Impact of the Extent of Management Initiatives on Manufacturing Plant Profitability, An Exploratory Investigation

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Abstract

This paper reports the results of an exploratory empirical investigation of the impact of the extent of implementation of five management initiatives on the profitability of manufacturing plants. These initiatives are, (i) just in time systems, (ii) total quality control, (iii) use of the state-of-the-art technology, (iv) capacity utilization, and (v) developmental activities. We collected data through a mail questionnaire from manufacturing plant managers in several industries, and used a linear structural relations (LISREL) model to analyze the same. The data included measures of several observable indicators reflecting the extent of the implementation of these initiatives. The results show that these five factors explain almost half of the variability in the profits of the manufacturing plants. Furthermore, each of these factors has a positive impact on the profitability, and except for capacity utilization, such impact is significant.

Key Areas

Profitability, Just-in-Time, Total Quality Control, Technology, Capacity Utilization, Developmental Activities, LISREL.

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Introduction

In order to strengthen or sustain their competitive advantage many American companies have been making major investments in advanced manufacturing practices (Motteram and Sizer 1992). Manufacturing practices indicate 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. These practices include, among others, (i) just in time (JIT) systems, (ii) total quality control (TQC), (iii) use of the state of technology, (iv) capacity utilization, and (v) developmental activities. For the sake of convenience, we refer to the set of these five practices as “management initiatives”. These initiatives are largely within the control of corporate management. They are implemented by manufacturing plants of a company, and at any particular time, the extent of their implementation may differ among different plants.

Empirical studies reported in the literature provide conflicting evidence about the impact of the implementing these initiatives on the profitability of companies. On the one hand, it has been stated that a proper use of such practices can provide business units significant advantages in terms of quality improvement, timely responsiveness to customer requirements and cost reduction, thus leading to higher profitability (for example, see, Krajewski and Ritzman 1993; Dean and Snell 1992; Giffi et al. 1990; and Crosby 1979). On the other hand, it is stated that many forms of manufacturing practices suffer from very high failure rates (Dean and Snell 1992). Thus, results of the studies relating to the success of these management initiatives are inconclusive (for example, see, Douglas and Judge 2001; Maiga and Agrawal 2001; Swamidass and Kotha 2000; Claycomb et al. 1999; Balakrishnan et al. 1996; Lev and Sougiannis 1996; Powell, 1995; Marucheck and McClelland 1992; Barton et al. 1988; Phillips et al. 1982).

The purpose of this paper is to expand upon previous studies in order to more clearly determine the financial benefits derived from these initiatives at the manufacturing plant level. Specifically, we have carried out an exploratory empirical investigation of the impact of the extent of implementation of these five management initiatives on the profitability of manufacturing plants using the data obtained from a survey of strategic business units (SBUs). The importance of our study lies in the fact that its scope and approach differ from prior studies that examine similar relationships (for example, see, Douglas and Judge 2001; Claycomb et al. 1999; Swamidass and Kotha 1998; Saraph et al. 1989; Chung 1988; Kim 1987; Celley et al. 1986). Some of the distinguishing features of our study are as follows,

(i) Prior studies are generally based upon either one or two of these factors, particularly JIT and TQM, while our study is based on five initiatives. Thus it is more comprehensive in coverage.

(ii) Our study is based on the extent of implementation of these initiatives while most other studies use a yes/no, years-of-implementation, or similar other format. As the extent of implementation may differ from plant to plant, its impact on the profitability may be expected to differ. Thus our study is expected to provide more accurate results.

(iii) Most of the reported studies use data relating to the corporate level, while our study uses data relating to manufacturing plants. As the implementation of these initiatives may differ among different SBUs even within the same company, it is expected to lead to more accurate results.

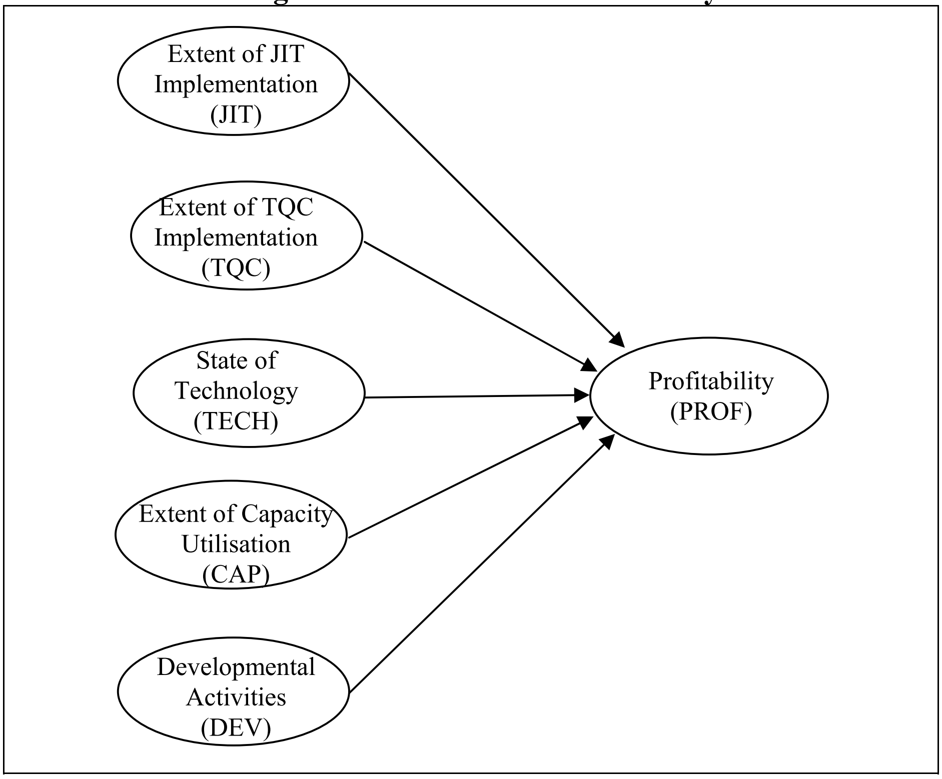
(iv) We have adopted a linear structural relations (LISREL) model to analyze the data. This is in contrast to regression analysis used in almost all of the reported studies. LISREL combines several techniques including factor, path and regression analyses. It uses observable indicators to investigate the relationship among latent constructs along a specified causal path. It provides a straight forward method of dealing with multiple relationships simultaneously while providing statistical efficiency. Its ability to assess the relationships comprehensively has provided a transition for exploratory to confirmatory analysis (Hair et al. 1995). This model is appropriate for our study because we believe that the extent of the implementation of the management initiatives is not directly observable, but is reflected in a number of indicators that can be observed and measured.

The rest of this paper is organized as follows. The next section explains the research model used by us, followed by a discussion of research methodology. Another section presents the results of the analysis. The paper concludes with a summary and conclusions.

Research Model

In this study we explore the relationship between the degree of successful implementation of five managerial initiatives and profitability at the plant level. Figure One presents the basic model. The model uses the managerial initiatives as exogenous constructs and profitability as the endogenous construct. We believe that these constructs are not observable directly, but are reflected by several indicators that can be observed and measured objectively. The analysis is based on the data obtained from a cross section of manufacturing plants that are expected to be at different stages of the implementation of various management initiatives. Various constructs and their observable indicators are discussed below in detail.

Figure One
Five Managerial Initiatives and Profitability Model



Exogenous Constructs

The various management initiatives mentioned earlier constitute the latent exogenous constructs. These are discussed in more detail below, together

with the observable indicators that have been used to measure the extent of their successful implementation.

Just-in-Time (JIT)

There are several definitions of JIT manufacturing, and after reviewing the literature, Cowton and Vail (1994), "conclude that it "has been widely explained and discussed, yet there still persists confusion over its definition and a surprising diversity in the practices which go under its name." In this paper, we adopt a narrow, operational definition of JIT production as a business unit improving its inventory utilization, measured as the number of inventory turns. Thus, the purpose of using JIT is to eliminate – or significantly reduce – inventories and to maximize the manufacturing cycle time efficiency. Because of its operational nature, this definition is easily understood by plant mangers. It is also used by other researchers, including Balakrishnan et al. (1996).

Implementation of JIT lowers inventory levels causing a reduction in related costs such as insurance premiums, financing charges, inventory control personnel, record-keeping costs, procurement activity costs, and inventory audit costs (Gupta and Wilemon 1990; Im 1986). Furthermore, it facilitates identification and elimination of many non-value-adding activities leading to reduction in costs and increase in return on assets (Barton et al. 1988).

Mady (1990) has explored the relationship between inventory performance and other financial measures at the corporate level, and has found that both conventional inventory turnover rate and value-added inventory turnover rate positively affected company profitability. Additional empirical evidence indicates that firms can gain substantial benefits from JIT implementation (Claycomb et al. 1999; Im and Lee 1989; Chung 1988; Kim 1987; Voss and Robinson 1987; Celley et al. 1986; Im 1986; Ansari 1984). Maiga and Agrawal (2001) show that the adoption of JIT is associated with high levels of profitability at the plant level.

However, adoption of JIT does not increase profit in all cases. Fry (1992) notes that while there are a number of companies that have been able to reduce their inventories by using JIT systems, there are equal or greater number of companies who have been unable to achieve such reduction. Balakrishnan et al. (1996) examined the financial performance of JIT companies while concurrently controlling for the external factors that often influence a company's financial performance. In their study, 46 JIT firms were grouped into a treatment group, and 46 non-JIT firms formed the control group. After the adoption of JIT, due to general business climate, there was a decline in the return on assets of both groups, with no significant difference between them. Thus, adoption of JIT did not seem to provide any benefit in terms of financial performance. Balakrishnan et al. (1996) argue that reducing raw materials inventory levels increases a firm's dependence on the stability of its supply chain and could result in lost sales and/or higher costs from emergency purchases. Furthermore, they argue that the expected benefits from JIT adoption may be offset by its many direct and indirect costs, such as implementation and training costs, which increase overhead costs. Also capital expenditures associated with JIT increase the asset base and the associated depreciation would depress short term profit. The net effect of these factors is to depress financial performance.

Generally, the managers of SBUs will implement JIT inventory management if they believe that it would increase their profitability. Therefore, our conjecture is that JIT will have a positive impact on the financial performance of a SBU. As there may be degrees of successful implementation of JIT, we further believe that there would be a positive relationship between the degree of implementation of JIT and profitability.

Successful implementation of JIT is indicated by an increase in the turnover rates of the three kinds of inventory (raw material, work-in-process and finished goods) and in the manufacturing cycle efficiency. These four indicators are directly observable and have been selected to measure the extent of implementation of JIT. Other things being equal, the higher the values of these indicators, the higher is the extent of implementation of JIT.

Total Quality Control (TQC)

After an extensive survey of the literature, Mehra et al. (2001) define total quality control as "a quality based management strategy that promotes enterprise-wide quality through a strong focus on customer orientation and environment and dynamics. Additionally, this strategic orientation relies heavily on synchronized processes among all trading partners to create knowledge through innovation in order to achieve global competitiveness."

Higher quality reduces defects, scrap and rework, repair and field service, and this, in turn, lowers the total costs (Schonberger 1986). Companies that produce high quality products can charge higher prices and earn higher profit margins. Powell (1995), in an empirical study, found an association between quality and financial performance. Madu and Kuei (1995) also found positive associations between quality measures and organizational performance. Douglas and Judge (2001) have explored the relationship between the extent to which total quality management practices were adopted within organizations and the corresponding competitive advantages, and find strong support for such a relationship with influence on financial performance. However, superior quality could require the use of more expensive components, less standardized procedures, greater emphasis on product innovation to sustain high-quality position, and higher promotional expenditures to convey a position of superior quality to customers (Phillips et al. 1982). When these increased costs cannot be passed on to customers, profit margins would be squeezed, and profit would be adversely affected. Many companies have begun to question the relationship between quality and financial performance. Surveys by A.T. Kearney and Arthur D. Little have shown that two-thirds of 500 U.S. companies saw "zero competitive gain" in their quality implementation (The Economist 1992). This might happen because of the economic trade-off between the financial benefits and cost of quality. Quality costs are incurred for various reasons, including (1) prevention of defects, (2) inspection and appraisal to monitor ongoing quality, (3) correction of defective products or services before delivery to the customer (also known as internal failures), and (4) repairs, replacements, discounts, or refunds for defective products caught after delivery to the customer (also known as external failures). Expenditure in the first two categories are incurred to ensure that products conform to specifications, and are collectively known as conformance costs. Two failure cost categories arise because products do not conform to specifications, and are known as non-conformance costs (Ittner and Larcker 1995). However, assuming management's commitment to quality implementation, good organizational practices and structures, and other things being equal, we expect to find a positive relation between the extent of TQC implementation and profitability.

In order to measure the extent of TQC implementation we use several indicators based upon internal and external failures. Internal failures are indicated by the rate of scrap computed as total units scrapped divided by total units manufactured; and the rate of rework computed as total units reworked divided by total units manufactured. Similarly, external failures are indicated by the rate of products returned computed as total units returned and estimated to be returned due to defects divided by total units sold; and the rate of warranty work computed as total units returned and estimated to be returned for warranty work divided by total units sold. This study uses the four values (1 - each rate) as indicators of the implementation of TQC. Other things being equal, the higher these values, the higher is the extent of implementation of TQC.

State of Technology (TECH)

The value of technology investments is receiving increasing attention from the academic community (e.g., Boyer et al. 1997; Nichols and Jones, 1994). This is especially true for capital-intensive investments such as advanced manufacturing technology. It is important for businesses to incorporate the latest technological developments in their product and service providing activities (Kleinschmidt and Cooper 1991). In order to be beneficial, such developments should have been proven to be efficient, reliable and flexible. Often, benefits arising from the use of latest technology include reduced direct labor costs, greater levels of machine utilization, reduced indirect labor costs, and reduced inventories (Lee 1996), and should be cost effective with a measurable value-added impact (Vasilash 1992). The importance of technology should be related to its significance in the firm's portfolio as measured by their competitive impact and maturity, and strength of the firm's technical competitive position (Erickson et al. 1990). Jaikumar (1984) argues that when technologies, such as flexible manufacturing systems, are introduced, they are often employed for the large volume production of a limited range of parts, even though this might be unintended and/or detrimental to the users. Empirical research conducted by Swamidass and Kotha (2000) indicates that the use of advanced manufacturing technology does not show any direct impact on firm performance.

We expect that the benefits derived from the acquisition of new technologies will outweigh its costs, assuming that cost control techniques are used to ensure that the levels of performance attained are those that were specified in the investment justification. The extent of utilizing state-of-the-art technology may be related to the (1) newness of technology used as compared to the state of technology in the industry, (2) extent of its significance in the business portfolio as related to its competitive impact and maturity, (3) state of business unit technical competitive position of the major product areas, and (4) extent to which technology is used at the plant. Other things being equal, the higher the values of these indicators, the greater is the use of latest technology at a manufacturing plant.

Capacity Utilization (CAP)

Capacity is the output capability of a company when it fully uses its bottleneck resources to create the maximum value for customers while generating the minimum waste (McNair 1994). Capacity management is the function of planning and controlling capacity (Bihum and Musolf 1984). Planning consists of determining the necessary resources to meet production objective while control consists of measuring production output to plan, determining variances, and taking corrective actions (Bihum and Musolf 1984). Capacity is intimately related to the fixed costs incurred by a company.

Managing manufacturing capacity effectively is critical to company success. Marucheck and McClelland (1992) state that capacity utilization plays a major role in improving profitability compared with other strategic variables including market share, inventory, vertical integration and industry growth. This is supported by other research which has determined that excellent capacity management can boost average annual returns on invested capital by as much as 3-4% (Achi et al. 1996). Therefore, other things being equal, we expect a positive relationship between the extent of capacity utilization and profitability.

This paper uses several indicators to measure the utilization of capacity, (1) units manufactured divided by total output capability (2) actual production divided by planned production (3) rate of machine utilization, and (4) hours worked divided by hours planned. Other things being equal, the higher the values of these indicators, the greater is the utilization of capacity at a manufacturing plant.

Developmental Activities (DEV)

In order to stay competitive and improve continuously, companies must carry out developmental activities. Such activities lead to innovation and growth, which is one of the four perspectives of business in the Kaplan and Norton (1996) Balanced Scorecard. Examples of developmental activities are research and development (R&D), marketing, and worker training. Product R&D and process R&D have a positive impact on innovation (Hill and Snell 1989). Businesses consider marketing efforts, such as customer support and service, direct marketing, channel communications, sales support programs, public relations, trade shows, and product design and styling, to be quite important (see the survey conducted by Neale-May Partners of Palo Alto, in 1995. In contrast to these observations, Lev and Sougiannis (1996) have not found a direct relationship between developmental efforts and specific future revenue, even with the benefit of hindsight. However, we expect that the benefits derived from these activities will outweigh their costs, assuming that such activities are undertaken after an appropriate cost/benefit analysis.

Developmental activities are very diverse in nature, and are treated differently by different companies in their financial statements. In this study, we use ratios of several non-manufacturing expenses to total sales as indicators of such activities, product design costs, selling expenses, administrative expenses, and other non-manufacturing costs. Although some of these items may include costs of non-developmental activities also, it may be expected, other things being equal, that the higher these ratios, the greater is the extent of developmental activities.

Endogenous Construct

Profitability (PROF)

The conceptual model shown in Figure One uses profitability of the strategic business unit as the endogenous construct. In this study we use three indicators that reflect profitability, profit margin, rate of return on operating assets, and turnover of operating assets (for a support of these indicators, see Venkatraman and Ramanujam 1986). We have used operating assets controlled at the plant level in the computation of the profitability ratios. Profit margin is the ratio of operating income over sales. Rate of return on operating assets is the ratio of operating income before taxes to total operating assets. It is considered an excellent way to measure present performance and to rate managerial effectiveness (Van et al. 1995). Turnover of operating assets shows the amount of net sales dollars generated for each dollar invested in operating assets. The use of these ratios eliminates the size effect and therefore they may be compared across businesses of various sizes. Other things being equal, it is expected that the higher the value of these ratios, the higher is the profitability of the business.

The Appendix to this paper lists all the constructs and indicator variables discussed above. It also shows the method of computation used for several indicators on the basis of data collected.

Research Methodology

Data Collection

In order to collect data required for our study, we developed a survey instrument (a copy of which is available upon request from the first author) according to the general approach offered by Churchill (1979). Our sample consisted of randomly selected manufacturing plants with the following industry profile, apparel, automotive, chemical/paints, computers, electrical/electronics, industrial machinery, plastics, tires/rubber, primary metal industries, fabricated metal products, and instrumentation. Use of the cross sectional sample is expected to increase the generalizability of the research effort to a significant degree given differences among manufacturing units. In our sample, we identified the plant managers of the manufacturing units as key informants on the basis of Campbell's (1955) criteria for choosing informants. First, the informants occupy roles that make them knowledgeable of their relationship with their respective units. They are the central decision makers of their organizations. Second, they fit the requirement of being able to communicate effectively with the researchers because they are familiar with questionnaires of the type used.

The survey instrument was mailed to 1098 manufacturing plant managers together with a cover letter and a self-addressed, postage paid envelope was attached for returning the completed questionnaire directly to the researcher. The cover letter explained the purpose of the study and assured respondents of the confidentiality of the information provided. The post office returned 209 letters because of inaccurate address or other reasons. These were deleted from the sample and the valid sample turned out to be 889. To increase the response rate, a second mailing was undertaken three weeks after the first wave. The survey was closed out after eight weeks from the initial mailing. Of the 889 valid sample size, a total of 134 questionnaires were returned by the respondents. Of these 134 questionnaires, 7 were incomplete and could not be used. The final 127 usable responses resulted in a response rate of 14.3%.

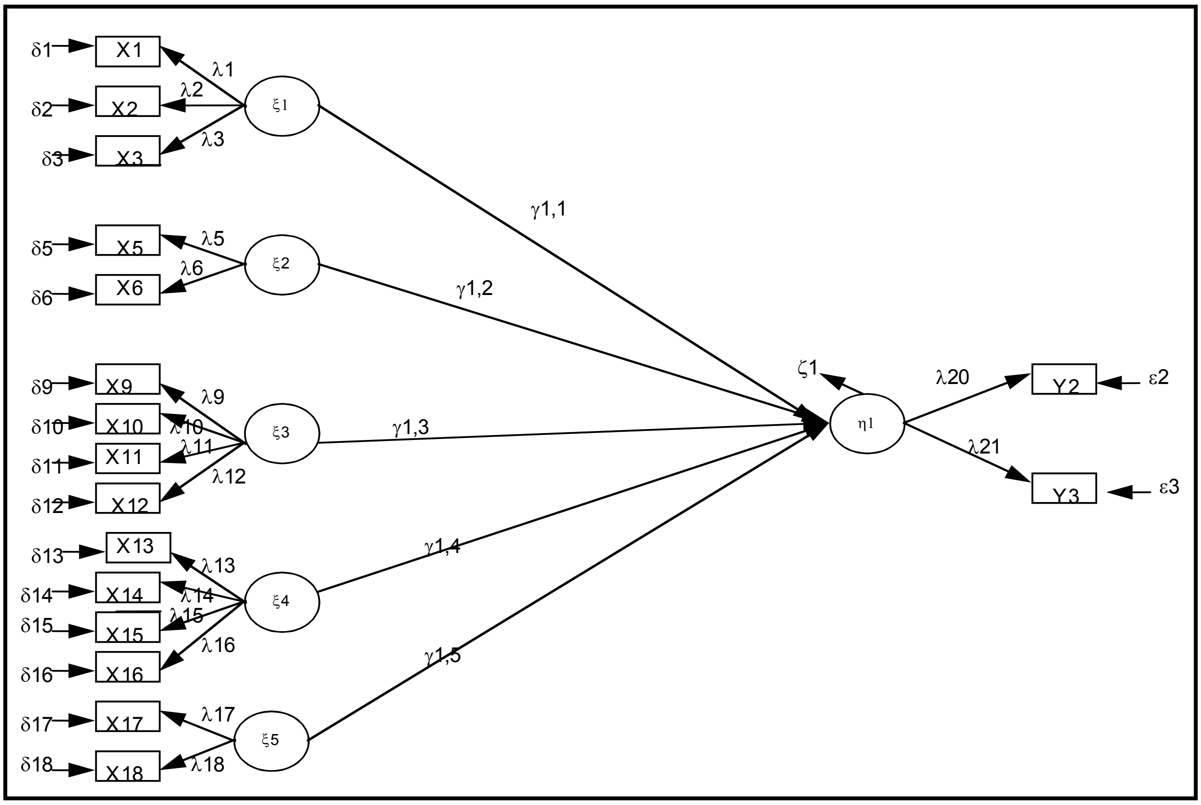
Next, we used discriminant analysis to compare responses to the first mailing with the responses to the second mailing (Fowler, 1993). Results of this analysis revealed that the two groups did not differ significantly in either the level of the variables or in the relationship between the variables,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

The Measurement Model

As indicated earlier, we have used a model of linear structural relations (LISREL) that provides evidence of a relationship between the exogenous and endogenous constructs, each of which is reflected by several observable indicators and their corresponding measurement errors. For this purpose, a measurement model was needed that would be based upon the conceptual model developed earlier. The measurement model was estimated using the two-step approach proposed by Anderson and Gerbing (1988). The first step in data analysis was to assess whether the constructs used in this study were indeed five distinct dimensions representing management initiatives. A confirmatory factor analysis then was carried out to evaluate the factor loadings of the indicator variables. This led to the dropping of several of these variables that are shown in *italics* in the Appendix to this paper. Items dropped are further discussed below.

In the case of JIT, manufacturing cycle efficiency was dropped, while the three turnover ratios were retained. Even though implementation of JIT may be expected to increase both the manufacturing cycle efficiency and the turnover rates of various kinds of inventory, as a practical matter there might not be a high degree of correlation among such increases. For TQC, variables relating to external failures were dropped while those relating to internal failures were retained. In this case also, while implementation of TOQ may be expected to show a decrease in all of these variables, there might not be a high correlation among the two groups of variables. For the construct DEV, ratios of administrative expenses and other non-manufacturing costs were dropped. Obviously they were not found to move with the other variables, product design costs and selling expenses. Finally, in the case of PROF, profit margin was dropped while the rate of return on operating assets and turnover of such assets were retained. Here also, while the rate of return and turnover will move together, the profit margin may change independently. Thus the dropping of these variables improves the consensual measurement of various constructs.
The measurement model is shown in Figure Two. This model includes the indicator variables for various constructs that were retained in the foregoing analysis. It also shows the measurement errors among various indicator variables, as well as such error in the endogenous construct.

Figure Two
The Measurement Model



A summary of the data collected about the foregoing variables appears in Table One. The Table shows the means and standard deviations of the information received from the respondents.

Data Analysis

LISREL analysis provided estimates of various parameters. An individual parameter estimate reflects the loading of its corresponding indicator on a latent construct or dimension. The t-value associated with the parameter estimate indicates the statistical significance of the parameter. As a rule of thumb, t-values greater than 2.00 indicate statistically significant parameters (Mariani and Lederer 1998). The item-loadings for each factor were significant at $p < .01$. Next, the overall fit of the model was estimated as recommended by Joreskog and Sorbom (1989). Results indicated that the overall fit of the measurement model was acceptable as indicated by various tests (Chi-square = 260.36, $p < .01$; GFI= .82; AGFI = .74; RMR= .05; TLI= .94; CFI= .95). The results are reported in Table Two.

Table One

Descriptive Statistics of Observable Indicators Used in the Structural Equation Model

Variable	Mean	Std. Deviation
Extent of JIT implementation		
Direct materials turnover	22.956	12.687
Work-in-process turnover	20.722	15.834
Finished goods turnover	23.946	11.406
Extent of Total Quality Control		
Net-of-Scrap rate (1- scrap rate)	.978	.121
Net-of-Rework rate (1- rework rate)	.989	.091
State of Technology		
Newness of technology used as compared to state of technology in the industry	.862	.021
Degree of significance of the technology in your business portfolio as measured by its competitive impact and maturity	.957	.312
In your major product areas, how is your business unit technical competitive position	.931	.023
To what extent the existing technology at your plant is used	.849	.147
Rate of Capacity Utilization		
Units manufactured divided by total output capability	.774	.438
Actual production divided by planned production	.928	.376
Rate of machine utilization	.873	.416
Hours produced divided by hours planned	.921	.337
Developmental Activities		
Total product design cost divided by total sales	.113	.004
Selling expenses divided by total sales	.092	.012
Profitability		
Rate of return on operating assets	.258	.007
Turnover on operating assets	.189	.058

Table Two
Standardized Maximum Likelihood Estimates of Factor Loadings

Indicator	*Parameter*	*Factor Loadings*					*T-value*
		JIT $\xi 1$	TQC $\xi 2$	TECH $\xi 3$	CAP $\xi 4$	DEV $\xi 5$	
Raw Materials Turnover	λ_1	.94					12.93
Work-In-Process Turnover	λ_2	.65					7.37
Finished Goods Turnover	λ_3	.65					6.22
1- Scrap Rate	λ_5		.91				11.12
1 – Rework Rate	λ_6		.90				11.00
Newness of Technology	λ_9			.63			7.20
Extent of Significance of Technology	λ_{10}			.67			7.80
Technical Competitive Position	λ_{11}			.86			10.62
Extent of Technology Used	λ_{12}			.67			7.81
Units Manufactured/Total output capability	λ_{13}				.67		7.76
Actual Production/Planned Production	λ_{14}				.69		5.44
Rate of Machine Utilization	λ_{15}				.93		11.30
Hours Produced/Hours Planned	λ_{16}				.65		7.56
Total Product Design Cost/Total Sales	λ_{17}				.	.95	13.63
Selling Expenses/Total Sales	λ_{18}					.91	15.14

Measurement Model, (χ^2 = 260.36, p < .01; GFI = .82; AGFI = .74; CFI = .95; RMR = .05; TLI = .94)

Next, in order to test for internal consistency of data, we carried out Cronbach's construct reliability (alpha), and also composite reliability which is a LISREL-generated estimate of internal consistency analogous to Cronbach's alpha (Fornell and Larcker 1981). These estimates ranged from .78 to .94 (Table 3) providing evidence of internal consistency estimates. The average variance extracted (AVE) by a construct's measure relative to measurement error and the correlations (f estimates) among the constructs in the model are also shown in Table Three. AVE estimates of .50 or higher indicate validity for a construct's measure (Fornell and Larcker 1981). Results reveal that all estimates meet this criterion. It can be observed from Table Three that the correlation between each pair of the exogenous variables is significant, thereby indicating that these variables are dependent on each other. One interpretation of this result is that the adoption of a management initiative could be accompanied by the modernization or improvement of another existing management initiative. Finally, we checked whether the average variance explained by that construct's items is greater than the construct's shared variance with every other construct (see Fornell and Larcker 1981). This criterion was met across all pairs of constructs, supporting discriminant validity (Table Three).

Table Three
Construct Reliabilities and Intercorrelations

	Cronbach's Alpha	Composite Reliability	AVE	Correlation Matrix JIT	TQC	TECH	CAP
Extent of JIT implementation (JIT)	.90	.82 .91.					
Extent of TQC implementation (TQC)	.92	.79 .94	.61				
State of technology (TECH)	.79	.71 .83	.27	.23			
Extent of capacity utilization (CAP)	.78	.70 .81	.21	.26	.28		
Developmental Activities (DEV)	.86	.75 .89	.29	.24	.25	.23	

Note, The first entry is Cronbach's alpha of construct reliability, the second is composite reliability which is LISREL-generated estimate of internal consistency analogous to coefficient alpha, and the third is Fornell and Larcker (1981) index of the average variance extracted (AVE) by the construct. To the right is the intercorrelation matrix.

Results

The results of the analysis are reported in Table Four. The standardized structural model parameters indicate the relationships between the endogenous and exogenous constructs. The impact of JIT, TQC, state of technology, and developmental activities is significant at .05 level with structural coefficients equaling .14 ($t = 2.23$, $p < 0.05$), .48 ($t = 4.52$, $p < 0.05$), .25 ($t = 2.92$, $p < 0.05$), and .40 ($t = 4.25$, $p < 0.05$), respectively. However, the impact of capacity utilization is not significant ($t = .54$, $p > .10$), though it is in the right direction. The trait variance is found to be .47, and the overall measurement error of the model is .05.

Table Four
Construct Reliabilities and Intercorrelations

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Overall, our study indicates that the higher the extent of implementation of various management initiatives, the higher would be the profitability of manufacturing plants. The factors used in the study explain 47% of the variance in the profitability of a cross section of manufacturing plants. This is quite a large degree of explanation, particularly in view of the fact that the exogenous constructs represent only the factors controllable by the management.

Our study shows a positive impact of individual management initiatives on financial performance. As mentioned above, the impact of JIT, TQC, state of technology, and developmental activities is significant at .05 level. Thus the doubts expressed by some of the researchers about their positive impact on financial performance have not found support in our study. However, we find the impact of capacity utilization to be in the right direction but not significant at .05 level.

Summary and Conclusions

The cross sectional study reported in this paper investigates the relationship of profitability of manufacturing plants and management initiatives. These initiatives include JIT, TQC, state of technology, capacity utilization, and developmental activities. Our study indicates that the extent of the implementation of management initiatives has a significant positive correlation with profitability.
Further, the impact of all the individual factors is positive and – except for capacity utilization – significant.

The scope and approach of our study differ from prior studies in several respects, particularly in regard to our use of a combination of five management initiatives rather than studying them one at a time; our use of data relating to manufacturing plant level rather than to the company level; our use of the extent of the implementation of various initiatives as distinct from using a yes/no, years-of-implementation, or similar other format; and our use of several highly-correlated indicator variables to measure various constructs rather than using a given value for each. We believe that this study makes several contributions to the growing field of studies in this area.

***Theoretical Contributions*:** We believe our study has made two theoretical contributions. First it provides a framework for using a fresh approach to study the financial impact of the initiatives adopted by management. We have analyzed the impact of a combination of several such initiatives, using data at the manufacturing plant level. Second, we have tried to use the extent of the implementation of different initiatives, utilizing several indicator variables to measure the same. We hope that other researchers will find this approach useful in their own studies, and that the new constructs can help theory development on important strategic issues in manufacturing performance.

***Managerial Implications*:** The findings of this research have some interesting implications for the managers of SBUs. They can improve their financial performance as a result of effective management initiative implementation. 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 initiatives are no longer just an enabler of business performance but are increasingly becoming essential components of business strategy. Managers may want to emphasize these initiatives for managing innovativeness.

Limitations and Directions for Research: Just as is the case with all work of this nature our study has some limitations. When combined with the findings, they raise several issues for future investigation. First, this study only examined the relationships between five management initiatives and profitability. Other management initiatives such as the use of balance scorecard, reengineering, utilization of worker teams, benchmarking, as well as external factors that are not under the control of management, such as market demand, could be used in further studies. Second, a longitudinal data might be obtained as a cross-check of these findings and to uncover the dynamic elements of the implementation process.

In summary, despite the limitations, we believe 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 initiatives, and quantify their impact on organizational outcomes.

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