distinction be-
tween process control (“degree to which the procedure
gives those affected by a decision an opportunity to
express their views”) and decision control (“degree of
actual influence over the nature of decisions made”)
(Tyler et al., 1985, p. 72) (Dulebohn, 1999; Houlden
et al., 1978; Tyler et al., 1985). Early research in this
area focused on ‘participation’, without distinguish-
ning between process and decision control, and found
that it heightens outcome satisfaction. However, Tyler
et al. (1985) distinguished between process and de-
cision control and observed that they are distinctly
different, although strongly related, characteristics
governing the perception of process fairness. This
distinction can also be seen in the area of strategic
information systems planning. For example, Das et al.
(1991) differentiated between the level of involvement
(participation) and influence of the MIS executive in
business-level strategic planning.

We believe that organizational performance may not
only be impacted by the inter-play between involve-
ment and influence of the manufacturing executives,
but also by how their actions can jointly facilitate a
better “fit” or agreement/alignment between the busi-
ness and manufacturing strategies. Such agreement
has been measured as the “fit” or “congruency” be-
tween strategies (Richardson et al., 1985) and as “pro-
duction competence” (Cleveland et al., 1989), which
reflects the value of manufacturing’s capabilities be-
ing able to support the business strategy. The recent
work by Gupta and Lionel (1998) showed that one
outcome of more effective manufacturing leadership
is a greater degree of alignment between the business
and manufacturing strategies. Such alignment is, in
turn, associated with better business performance (i.e.
Cleveland et al., 1989; Gupta and Lionel, 1998;
Richardson et al., 1985; Schroeder et al., 1986; Swamidass,
1986; Vickery et al., 1993). Thus, all three — involvement, influence, and the resulting
alignment — must be looked at in conjunction with
one another if the goal is to identify the antecedents
of improved organizational performance. Our study
is focused on attaining this objective.

The theoretical framework and hypotheses are pre-
sented next. This is followed by the research methods,
operational constructs, and data used to test these hy-
potheses. Structural equation modeling is used to ana-
lyze the results. Finally we conclude with the discus-
sion of results, contributions of this study, and future
research directions.

2. Theoretical framework and research hypotheses

Based on the aforementioned discussion and extant
literature, numerous questions are raised. First, could
the conflicting results with respect to involvement in
prior literature be attributed to the absence of an im-
portant aspect of the relationship between involvement
and business performance — namely the alignment
between business and manufacturing strategies? In
addition, the manufacturing strategy process research
has either excluded influence or not distinguished be-
tween involvement and influence, as can be seen by the
apparent interchangeability of the terms in prior work.
Yet, this distinction may prove to be an important one
as can be seen in the Boeing example. So, are involve-
ment and influence different aspects of the manufac-
turing executive’s role in the strategic decision-making
process? If so, does there appear to be a differ-
ence in their effect on performance? Finally, how do
manufacturing executives become more involved or
influential?

Addressing these questions leads to our theoretical
model shown in Fig. 1. The research model extends
prior manufacturing strategy research by proposing
that enhanced business performance results from in-
creased involvement and influence of manufacturing ex-
ecutives, but through the alignment of the business and
manufacturing strategies rather than directly. Also, the
effects of involvement and influence are differentiated,
while the expectation of a strong relationship between
these two aspects of the manufacturing executive’s
role is proposed. In addition, this research replicates
prior research by including both involvement and busi-
ness performance as part of the model. The hypoth-
esized relationships are examined separately next in
order to understand them in greater detail.

2.1. The role of involvement

The general expectation among researchers and
practitioners alike that greater involvement or par-
ticipation of the manufacturing executive in
business-level strategic decision-making processes should enhance strategic alignment and thus organizational performance is based on an expectation that involvement leads to increased communication and understanding among those involved. Increased involvement of the executive should allow manufacturing to have a clearer picture of the strategic direction of the firm and the associated requirements that might affect decisions with respect to that department. This can also enhance the quality of manufacturing executive’s input into the planning process, since his/her understanding of the business objectives is sharpened (King and Teo, 1997).

Involvement also increases top management team heterogeneity, which is expected to have positive effects (Bantel and Jackson, 1989; Eisenhardt and Schoonhoven, 1990; Hambrick and Mason, 1984; Schweiger et al., 1989). Such heterogeneity allows “access to a diverse range of information sources” (Bantel, 1993, p. 37) and “each participant brings unique information, knowledge, or perspectives that may be shared” (Schweiger et al., 1989, p. 745). Similar to Hoshin planning, which focuses on wide involvement and information sharing to improve the strategy planning and implementation processes (Mulligan et al., 1996), involvement provides an opportunity for the manufacturing executive to voice his/her opinions about strategic issues, which could increase non-manufacturing executives’ awareness of manufacturing related issues, and potentially affect the outcome of strategic decisions such that they are better aligned with manufacturing decisions. This leads to the first hypothesis (Hypothesis 1).

**Hypothesis 1.** Greater involvement of the manufacturing executive in business-level strategic decision-making will lead to a greater degree of alignment between the business and manufacturing strategies.

### 2.2. The role of influence

Influence provides a means by which executives are better able to “protect their self interests” (Sapienza and Korsgaard, 1996, p. 548). Particularly, a manufacturing executive with greater influence should be able to persuade the head of the firm (CEO or President who has ultimate decision-making authority) to follow his/her advice. In such a case, manufacturing “actively contributes to the development of a company’s competitive strategy” rather than merely reacting “to the plans developed by other functional groups” (Hayes et al., 1988, p. 352). A more influential manufacturing executive might be able to steer the decision-making process so the results reflect manufacturing’s capabilities. Or he/she may be able to secure greater resources for the manufacturing area, which would allow better support of the business strategy (Hill, 1994). In the Boeing example, greater manufacturing influence may have resulted in a very different strategic direction or at least the availability of the resources needed to support the business direction being followed. This leads us to Hypothesis 2.

**Hypothesis 2.** Greater influence of the manufacturing executive over business-level strategic decision-making will lead to a greater degree of
alignment between the business and manufacturing strategies.

2.3. The role of strategy alignment

Beginning with Skinner’s work in 1969, researchers and practitioners alike have discussed the importance of agreement between the business and manufacturing strategies. Much of this has focused on aligning the goals and objectives of the business and manufacturing strategies, which is expected to result in manufacturing capabilities that can support the firm’s strategic direction. This should lead to greater value to the customer through a product that has such features as lower cost, higher quality, or more timely delivery. This increased value should ultimately lead to increased market share or sales. In addition, the proper allocation of resources to the manufacturing area in support of the business strategy, which is more likely when the business and manufacturing strategies agree, could result in waste and cost reduction and, ultimately, improved business performance. This leads us to Hypothesis 3.

Hypothesis 3. Greater alignment between the business and manufacturing strategies will lead to enhanced business performance.

2.4. The relationship between involvement and influence

Little discussion has occurred in the manufacturing strategy literature with respect to the relationship between involvement and influence. Swamidass and Newell (1987), based on management literature, suggested that the level of involvement of the manufacturing executive might be a function of “intra-organizational power and influence”. However, an involved manufacturing executive could become more influential through a history of sound judgments and successes (Conger, 1998). In the information systems field, Williams and Wilson (1997) concluded that the use of GroupWare in decision-making leads to greater participation as well as greater opportunity to influence decision outcomes. This suggests a strong relationship between the two, as has also been observed in the procedural justice field. Based on these studies, Hypothesis 4 states the expectation that involvement and influence, although different, are related aspects of the manufacturing executive’s role in business-level strategic decision-making.

Hypothesis 4. Involvement and influence are distinct characteristics of the manufacturing executive’s role and are strongly related to one another.

We will test the path model shown in Fig. 1 using structural equation modeling methodology that accommodates the multiple interrelated dependence relationships present in the research model (Hair et al., 1995). Although these relationships could be examined through a series of separate, but interdependent regression equations, structural equation modeling allows the research model to be examined in its entirety.

3. Operational definitions and data collection

3.1. Construct measurement

Multiple item scales were used to measure each construct. In all cases existing scales were used. Content validity was addressed by carefully defining what is captured by each construct, reviewing the literature for use of each construct, using existing scales with strong measurement properties, and discussing each scale with manufacturing executives during pre-testing. Face validity was addressed through pre-testing. The following sections describe the source of each scale. The items themselves and their anchors are reported in Appendix C.

The scale to measure involvement consisted of items used previously in manufacturing strategy research by Anderson et al. (1991), and Ward et al. (1994). It captures participation with respect to product decisions, capital budgeting, operating philosophy, and strategies for growth. The scale to measure influence was adapted from procedural justice research where it demonstrated high internal consistency reliability (Sapienza and Korsgaard, 1996). It captures the ability of the manufacturing executive to influence the head of the firm or business unit with respect to decisions that will ultimately affect the operations function.

Several measures have been developed to measure the alignment of the business and manufacturing strategies as “fit” (i.e. Richardson et al., 1985; Schroeder et al., 1986; Vickery, 1991; Vickery et al., 1993). These measures rely on determining whether
identified characteristics in the operations function “fit” the characteristics of the current business strategy. Given several limitations associated with such measures, including identifying a comprehensive yet parsimonious list of business strategy and manufacturing strategy components (Vickery et al., 1993) and determining the correct configuration of those components (Sisk and Roth, 1994), an alternate measure was desired. Hayes et al. (1988), Hill (1994) and others have discussed alignment as the degree of understanding and agreement between top management and the manufacturing function on (1) the goals for the organization and the manufacturing function and (2) how manufacturing can support the strategic direction of the firm. Segars and Grover (1998) operationalized this idea of perceived strategy alignment as a direct measure of planning system success in strategic information systems planning. His scale demonstrated strong measurement properties and was adapted for the manufacturing context in this study.

Bourgeois (1980, p. 235) captures the general agreement among researchers that the selection of performance measures is difficult at best. “The adoption of any particular set of indicators embroils the researcher in the quagmire of problems of quantification and dimensionality, not to mention the issue of validly choosing the set of indicators which meets universal acceptance”.

The measure of performance used in this study was adopted from Ramanujam and Venkatraman (1987), where it demonstrated a high level of internal consistency. It includes two items measuring growth and two items reflecting profitability, all of which have been used in prior manufacturing strategy research (i.e. Boyer et al., 1997; Swamidass and Newell, 1987; Vickery et al., 1993; Ward et al., 1994). All items reflect the respondent’s perception of performance relative to major competitors, given difficulties of obtaining objective measures (Boyer et al., 1997; Vickery et al., 1993; Ward et al., 1994) and acceptance of perceptual measures as a substitute (Dess and Robinson, 1984).

3.2. Data collection

Data for this study was collected via a survey of US manufacturing firms that addressed strategic manufacturing planning. Sampling was done at the strategic business unit (SBU) level (division, subsidiary, or single product line) to address the level at which the business and manufacturing strategies are expected to be developed (Hayes and Wheelwright, 1984). The sampling frame consisted of organizations from all Standard Industry Classification groups, since the effect of the level of involvement or influence was not expected to differ based on type of industry (Swamidass and Newell, 1987). The sample consisted of medium to large firms or SBUs (sales of US$ 50 million or more) given prior findings that strategic planning differs between large and small firms (Lorange and Vancil, 1977; Marucheck et al., 1990). The sample was drawn from the 1996 National Edition of the Harris Manufacturing Directory, which has been used in prior manufacturing strategy research as well (e.g. Safizadeh et al., 1996; Ward et al., 1994) and provided necessary information at the SBU level. The targeted respondent was the highest-ranking manufacturing executive, usually the vice president of manufacturing.

The survey instrument, which consisted of just over 100 questions addressing various aspects of strategic manufacturing planning, was pre-tested and then mailed to 681 manufacturing firms. Pre-testing was done via interviews with sixteen vice presidents of manufacturing, all of whom indicated that they were involved in strategic planning at the business level. Preliminary assessment of the measures indicated a high degree of internal consistency. Of the surveys sent to the final sample, 202 useable responses were returned, giving a 30% response rate. The sample included all but one SIC group, and varied in sales, number of employees, and variety of products and processes (see Table 1). The targeted respondent was one or two levels below the head of the firm in 85% of the cases. No significant differences were found for any of the variables based on industry, sales, process or product. Finally, a check for non-response bias indicated that respondents did not differ significantly from non-respondents with respect to SIC code, sales, or number of employees.

Subsequent to the survey, 20 min structured phone interviews were conducted with a different sub-sample of executives. This was done in order to further understanding of the involvement, influence, and alignment constructs, as well as create better insights into their relationship by examining executive perceptions
Table 1
Profile of survey respondents

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Sales (in million US$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50–100</td>
<td>45</td>
<td>22.9</td>
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<tr>
<td>101–250</td>
<td>75</td>
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<tr>
<td>251–500</td>
<td>26</td>
<td>13.2</td>
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<tr>
<td>501–1000</td>
<td>30</td>
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<tr>
<td>1001–3000</td>
<td>16</td>
<td>8.1</td>
</tr>
<tr>
<td>&gt;3000</td>
<td>5</td>
<td>2.5</td>
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<tr>
<td>Number of employees</td>
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<td></td>
</tr>
<tr>
<td>100–500</td>
<td>81</td>
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<td>501–1000</td>
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<tr>
<td>1001–1500</td>
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<td>11.7</td>
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<tr>
<td>1501–2000</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>2001–2500</td>
<td>4</td>
<td>2.0</td>
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<tr>
<td>2501–3000</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>&gt;3000</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Products\textsuperscript{a}</td>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>41</td>
<td>19.8</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>31.4</td>
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<td>3</td>
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<td>5</td>
<td>17</td>
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<tr>
<td>Processes\textsuperscript{b}</td>
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<tr>
<td>1</td>
<td>41</td>
<td>20.0</td>
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<tr>
<td>2</td>
<td>31</td>
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<td>53</td>
<td>25.9</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>39.0</td>
</tr>
</tbody>
</table>

\textsuperscript{a} 1: customized product manufactured to customer specifications; 2: standard product with options modified to customer specification; 3: standard product modified to customer specification; 4: standard product with standard options; 5: standard product with no options (Safizadeh et al., 1996).

\textsuperscript{b} 1: products are produced in small batches, similar equipment performing the same functions grouped together; 2: products are produced in moderately large batches, similar equipment performing the same functions are grouped together; 3: products are produced in batches, work centers are laid out in the sequence in which the products are manufactured; 4: products are produced in large batches or in a continuous flow, work centers are laid out in the sequence in which the products are manufactured (Safizadeh et al., 1996).

4. Results

4.1. Measure refinement and validation

The structural equation model consists of each item in the multi-item scales. The correlation matrix of the variables is presented in Table 2. Following the two-step approach recommended by Anderson and Gerbing (1988), adequacy of each multi-item scale in capturing its construct is assessed using the measurement model of all constructs before testing the hypotheses via the causal (proposed) model. This evaluation of the measurement properties of each scale includes assessing unidimensionality, internal consistency reliability, convergent and discriminant validity, and interrater agreement.

The fit indices and the significance of the t-values for all factor loadings (all at $P < 0.001$ level) suggest that the measurement model (Fig. 2) is an acceptable representation (Chau, 1997; Hartwick and Barki, 1994; Segars and Grover, 1993). Examination of the asymptotically standardized residual values and modification indices to evaluate the unidimensionality of the scales (Segars, 1997) suggests one item used to assess involvement (INV2) may be cross loading on the latent factor influence. Examination of this item did not reveal any theoretical reason why it should be associated with both involvement and influence, but it was the only item that was reverse-coded. The standardized factor loading for this item (0.54) was also substantially less than other factor loadings and below the suggested cut-off of 0.60 (Hatcher, 1994). Since dropping the item does not appear to decrease content validity of the scale, this is done. The residual ma-
trix also indicates that the items measuring business performance reflect two dimensions: growth (BP1 and BP3) and profitability (BP2 and BP4). However, this is not unexpected based on the earlier discussion. Given the high composite reliability of this scale reflecting internal consistency, and the difficulties commonly associated with measuring business performance (Bourgeois, 1980), all items are retained.

The re-specified measurement model, after dropping the problem item (INV2), shows an improved fit (GFI = 0.88, AGFI = 0.83, CFI = 0.93, $\chi^2$ adjusted for d.f. = 2.35). The residuals and modification indices indicate that the scales exhibit satisfactory unidimensionality. Internal consistency reliability, assessed using composite reliability, is demonstrated since values for all constructs are above the suggested threshold of 0.70 (see Table 2). All factor loadings for indicators measuring each construct (standardized values in Fig. 2) are significant (all at $P < 0.001$ level) providing evidence of convergent validity. In addition, the discriminant validity of the scales is evaluated for all possible paired combinations of the constructs, although involvement and influence are the greatest concern given prior findings that they tend to be highly correlated (Tyler et al., 1985). Table 3 shows that all $\chi^2$ differences are significant, demonstrating discriminant validity for all scales and providing sta-

**Table 3**

<table>
<thead>
<tr>
<th>Variables compared</th>
<th>$\chi^2$ difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involvement</td>
<td>Influence</td>
</tr>
<tr>
<td></td>
<td>Alignment</td>
</tr>
<tr>
<td></td>
<td>Business performance</td>
</tr>
<tr>
<td>Influence</td>
<td>Alignment</td>
</tr>
<tr>
<td></td>
<td>Business performance</td>
</tr>
<tr>
<td>Alignment</td>
<td>Business performance</td>
</tr>
</tbody>
</table>

$^a$ Significant at the $P < 0.001$ level.
Finally, the within-group interrater agreement ($r_{wg}$) (James et al., 1984, 1993), which reflects the interchangeability of respondents, is evaluated. Using this measure, both the level and rank orderings of responses from individuals identified by the primary respondent as equally knowledgeable, are compared to those of the primary respondent in a sub-sample of firms (see Appendix C for details). Although no rule-of-thumb was given by James et al. (1984, 1993), the indices in this study, ranging from 0.73 to 0.91 (see Appendix C for individual $r_{WG}$ values), indicate that respondent agreement was high according to conclusions in other research (i.e. Dean and Sharfman, 1993).

4.2. Structural equation models for hypothesis testing

Before testing each of the hypotheses, the appropriateness of the research model (nested model in Fig. 3a) is evaluated by comparing it to the full model (Fig. 3b), which includes the direct effects of involvement and influence on business performance and reflects the relationship between involvement and business performance examined by previous researchers. The goodness of fit indices for these models indicate that both are appropriate representations of the relationship between the constructs. A $\chi^2$ difference test between these two models ($\chi^2_{\text{diff}} = 1.16$, d.f. = 2) indicates no significant difference between them. So the nested model (Fig. 3a) is accepted as the better representation of the observed covariances since it improves parsimony (Joreskog and Sorbom, 1989). Equally important, the lack of significance of the direct paths in the full model (Fig. 3b) provides statistical support for the basic premise of this research, that alignment is an important mediating variable in this relationship.

Each of the hypotheses is tested via the path coefficients in the theoretical model (Fig. 3a). In each case, the significant path coefficient provides support for the hypothesis about the associated relationship (Table 4), and all of these relationships are strong as indicated by the magnitude of the path coefficient and level of significance. The $R^2$ values for the latent endogenous variables show that involvement and influence account for 57% of the variance in alignment, which in turn accounts for 9% of the variance in business performance. Although the $R^2$ value for business performance is not extremely high, it was not unexpected given the myriad other factors that can affect business performance (Swamidass and Newell, 1987; Vickery et al., 1993). It is also comparable to the $R^2$ values reported in other manufacturing strategy research studies (i.e. range of $R^2 = 0.07–0.19$ for perceptual measures in Vickery et al. (1993)).

5. Discussion and managerial Implications

Our findings agree with those from prior research in that both involvement and influence are found to affect business performance. As one of the executives, who responded that he is both highly involved and influential, stated, “I have visited other companies where they [the manufacturing executives] are not involved enough and the company’s financial performance suffers because of that.” However, an important difference between this study and prior work is that we observe this effect happening through better alignment of the business and manufacturing strategies, rather than directly. Most executives, in talking about the benefits of involvement and influence, echoed this idea since commonly mentioned benefits were alignment of strategies and ensuring that manufacturing could support the strategic direction of the firm. And these enhance the company’s performance. “There are three ways it [alignment] helps: getting the right product or service, timeliness of your response, and cost”.

But are there differences between the involvement of the manufacturing executive and his/her ability to influence decisions? The answer to this, based on both survey results and the executive interviews, is yes. First, the strong evidence of discriminant validity indicates that they are seen as distinctly different constructs. In the interviews, the manufacturing executives not only agreed with the definitions of each (one executive stated, “I participate but don’t dictate” in discussing involvement), but also easily addressed them as being different concepts. But the executives see them as more than just different concepts. Table 5 shows this distinction in terms of different managerial actions, contingencies, and benefits associated with each.
Fig. 3. Results for nested and full structural equation models: (a) nested (proposed) research model; (b) full model with direct effects.

Table 4
Results of hypothesis testing

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relationship</th>
<th>Standardized path coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Involvement enhances alignment</td>
<td>0.24&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Influence enhances alignment</td>
<td>0.58&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Alignment enhances business performance</td>
<td>0.30&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>Involvement and influence related</td>
<td>0.62&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Significant at the $P < 0.01$ level.

<sup>b</sup> Significant at the $P < 0.001$ level.
Table 5
Executives’ responses: factors affecting role and benefits of involvement and influence

<table>
<thead>
<tr>
<th>Role</th>
<th>Factors affecting role</th>
<th>Contingencies</th>
<th>Benefits of role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involvement</td>
<td>Working and thinking cross-functionally</td>
<td>Corporate culture/climate</td>
<td>Better decisions</td>
</tr>
<tr>
<td></td>
<td>Being knowledgeable about all facets of business</td>
<td>Type of company (whether</td>
<td>Strategic alignment</td>
</tr>
<tr>
<td></td>
<td>Educating CEO and peers about consequences of</td>
<td>marketing-driven or</td>
<td>Manufacturing executive</td>
</tr>
<tr>
<td></td>
<td>exclusion through specific examples</td>
<td>manufacturing-driven)</td>
<td>exposed to other ideas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specifications of strategic</td>
<td>More effective implementation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>planning process</td>
<td></td>
</tr>
<tr>
<td>Influence</td>
<td>Establishing credibility</td>
<td>Industry</td>
<td>Garner greater share of resources</td>
</tr>
<tr>
<td></td>
<td>Performing successfully</td>
<td>Manufacturing executive’s expertise</td>
<td>Greater chance for success</td>
</tr>
<tr>
<td></td>
<td>Thinking and explaining cross-functionally</td>
<td>in decision area</td>
<td>More prestige and/or power</td>
</tr>
<tr>
<td></td>
<td>Interacting with the CEO/board</td>
<td>Head of the firm’s perception</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>about manufacturing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head of the firm’s discipline</td>
<td></td>
</tr>
</tbody>
</table>

To increase the level of involvement, the manufacturing executive must be willing to both work and think cross-functionally. Our respondents stressed that the manufacturing executive should no longer focus just on the technical aspects of the manufacturing function, but must become knowledgeable about the business as a whole. As one executive summarized, they need “to understand the business from all functional organizations, everything from development, sales, marketing, product management, financial”. But to become more influential requires this and more. Establishing credibility was indicated by virtually all of the manufacturing executives as essential in becoming more influential. Such credibility may result from the executive’s past performance on projects or routine work. It is important to gain respect by demonstrating the ability to grasp facts, thereby creating a reputation as a good problem solver. This finding supports observations by Conger (1998) that establishing credibility is one of the essential steps in effectively persuading and influencing others.

However, to some extent, the degree of a manufacturing executive’s involvement or influence is not under their control. Rather it is shaped by factors such as the corporate climate, the type of company or industry, or the head of the firm’s and other top managers’ perceptions about manufacturing. One executive stated that manufacturing is commonly not involved because “ops people are looked at as the guy who grew out of the factory … and a lot of time people say they are factory rats”. If greater involvement and/or influence are achieved, numerous benefits are realized due to the alignment between the business and manufacturing strategies. However, the route to that end differs between the two roles. The executives indicated that greater involvement often leads to better decisions because more information is available, specifically about the capabilities and limitations of the manufacturing system. As one executive stated:

“Greater involvement by manufacturing really puts a face on manufacturing. In some companies, and ours is no exception, manufacturing is viewed as a big warehouse out there that you walk into like a supermarket and you pick things off the shelf that you want. Very flexible and they can change things around very quickly to satisfy marketing, satisfy sales, satisfy finance, etc. If you don’t stay on top of what is going on, sooner or later you are going to be put between a rock and a hard place.”

At a minimum, involvement increases the manufacturing executive’s awareness of what is happening. As one executive described, “I might not like the strategy, but I know its coming. As long as I am involved I am not going to trip over it”. But, as demonstrated by Boeing, involvement alone may not be enough.
Table 6
Executives’ responses: organizational implications of the manufacturing executive’s role

<table>
<thead>
<tr>
<th>Level of Involvement</th>
<th>Level of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Knowledge enhancement</td>
</tr>
<tr>
<td></td>
<td>Increased visibility for the manufacturing perspective, so others in the process may better understand manufacturing’s capabilities and limitations</td>
</tr>
<tr>
<td></td>
<td>Manufacturing understands corporate goals and its role relative to other functional areas</td>
</tr>
<tr>
<td></td>
<td>Lack of “pull” may mean lack of resources to accomplish those goals</td>
</tr>
<tr>
<td></td>
<td>Less able to affect strategic direction of firm</td>
</tr>
<tr>
<td>High</td>
<td>Inclusion and protection</td>
</tr>
<tr>
<td></td>
<td>Manufacturing is active in the “corporate debate”, so a much better understanding of corporate goals and manufacturing’s capabilities and limitations is attained</td>
</tr>
<tr>
<td></td>
<td>Manufacturing executive is more able to affect strategic direction of the organization</td>
</tr>
<tr>
<td></td>
<td>Manufacturing executive more able to garner needed resources</td>
</tr>
<tr>
<td></td>
<td>Waste is reduced since resources are more likely to be allocated in support of the business direction</td>
</tr>
<tr>
<td>Low</td>
<td>“Some warehouse out there”</td>
</tr>
<tr>
<td></td>
<td>Manufacturing’s capabilities and/or limitations are generally not considered</td>
</tr>
<tr>
<td></td>
<td>Manufacturing primarily reacts to decisions of others</td>
</tr>
<tr>
<td></td>
<td>Manufacturing “not geared to the business’s corporate objectives”</td>
</tr>
<tr>
<td>Low</td>
<td>“Not a good route”</td>
</tr>
<tr>
<td></td>
<td>Manufacturing not seen as a “team player” by others, leading to possible alienation from other functions in the firm</td>
</tr>
<tr>
<td></td>
<td>Manufacturing executive has “given” influence rather than an “earned” influence, so is possibly less respected in the organization</td>
</tr>
<tr>
<td></td>
<td>Manufacturing executive is likely “on his way out”</td>
</tr>
</tbody>
</table>

Influence, on the other hand, creates a greater chance for success. This is not surprising since greater influence means that the opinion of the manufacturing executive is actually affecting the outcome of the process, rather than just being heard by others involved in it. Greater influence can result in more resources being allocated to the value added manufacturing function to support the overall competitive strategy of the firm. Many executives noted that influence is important in attaining greater investments in structural and infrastructural development programs. “You have to be influential, you have to gain the ability to be influential in order to attract capital for programs you want to do, that you feel will benefit the business.” This may explain why such investments, in conjunction with involvement, were a key factor in distinguishing between low and high performers in the Ward et al. (1994) study.

Understanding these two different facets of the manufacturing executive’s role and how they can be used to improve firm performance has significant organizational implications. Table 6 summarizes the related insights gleaned from our executive interviews. A manufacturing executive could independently have low and high levels of involvement and influence, which reflect whether the firm views manufacturing as a competitive weapon or a millstone around the neck. Table 6 shows that not having sufficiently high influence leads to manufacturing being relegated to a minor role or having a non-sustainable set of opportunities in affecting the firm performance. Yet, a manufacturing executive that exerts influence without involvement will likely be “in a bad situation”. It is obviously desirable to have high levels of both.

These different roles of the manufacturing executive are thus intertwined. But what is the relationship between them? The executives’ responses shed some light on this issue (see Table 7). All executives believe that greater involvement can lead to greater influence (“Involvement starts out first and lets you build trust and credibility and then it moves to influence”), but one-third of them believe that influence does not lead to involvement. There was a consensus that influence without involvement was unadvisable. Two-thirds of the executives felt that the relationship could occur in both directions, and most of these felt that this “circular” relationship, where “one begets the other”, starts with involvement. Typical of examples given, one manufacturing executive was able to influence a
Table 7
Executives’ responses: how do involvement and influence relate?

<table>
<thead>
<tr>
<th>Transition</th>
<th>Number of responses</th>
<th>Mechanisms for transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involvement → influence</td>
<td>7</td>
<td>Involvement leading to influence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establish credibility through past involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Successful completion of past projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Build relationships with other areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop business expertise rather than just manufacturing expertise.</td>
</tr>
<tr>
<td>Involvement ↔ influence</td>
<td>6</td>
<td>Involvement leading to influence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Establish credibility through past involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Successful completion of past projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Build relationships with other areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop business expertise rather than just manufacturing expertise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Influence leading to involvement</td>
</tr>
<tr>
<td>Involvement → influence</td>
<td>1</td>
<td>Gain respect of others</td>
</tr>
<tr>
<td>Involvement ← influence</td>
<td>0</td>
<td>Demonstrate ability to grasp facts</td>
</tr>
<tr>
<td>Involvement ↔ influence</td>
<td>3</td>
<td>Develop reputation as a successful problem-solver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Personal characteristics</td>
</tr>
</tbody>
</table>

* Direction of arrow(s) reflects direction of transition(s); relative length of arrow in arrow pairs reflects whether relationship in one direction is less or more likely than the relationship in the other direction.

decision about a product line because of successful involvement in prior projects. Because of his ability to influence a decision seen as “out of his area”, he was asked to work on other projects. These observations suggest that the nature of the relationship between involvement and influence is complex and evolves over time. Although this study sheds considerable light on this relationship, longitudinal research studies in the future can perhaps further isolate the impact of the contingency factors shown in Table 5.

6. Contributions and future research

We believe that this study has made several important contributions to the field of manufacturing strategy. The first contribution of this research is empirically demonstrating that involvement and influence enhance business performance through the alignment of the business and manufacturing strategies. This extends and clarifies conflicting findings in prior research, and thereby allows us to better understand the effect of the manufacturing executive’s role in strategic decision-making. We also believe that alignment, as assessed in this study, may prove to be a useful construct for future manufacturing strategy research, particularly where researchers have been developing different methods to assess congruence between the two strategies.

The second major contribution of this research is that it conclusively demonstrates that involvement and influence are indeed two different aspects of the manufacturing executive’s role in the strategic planning process. The paths executives take in increasing their level of involvement or influence and the benefits associated with each differ in several respects. Future work in our field should create a distinction between them, unlike prior work that has focused on involvement alone (Swamidass and Newell, 1987; Ward et al., 1994) or examined involvement while discussing both (i.e. Anderson et al., 1991).

Third, we show empirically that manufacturing executives indeed perceive influence and involvement as being closely linked. There was consensus among the executives that greater involvement is a precursor to being influential; however, there was less agreement on an executive translating their influence into involvement. The knowledge gained from these executive interviews could be used to affect how manufacturing executives proceed in the future in attaining a more substantive role in decision-making processes within their firms.

With respect to practice, this research confirms that in the absence of influence and involvement, the manufacturing function may continue to be viewed as “some warehouse out there” and have to react to decisions made by others (see Table 6). Although greater involvement is advantageous, a much greater benefit is realized when the manufacturing
executive can actually influence the outcome of the decision-making processes, due in part to steering the plans in a direction manufacturing can support or garnering the resources needed to support the business strategy. By better understanding what actions might affect his/her level of involvement and/or ability to influence decision outcomes, a manufacturing executive might be able to avoid a fiasco such as that experienced by Boeing. Although focusing on becoming more influential without being involved may be tempting because of time constraints and short-term benefits, it may be detrimental in the long run and lead to an erosion of that influence over time.

There are a few limitations of this study that should be recognized. Several of these stem from using a survey methodology, including the possibility of single-respondent bias and common methods bias, and cross-sectional rather than longitudinal results. However, based on within-group interrater agreement assessment, no evidence of single-respondent bias was found.

While common methods bias is a concern, this form of data collection is generally appropriate for hypothesis testing and was needed to ensure sufficient sample size to test the structural equation model. Third, even though longitudinal perspective is needed to address the “circular” nature of the relationship between involvement and influence, the use of cross-sectional data increased generalizability. Finally, we studied involvement and influence in the form of the manufacturing executive providing information or influencing the head of the firm with respect to the business strategy. But what about the reverse effects, which also need to be examined?

Future research in this area can build on our findings in several other areas. Although this research pointed out some mechanisms that can be used to increase involvement and influence as well as some contingencies that affect their level, other factors that may be important within this context should be identified and examined. Future studies should examine how factors such as environmental uncertainty and the nature of dependencies between different functional areas affect levels of involvement and influence (e.g. Hickson et al., 1971; Hinnings et al., 1974; Pfeiffer and Salancik, 1977; Salancik and Pfeiffer, 1977). In addition, what is the role played by organizational characteristics such as process sophistication, flexibility, or breadth of functional experience of top management in affecting the level of involvement and influence of the manufacturing executive (Rafii, 1984)? These relationships must be examined more exhaustively in the manufacturing domain. Finally, an area that has been a subject of research in the strategic management and information systems fields but has not been addressed substantially in operations management is power. Involvement, influence, and power are likely related, but we do not yet understand the role of power within this context.

Acknowledgements

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Appendix A. Questions used in manufacturing executive interviews

Through this research we hope to better understand the manufacturing executive’s role in business level strategic decision-making, which refers to decisions about capital investments, growth strategies and such. We are focusing on the involvement and influence of the manufacturing executive in that decision-making process.

- **Involvement:**
  - We will start with involvement. We defined involvement as the extent to which the manufacturing executive participates in making strategic decisions. Does your perception of involvement coincide with this interpretation?
  - We are also trying to better understand how a manufacturing executive might become more involved. Do you think there are actions the manufacturing executive could take that might lead to greater involvement? In other words, if you were giving advice to a young manufacturing executive on how to increase their level of involvement, are there actions you would recommend them taking?
Now, can you think of other situations or contextual factors which might affect the level of involvement that are not linked to the specific actions of the manufacturing executive (such as seniority or being assigned to committees).

**Influence:**
- Next I would like to discuss influence. We defined influence as the extent to which the manufacturing executive directly affects the outcome of decisions that affect him or her. And particularly we were focusing on influence as the extent to which the head of the firm takes the advice of the top level-manufacturing executive (or that executive can change the direction of the decision outcome). Again, does your perception of influence coincide with this interpretation?
- Repeat of question number 2 above with respect to ability to influence decision outcomes.
- Repeat of question number 3 above with respect to ability to influence decision outcomes.

**Relationship between involvement and influence:**
- Now that you have answered some questions on involvement and influence individually, I would like to focus on any possible relationship between them. First, do you think that involvement and influence are related or do you think that they always occur independently?
- Do you think that they occur simultaneously or does one lead to another? (Ask the following questions about that direction; ask if the other direction can occur and, if so, ask the following questions about it as well and finish with: Is one direction in the relationship more predominant than the other? Which one?)
- Can you give me an example of a situation where greater involvement led to greater influence?
- Are there actions the manufacturing executive can take or other mechanisms that would facilitate this relationship? In other words, how does greater involvement get translated into greater influence or vice versa?

**Benefits of involvement and influence:**
- Now I would like to focus on possible benefits for the manufacturing function or the business as a whole that result from greater involvement or influence of the manufacturing executive in strategic decision making process. First, do any benefits of greater involvement come to mind?
- Now, are there any benefits associated with a more influential-manufacturing executive?
- Does having an involved manufacturing executive allow for greater consistency between the business and manufacturing strategies?
- Does being influential allow for greater consistency?
- Which affects the level of consistency between the strategies more — involvement or influence?

**Alignment:**
- In your opinion, what benefits might result from an alignment of the two strategies?
- Does such an alignment affect the company’s ability to compete by making a product that is more desirable to the customer?
- Do you think that involvement and/or influence affect the manufacturing executive’s understanding of manufacturing’s role in relation to other functional areas? If so, do you think one of them is more important in increasing the manufacturing executive’s understanding of other functional areas?
- Do you think there is a relationship between the manufacturing executive’s level of involvement and/or influence and the level of investment in structural and infrastructural development programs? If so, do you think one of them is more important with respect to the level of investment?

**Additional question:** If the respondent felt that both directions could occur with respect to the relationship between involvement and influence and had not talked about the nature of that relationship, ask the following: Do you feel that the relationship is circular in nature? If so, where do they think the “circle” begins?
Appendix B. Characteristics of executive interview sub-sample

<table>
<thead>
<tr>
<th>Process(^a)</th>
<th>Product(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33(^c/3)</td>
</tr>
<tr>
<td>2</td>
<td>33/3</td>
</tr>
<tr>
<td>3</td>
<td>30/2</td>
</tr>
<tr>
<td></td>
<td>24/2</td>
</tr>
<tr>
<td></td>
<td>26/3</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>21/3</td>
</tr>
<tr>
<td></td>
<td>20/3</td>
</tr>
<tr>
<td></td>
<td>33/5</td>
</tr>
<tr>
<td></td>
<td>33/3</td>
</tr>
</tbody>
</table>

\(^a\) 1: products are produced in small batches, similar equipment performing the same functions grouped together; 2: products are produced in moderately large batches, similar equipment performing the same functions are grouped together; 3: products are produced in batches, work centers are laid out in the sequence in which the products are manufactured; 4: products are produced in large batches or in a continuous flow, work centers are laid out in the sequence in which the products are manufactured (Safizadeh et al., 1996).

\(^b\) 1: customized product manufactured to customer specifications; 2: standard product with options modified to customer specification; 3: standard product modified to customer specification; 4: standard product with standard options; 5: standard product with no options (Safizadeh et al., 1996).

\(^c\) SIC group.


Appendix C. Measurement scales

Involvement (INV) \((r_{wg} = 0.78)\): seven-point scales with endpoints “strongly disagree” and “strongly agree” in response to:
1. The head of manufacturing is totally involved in specifying strategy for the firm;
2. The head of manufacturing is seldom involved in product decisions concerning production, marketing, and R&D strategies (reverse coded);
3. The head of manufacturing frequently participates in capital budget decisions (the selection and financing of long-term investments);
4. The head of manufacturing participates in decision-making regarding changes in the business unit’s operating philosophy and strategies for growth;
5. The head of manufacturing takes an active, proactive role in strategic business planning.

Influence (INF) \((r_{wg} = 0.86)\): five-point scale with endpoints “not at all” to “great” in response to:
1. What extent does the head of the firm take the advice of the highest ranking manufacturing executive in making strategic choices about the manufacturing function?
2. What extent could the highest ranking manufacturing executive influence strategic decisions made by the head of the firm?
3. What extent does the highest ranking manufacturing executive influence strategic decisions made by the head of the firm?
4. What extent does the head of the firm ignore the advice of the highest ranking manufacturing executive in making strategic choices about the manufacturing function (reverse coded)?

Alignment (ALIGN) \((r_{wg} = 0.73)\): seven-point scale with endpoints of “entirely unfulfilled” and “entirely fulfilled” in response to:
1. Understanding the strategic priorities of top management;
2. Adapting the goals/objectives of the manufacturing function to the changing goals/objectives of the firm;
3. Maintaining a mutual understanding with top management on the role of the manufacturing function in supporting the organizational strategy;
4. Identifying manufacturing related opportunities to support the strategic direction of the firm.

Business performance (BP) \((r_{wg} = 0.91)\): seven-point scale with endpoints of “much worse than major competitors” and “much better than major competitors”.

\(^2\) A second respondent at approximately one-fourth of the firms completed a survey. Of the forty-five respondents (three surveys were incomplete), 26% were at the same level as the original respondent (generally a vice president of another area), 57% were one level below, and 17% were two levels below (with titles such as operations manager” “director of operations” or “plant manager”).
competitors” in response to:
1. sales growth;
2. earnings growth;
3. market share change;
4. return on investment (ROI).

References


