Effects of Management Control Systems on Manufacturing Performance: A Path Analytical Model

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Abstract

This study uses linear structural relations (LISREL) model to investigate the influence of management control systems (i.e., quality-related goals, quality feedback and incentive-compensation) on conformance quality and the influence of conformance quality on customer satisfaction. Overall, the results indicate support for the theoretical framework linking goals, feedback and incentives to conformance quality. The results also indicate that quality conformance has a significant impact on customer satisfaction and also mediates the relationship between management control systems and customer satisfaction.

Key Words

Management Control Systems
Manufacturing Performance
Path Analytical Model

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Introduction

The manufacturing strategy literature has viewed product quality as one of the major competitive priorities for attaining a sustainable competitive advantage (Hill 1997), and manufacturing control systems highlight the manner in which the business unit deploys its resources (Hayes and Wheelwright 1984) and effectively uses its strengths (Swamidass and Newell 1987) to complement the business strategy. Numerous studies have investigated the direct effects of manufacturing control systems (e.g. employee empowerment, employee commitment and quality-related feedback) on business performance (e.g. customer satisfaction, conformance quality or other variables) (Ahire et al. 1996; Hardie 1998; Ittner and Larcker 1995). Performance is the most frequently researched (and probably the most important) effect of these control-system components, and conformance quality has been a dependent variable in some studies.

While control systems can have many direct effects on performance measures, suppressing relationships among these performance measures can lead to a distorted understanding of the effects of control systems. The predicted or estimated effects of a control-system on a dependent variable can depend on which of the other variables that are affected by that component are included in the study. As such, the omission of conformance quality as a key mediating construct in the domain of quality practices represents a significant gap in both theory construction and testing. Accordingly, there is a need to address the issue of conformance quality in measuring business performance.

Alternative views exist on how quality should be managed in organizations. Practicing managers seem to favour one quality expert (guru) over another one, while the empirical studies indicate no clear directions (e.g. Flynn et al.1994; Ahire et al. 1996; Ittner and Larcker

1995; Sim and Killough 1998). However, Benson et al. (1991) have proposed a system-structure model of quality management that relates organization context, actual quality management, ideal quality management, and conformance quality. Their results suggest that organizational context influences manager's perceptions of both ideal and actual quality management. Important contextual variables are corporate support for quality, past conformance quality, managerial knowledge, and the extent of external quality demands (Adam 1994).

With the practice of quality improvement literature as background, it is the empirical literature that provides the clearest direction for this study. Specifically, this study draws from the applied psychology, quality and related literature and develops a set of hypotheses that includes manufacturing controls (quality-related goals, quality feedback, and incentive compensation) as antecedents, and customer satisfaction as consequences, and conformance quality as the key mediating variable. In doing so, the notion of a key mediating variable is developed and the notion of centrality of the conformance quality in models of the quality practices suggested. The overall theoretical framework is illustrated in Figure 1.

The focus for this paper is the manufacturing unit shop floor because (1) responsibility for detecting nonconforming items shifts from a quality control department to line personnel and each worker is responsible for quality and for stopping the production process when there is a problem, and (2) competitive advantage is ultimately won or lost primarily at the business unit level rather than the corporate level (Porter, 1980).

Measurements for this study are questionnaire responses from a random sample of manufacturing business units located in the United States.

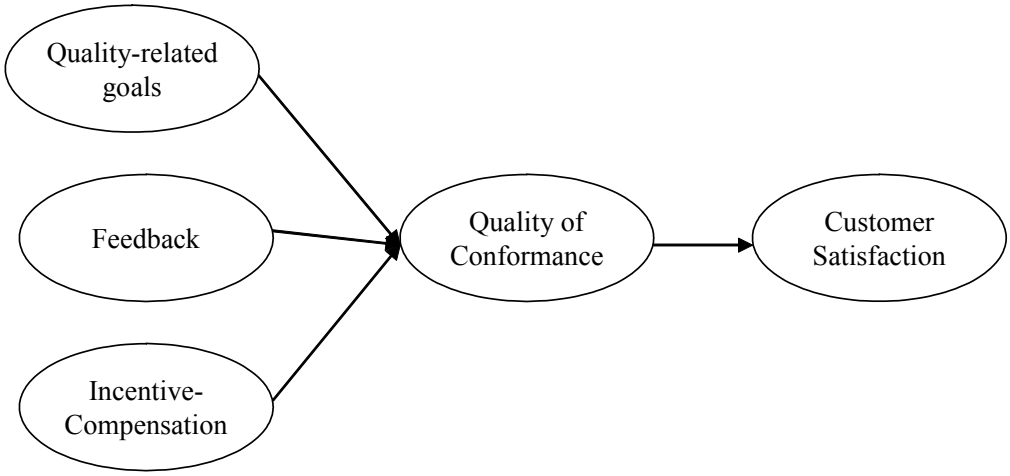
The paper is organized as follows. First, the literature review is discussed and hypotheses are developed. Next, a discussion of the research methods is conducted. After the empirical results are reported, a conclusion, discussion and suggestions for future research are presented.

Literature Review and Hypotheses Development

Management Control Systems and Conformance Quality

Quality-related Goals: A significant amount of research has shown that one of the most effective management control techniques for achieving improved performance is to provide specific, challenging goals and feedback to individuals (Locke 1982). Therefore, management strategy focusing on quality improvement should provide frequent goal-setting to all assembly personnel, since the responsibility for quality rests with those who produce the products (Daniel and Reitsperger 1991). Appealing to prior goal theory research studies, Wexley and Yuki (1984) recommend that employees should have specific performance goals to guide behaviour. Therefore, it is expected that congruence between employees' goals and those of the organization more likely will lead to achievement of both sets of goals. Under these circumstances, it is argued that performance will be better.

Figure 1
Indirect Model



To examine the relationship between quality-related goals and conformance quality, the following hypothesis is formulated:

H_1: *The use of quality-related goals will be positively associated with quality of conformance.*

Quality Feedback: One of the primary perceived benefits of the new manufacturing practices is the gain in efficiency that occurs from the use of on-the-spot knowledge and problem solving abilities of workers (Aoki 1986). In order for workers to identify problems and opportunities, and coordinate their efforts, management needs to provide them with feedback information in the form of manufacturing performance measures. Performance feedback to workers is necessary to enable them to determine the relationship between their own behaviour and the outcomes the process is producing.

The use of performance information assesses predetermined ends while allowing employees to determine the appropriate means to those anticipated ends. Sharing performance information is a critical component of any management process (Katz and Kahn 1978). The types of performance information that are gathered and disseminated determine what employees ultimately pay attention to (Ilgen et al. 1979). For example, if information on quality costs is measured and disseminated to employees, then employees will pay more attention to quality. Second, performance information provides feedback to employees and their managers and thus can provide guidance regarding areas for improvements (Ashford and Tsui 1991).

From a learning perspective, more frequent reporting of manufacturing performance measures to workers helps them develop effective task strategies quicker that can improve performance (Locke and Latham 1990). Since assembly line personnel are responsible for quality and considered to be the quality experts, information must be widely disseminated to focus the attention of all production personnel to continuously improve quality levels (Daniel and Reitsperger 1991). The value of shop floor information is also

consistent with organizational behaviour research that has shown that feedback helps promote task oriented behaviour (Utzig 1988; Ashford and Cummings 1984; Ilgen et al. 1979). To explore the relationship between feedback and conformance quality, the following hypothesis will be tested:

H_2: *Frequent use of quality feedback is positively associated with quality of conformance.*

Incentive-Compensation*:* Expectancy theory predicts an increase in employee motivation with an incentive compensation scheme if the beneficiaries perceive the goal as attainable (Snead and Harrell 1995; Stahl and Harrell 1981). Govindarajan and Gupta (1985) state that when perceived rewards are attached to specific performance measures, behaviour is guided by the desire to optimize those performance measures. Incentives decrease differences between employee and organizational goals (Hesterly et al. 1990; Lawler 1990). Empirical research has shown that when rewards are tied to performance, employees will adjust their effort to optimize their own income and simultaneously boost organization performance (Cooke 1994; Lawler 1986). In effect, incentives enhance employees' concern for the organization by more closely tying their fate to the success of the organization (Miles and Creed 1995). Therefore, it can be argued that the use of performance incentives will help make employees more willing to improve quality. To examine the impact of incentives on conformance quality, the following hypothesis is formulated:

H_3: *The use of incentive compensation will be positively associated with quality of conformance.*

Conformance Quality and Customer Satisfaction

The notion that overall market and business performance can be improved through product quality improvement is the cornerstone of the contemporary quality revolution (George and Weimerskirch 1994; NIST 1998). Product quality should affect customer satisfaction. For example, lower percentage of defective products should help a firm to reinforce positive customer experience (Hardie 1998). Similarly, it has been suggested that a strategic focus on quality and its continuous improvement is likely to result in an improved product appeal in a market with a keen quality awareness (Schonberger 1982), thus facilitating the building and maintenance of a competitive position.

An important study on quality was conducted by the U. S. General Accounting Office (USGAO) (1991). The GAO study involved the finalists in the Malcolm Baldrige National Quality Award for the years 1988 and 1989. This study reveals that companies adopting quality management practices experienced an overall improvement in corporate performance. In fact, in almost all cases, the GAO study found that companies using quality practices achieved better employee relations, high productivity, greater customer satisfaction, increased market share, and improved profitability among other benefits.

To explore the relationship between conformance quality and customer satisfaction, the following hypothesis is tested:

H_4: *Conformance quality is positively associated with customer satisfaction.*

In summary, management control systems are designed so that the employees' interests and consequent actions will be in line with those of the organization, and so management control systems depend on such actions in influencing outcomes. In short, these management control systems are believed to affect conformance quality. It is expected that conformance quality, in turn, will have an impact on customer satisfaction. Therefore, the effect of management control systems on customer satisfaction (which is the final outcome) could be indirect through conformance quality, an intermediate performance outcome.

Direct Effects of Management Control Systems on Customer Satisfaction

Although it can be hypothesized that conformance quality is a key mediating variable, this does not imply that the direct influence of management controls on customer satisfaction would be nonexistent. Rather, the hypothesis for the mediating role of conformance quality that the direct, non mediated – "after" effect (i.e., after accounting for conformance quality) of management control systems on customer satisfaction will be small (in magnitude) compared to the "before" effect (i.e., before controlling for conformance quality). This is based on the assertion that management controls directly impact internal quality (i.e., conformance quality), and indirectly impact customer satisfaction. Thus, the following hypothesis is proposed:

H_{5a}: *After controlling for conformance quality, the direct and unmediated effect of quality-related goals on customer satisfaction will be insignificant.*

H_{5b}: *After controlling for conformance quality, the direct and unmediated effect of quality feedback on customer satisfaction will be insignificant.*

H_{5c}: *After controlling for conformance quality, the direct and unmediated effect of incentive-compensation on customer satisfaction will be insignificant.*

Research Method

Sample and Procedure

The specific objective of this study is to investigate the influence of management control systems on conformance quality and the influence of conformance quality on customer satisfaction. To this end, during Summer 2002, a survey questionnaire was used as a cost-effective method to collect data from a cross-section of manufacturing plants. The targeted responding population was plant or quality managers. The sample selection process for this study involved searching a variety of sources in order to identify adopters of TQM. The primary source is the *Industry Week* series on manufacturing excellence. Additional sources include The *Wall Street Journal*, various industrial engineering journals, and periodical indices for articles in any journal that might produce a case report or other information to determine if TQM is adopted. From the above sources, a total of 539 manufacturing plants were randomly selected and the names of plant or quality managers were gathered.
A self-addressed, postage paid envelope was attached for returning the completed questionnaire directly to the researcher. The survey cover letter promised anonymity and described the objectives of the study. As an

inducement to reply, respondents were promised summarized results of the study (respondents were asked to include a business card). A follow-up letter and another copy of the questionnaire were sent after four weeks of initial mailing.

Of the 539 questionnaires sent, 191 were received from first and second waves[1]. However, 18 were excluded from the study for incomplete responses. This resulted in 173 usable responses (or 32 percent response rate)[2]. Finally, the data were analysed for the presence of late response bias; no systematic difference between early (first wave) and late respondents (second wave) was found.

Measures

Management Control Systems

Three management control systems variables were measured with items borrowed from previous studies (e.g., Spreitzer and Mishra 1999; Sim and Killough 1998; and Ittner and Larcker 1995) and modified for this study. The first variable, quality-related goals, was measured by asking the importance of communicating specific numeric targets for conformance quality. Goals consisted of three items: (1) scrap, (2) rework (either in cost or in units), and (3) defects (either in cost or in units). Goals were anchored on 7 points (1 = not important; 7 = very important). The second variable, quality feedback consisted of three items. The items were similar to those used for goals. Following Sim and Killough (1998) and Daniel and Reitsperger (1992), the frequency of reporting (1) scrap, (2) rework (either in cost or units), and (3) defects (either in cost or units) were anchored on a 7-point Likert-scale (1 = never; 7 = daily). The third variable, incentive compensation, was measured by asking the importance of each of the following in determining compensation: (1) rewards and recognition are given to employees for improvement, not just for achieving a goal or target, (2) company has well-defined recognition and reward systems to acknowledge group and individual quality improvements (Spreitzer and Mishra 1999), and (3) team performance relative to individual performance (Ittner and Larcker 1995). Quality incentives were anchored on a 7-point scale (1 = not important; 7 = very important).

Next, used factor analysis was used with varimax rotation to determine how the management control systems items used in this study are grouped. Three factors with eigenvalues greater than one emerge from the analysis, with the varimax rotation factor solution retaining 73.01 percent of the total variance in the data. No item was dropped because each loading correlated highly with its respective factor, indicating that each item was well reflective of the underlying construct. Convergent validity is demonstrated by each factor having multiple-question loadings in excess of .50. In addition, discriminant validity is supported, since none of the questions in the factor analyses have loadings in excess of .45 (Nunnally 1978) on more than one factor. Next, in order to assess the consistency or reliability of responses across items, Cronbach's coefficient alpha (Cronbach 1951) was

[1] Because of contravening company policy, some had preferred not to participate.

[2] Discriminant analysis was used to compare responses to the first mailing with the responses to the second mailing (Fowler, 1993). Results of this analysis revealed that the two groups did not differ significantly in either the level of the variables or in the relationship between the variables, at the .05 level. This suggests that non-response bias would not affect the results to any significant degree.

computed for each factor (see Table One). This coefficient is based on the correlations among the responses comprising a scale. Coefficients were quite high for each of the three factors. The alpha coefficients were .760 for quality-related goals, .725 for quality feedback, and .734 for incentive compensation, indicating that the measures were reliable (Nunnally, 1978). Consequently, the scales were reliable (Nunnally 1967).

Overall, these tests support the validity of the measures representing the constructs used in this study. The factor loadings on the subsets of management control systems are presented in Table One.

Conformance Quality

Conformance quality was used as an antecedent variable. It was measured using four indicators: (1) scrap, (2) rework, (3) defects, and (4) internal (before shipping) product performance test. Based on support from TQM literature, (Dawson and Patrickson 1991; Ahire 1996), respondents were asked to provide improvement in these indicators over a 3-year time frame using a Likert-scale (1 = strongly disagree 7 = strongly agree). A reliability check for the conformance quality measures produced a Cronbach alpha of .903 (see Table One), indicating that the measures were reliable (Nunally 1978).

Customer Satisfaction

Following previous studies (e.g. Ahire and Dreyfus 2000; Sim and Killough 1998) customer satisfaction was measured using four items: (1) number of product of warranty claims, (2) number of product litigations, (3) number of customer complaints, and (4) sales returns. Respondents were asked to provide, on a 7-point Likert-scale (1 = very low decline, 7 = very high decline), information on the extent to which each of the four items has declined over the past three years. A reliability check for customer satisfaction measures produced a Cronbach alpha of .848 (see Table One), indicating that the measures were reliable.

Table One: Descriptive Statistics

	Mean	Factor Loadings	Cronbach Alpha
Quality-related goals			.760
Cost of scrap	3.96	.80	
Rework (either in cost or units)	4.10	.84	
Defect (either in cost or units)	4.37	.77	
Quality Feedback			.725
We use several types of quality assessments (such as scrap, rework and defects) to measure our conformance quality.	4.95	.89	
The types of quality data collected (such as scrap, rework and defects) and our analyses of them are continually improving.	5.42	.86	

Table One: Descriptive Statistics (cont.)

We gather quality data on scrap, rework and defects, analyse them, and disseminate them throughout our plant.	5.06	.85	
Incentive-Compensation			.734
Rewards and recognition are given to our employees for improvement, not just for achieving a goal or target.	3.66	.85	
We have well-defined recognition and reward systems to acknowledge group and individual quality improvements.	4.20	.74	
The importance of team performance relative to individual performance in determining compensation.	3.82	.74	
Conformance Quality			.903
Our scrap rate has been reduced over the last 3 years.	4.231	N/A	
Our rework rate has been reduced over the last 3 years.	4.045	N/A	
Our defect rates of finished products have been reduced over the last 3 years.	4.133	N/A	
Our internal (before shipping) product performance tests have shown improved product reliability over the last 3 years.	4.217	N/A	
Customer Satisfaction			.848
There has been a steady decline in the number of warranty claims over the last 3 years.	3.443	N/A	
There has been a steady decline in the number of product litigation claims over the last 3 years.	3.931	N/A	
There has been a steady decline in the number of customer complaints over the last 3 years.	3.987	N/A	

Results

This section has four parts. The first part reports descriptive statistics for the variables, the second part describes the structural equation model, third part presents the results of the model comparison tests, and the fourth part reports the hypothesis tests.

Descriptive Statistics

Data for the study were obtained from 173 manufacturing plants. Table Two provides the profile of the responding companies that constitute a broad spectrum of business units as defined by the 2-digit SIC codes. The classification by the primary 2-digit SIC code place the respondents in the food and kindred products (29), apparel and other fabricated textile products (7), chemical and allied products (19), stone clay and glass products (2), primary metal industries (15), paper and allied products (15), fabricated metal (14), electronic and other electric equipment (45), instruments and related products (27).

Additional information on respondents' characteristics is provided in Table Two. The respondents to the question regarding number of years with the business unit had a mean of 75 months (6.25 years) in their current position. To the number of years in management question, respondents indicated a mean of 16.69 years. It appears from their positions that the respondents are well qualified to provide the information required. The results also show that the average number of plant employees equals 254.

Table Two: Profile of Responding Manufacturing Plants

SIC Industry Code	Organization Type	
20	Food and kindred products	29
23	Apparel and other fabricated textile products	7
28	Chemical and allied products	19
32	Stone clay and glass products	2
33	Primary metal industries	15
33	Paper and allied products	15
34	Fabricated metal	14
36	Electronic and other electric equipment	45
38	Instruments and related products	27
Total		173
Number of years with the manufacturing plant		74.331 months
Number of years in management		16.693 years
Number of employees working at the plant		254

Data Analysis Methods

Amos (SPSS 1997), a structural equation modelling program, was utilized to analyse the data. The linear structural relations (LISREL) model has gained considerable popularity in the social sciences literatures (Bentley and Dudgeon 1996) and has recently attracted the attention of researchers in other areas (Gregson 1992). LISREL method offers the ability of correcting for measurement error and simultaneously estimating the modelled path coefficients. This produces coefficients with unbiased and minimal variance and contextualizes the test of specific hypotheses within a model that can itself be evaluated using a variety of fit statistics (Bentler 1990).

In the context of the present study, the LSVE method facilitates a unique means of examining the mediating role of conformance quality. In addition to constructing a model that parallels Figure 1 (the indirect model) and examining the coefficients that correspond to each of the hypotheses, LISREL also presents the opportunity to create alternative model for comparison purposes. In order to gain more of an appreciation for the consequence of including conformance quality, we examine a model that includes only the three management control systems and customer

satisfaction (i.e., the "direct model" wherein the impact of management control systems on customer satisfaction is estimated without conformance quality). This will allow the contribution of conformance quality, as that which differs between the two model specifications, to be inferred.

Model Fit

The overall fit statistics in Table Three reveal that both the indirect and direct models fit the data. First, the Chi-square test statistic associated with the null hypotheses that the proposed models can effectively reproduce the observed covariances result in a Chi-square/degree of freedom ratio of less than 2 indicating good fit (Wheaton et al. 1977). Second the various measures of relative and absolute fix index (ranging from 0 to 1, with 0 implying poor fit and 1 indicating perfect fit) including the goodness-of-fit (GFI), adjusted goodness-of-fit (AGFI), normed fixed index (NFI) and the comparative fit index (CFI) indices exceed .90 without any exceptions. This consistent evidence of exceeding the target value of .90 for good-fitting model is encouraging. Third, Table Three indicates that the residual mean square approximations (RMSEA) were less than .05. In sum, both indirect and direct models are both acceptable and a reasonable portrayal of the data, and serve as a sound basis for interpreting the specific hypotheses and influence pathways.

Table Three: Overall Fit Summary and Explained Variances for the Indirect and Direct Models

Statistical Tests	Indirect Model	Direct Model
Chi-Square	64.507	29.930
df	79	38
p-value	.881	.788
Chi-Square/df	.817	.822
Fit indices		
GFI	.958	.974
AGFI	.917	.908
CFI	.990	.983
NFI	.941	.945
Residual Analysis		
RMR	.044	.049
RMSEA	.000	.000
Explained Variance of Dependent Variable		
R^2 for Conformance Quality	.466	–
R^2 for Customer Satisfaction	.356	.192

Models-Comparison test

To assess the indirect model's ability to account for variance as compare to the direct model, a Chi-square difference test was performed in which the indirect model is compared to the direct model (Anderson and Gerbing 1988). The Chi-square for the direct model was subtracted from the Chi-square of the indirect model, and the degrees of freedom for the test are computed by subtracting the degrees of freedom from the direct model from the degrees of freedom from the indirect model. This results in a Chi-square of 34.577 with 41 degrees of freedom, indicating that the indirect model having the better fit to the data. The indirect model, therefore, accounts for the observed relations among the constructs as well as the direct model that allowed all factors to freely co-vary.

Structural Coefficients and Test of Hypotheses

The estimated maximum likelihood structural coefficients and associated statistics of the hypothesized models are summarized in Table Four. In general, an examination of these sources reveals broad support for the hypotheses embodied in the models.

Consistent with H_1, H_2, and H_3, each of the management control variables has a significant, positive influence on conformance quality with estimated coefficients of .552, .907 and .478 for quality-related goals, feedback and incentive compensation respectively (all p-values < .05). This suggests that conformance quality indeed appear to capture the cumulative or joint effect of individual management control variables.

Consistent with H_4, conformance quality has significant positive influence on customer satisfaction (B = .499, p < .01). This consistent, significant influence of conformance quality on customer satisfaction provides a reason for increased attention to the study of quality phenomenon.

Hypotheses 5_a, 5_b and 5_c entail consideration of the direct effects of management control systems on customer satisfaction. These relationships have the common feature of bypassing the conformance quality construct. Hypotheses 5_a, 5_b and 5_c suggest that management control systems will be marginally related, if at all, to customer satisfaction. As hypothesized, Table Four indicates that none of these effects are significant.

Overall, the uniformly significant results for H_1 through H_4 and the non significant results for $H5_a$, H 5_b and H 5_c point toward the need to theorize conformance quality as a consequence of customer satisfaction and as an antecedent of management control systems.

Table Four: Structural Equations Results and Estimated Coefficients for the Hypothesized Model

		Indirect Model		Direct Model	
Independent Variable	Dependent Variable	Standardized Coefficient	T-value	Standardized Coefficient	T-value
H_1 – Quality-related goals	Quality of conformance	.351	2.239		
H_2 – Quality-feedback	Quality of conformance	.415	3.889		
H_3 – Incentive-compensation	Quality of conformance	.318	2.138*		
H_4 – Quality of conformance	Customer satisfaction	.597	6.669**		
H_{5a} – Quality-related goals	Customer satisfaction			.089	.337***
H_{5b} – Quality feedback	Customer satisfaction			.189	1.112***
H_{5c} – Incentive compensation	Customer satisfaction			.324	1.301***

* significant at p < .05
** significant at p < .001
*** not significant

The Hypothesized Model with Conformance Quality as a Key Mediating Variable

The key mediating role of conformance quality is supported on the basis of several conceptual arguments. For example, Flynn et al. (1994) emphasized the need to distinguish between internal quality performance and external quality performance in the marketplace (e.g. customer satisfaction). Quality practices directly impact on internal quality performance and indirectly on external quality performance (Voss and Blackmon 1994). Internal quality performance incorporates both design quality and conformance quality, while external quality performance incorporates quality-in-use and customer value and satisfaction (Clark and Fujimoto 1990). This delineation between distinct elements of quality performance comes closest to encompassing the diversity in, and complexity of the definitions of quality as described by Reeves and Bednar (1994).

Summary and Discussion

Using a path analytical model, the major aim of this study was to investigate the influence of management control systems on conformance quality, and the influence of conformance quality on customer satisfaction. Overall, the results of this study indicated support for the theoretical framework. Management control systems had significant relationships with conformance quality, and higher levels of conformance quality were found to be associated with customer satisfaction. Also, conformance quality was found to mediate the relationship between management control systems and customer satisfaction. These findings suggest that management control systems affected customer satisfaction when they were accompanied by conformance quality. In other words, goals, feedback and incentives must be employed in tandem with conformance quality to achieve desired customer satisfaction effects.

Managerial Implications

The findings of this research have some interesting implications for the managers of SBUs. They can improve their customer relations as a result of effective management control systems. Managers can use these significant operating variables to obtain a better understanding of their business strategy and assign responsibilities within the organization for achieving organization-wide improvements in performance. These control systems are no longer just an enabler of business performance but are increasingly becoming essential components of business strategy. Managers may want to emphasize these control systems for managing innovativeness.

Limitations and Directions for Research

The results of this study should be assessed in light of three limitations. First, the research framework is not exhaustive, there may be other factors, both internal and external, not included in the framework that can partially or wholly explain the results. The second limitation relates to the general measure of incentives. Specific features of incentives (e.g., group vs. individual, financial vs. non financial, pay vs. promotion) could be investigated in future research. The third limitation relates to the temporal aspect of our study. Longitudinal data might be obtained as a cross-check of these findings and to uncover the dynamic elements of the variables.

Despite the limitations, the results of this study have important implications for managers and researchers. The evidence strongly suggests that the path analytical model offers a useful way for managers to approach management control systems. In particular, management control systems must be incorporated into development of

conformance quality and the justification of attaining higher customer satisfaction. The results of this study should enhance practitioners' confidence in their design of management control systems and process quality efforts as enablers of quality outcomes. It is believed that both researchers and practitioners will find the constructs useful and that much more research remains to be done to refine and extend the constructs, explore the drivers of management controls, and quantify their impact on organizational outcomes.

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