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An Empirical Investigation of JIT Effectiveness: an Organizational Perspective

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The organizational facets of JIT are investigated for 130 US manufacturing firms. Five research hypotheses are formulated and tested. The results of this research are presented in the context of a conceptual framework which attempts to shed some light on the organizational facets relevant to successful JIT implementation. © 1997 Elsevier Science Ltd

Key words—JIT initiation, JIT implementation, JIT effectiveness, business strategy, manufacturing firms, organizational perspective

1. INTRODUCTION

THE PAST TWO DECADES have witnessed an array of articles, books, and management gurus proclaim the impending death of American manufacturing. Without question, for many US industries this period was a low point in the history of American manufacturing competitiveness. Yet, this period did see the introduction of a dramatic series of technological and managerial innovations designed to reverse the overall negative trends in American manufacturing.

The manufacturing organization is an open dynamic system consisting of people, technology, procedures, and more importantly an organizational philosophy and culture. To survive in a highly competitive global business environment, the manufacturing system must be willing to make strategic adjustments consistent with the demands of its environment. However, system-wide long term strategic adjustments are not feasible without short term costs.

Strategic system-wide adjustments are achievable through the deployment of innovative manufacturing approaches, technologies, and managerial philosophies. The deployment and utilization of just-in-time (JIT), advanced manufacturing technologies, and total quality management are considered strategic adjustments by the manufacturing system in response to environmental demands for efficiency, effectiveness and customer responsiveness. In most cases, however, a system-wide strategic adjustment will not yield fruits, unless subsystems such as the input, the process, the output and the managerial subsystems of the organization are modified. These subsystems must actively contribute to, and facilitate strategic adjustments. Without such involvement, system-wide

strategic adjustments will be fruitless. Thus, strategic failure will be the rule rather than the exception.

It has been widely argued, with some justification, that the major reason for US competitive woes stems from a strategic failure brought about by the way managers have guided their companies, particularly in the areas of manufacturing and technology management. The current challenge for American manufacturers is to regain and maintain a competitive advantage in the global market. To meet this strategic challenge, new manufacturing technologies, philosophies and approaches are required. In this context, the utilization of a JIT manufacturing philosophy has shown much promise.

2. RELEVANT LITERATURE

Much has been written regarding the positive strategic influence of JIT on Japanese manufacturing organizations. On the other hand, when it comes to US manufacturing organizations, the strategic potential impact of JIT is still debatable. Some critics went as far as declaring US manufacturer JIT experience as nothing short of total disaster [1]. However, this view is the exception rather than the rule. The bulk of the evidence with regard to the JIT experience of US manufacturers seems to support the notion that JIT has significantly and positively impacted US businesses [2, 3].

Research has shown that a JIT organizational strategic philosophy has the potential of increasing organizational efficiency and effectiveness. Specifically, the following potential benefits of JIT are cited in the literature. First, JIT tends to eliminate waste in production and material [4]. Second, JIT improves communication internally (within the organization) and externally (between the organization and its customers and vendors) [5]. Third, JIT has the potential of reducing purchasing costs which is a major cost to most organizations [6]. Fourth, JIT is instrumental in reducing lead-time, decreasing throughput time, improving production quality, increasing productivity and enhancing customer responsiveness [7–9]. Fifth, JIT tends to foster organizational discipline and managerial involvement [10]. Last but not least, JIT tends to integrate the different functional areas of the organization. It especially tends to bridge the gap between production and accounting [7, 11–13].

However, research has shown that JIT benefits do not just happen. In this context, before an organization can enjoy the fruits of JIT, it must accept JIT as an organizational philosophy. This requires the organization to change or modify its operating procedures, production system, and in most cases its organizational culture. Plant layouts have to be adjusted, relation with suppliers and customers have to be modified, quality circles have to be implemented, and accurate demand forecast has to be achieved and maintained [14].

Research has identified several factors that could break or make the implementation process of JIT. Vora and others stressed the significance of top management involvement and proper employee training as essential for successful implementation of JIT [15]. The importance of the presence of a sound logistical planning system was stressed as a prerequisite to the successful implementation of JIT by Vickery [16]. On the other hand, Billesbach and Schniederjans [17] advocated training administrative, as well as, production workers to facilitate the implementation of JIT. Francis [18] underscored the importance of accurate data, especially, demand forecast as a requirement to the successful implementation of JIT.

Because as much as 75% of production cost can be incurred through the purchasing of goods from outside sources, manufacturers must take a proactive role in obtaining materials for the manufacturing process. Therefore, the relationship between the organization and its suppliers, in form of mutually beneficial strategic partnerships, is very critical to the success of JIT [19, 20].

Essential to the development of these strategic partnerships is the continuous flow of materials and efficient exchange of information along the vertical supply chain. To this end, JIT relies on collaborative contracts in the form of partnerships with supply chain members in a mutually profitable relationship [21–23]. In such an environment, the supplier has access to real time manufacturing information on demand, thus significantly reducing problems relating to the timing, quality and quantities of delivery. As a part of the manufacturing team, the supplier is motivated to provide high-quality on-time product delivery [21, 22, 24, 25]. It is generally

considered to be expedient to deal with geographically proximate suppliers, or to encourage suppliers to locate near the manufacturing facility [26–30].

Purported advantages of adopting a JIT Supplier relationship include the buyer's ability to decrease the supplier base to a more manageable size, with lower material overhead; decrease quality concerns, with inspections being made at the supplier's location; and benefit from the potential for joint development projects utilizing the technology and technical expertise of the supplier [19]. Buyers are also finding it advantageous to involve suppliers in increased participatory decision making providing for customer/supplier linkages which provide expansion of the talent base, improved quality, reduced bottlenecks, and increased cost reduction opportunities, Involving the supplier in manufacturing, material and design changes at an early stage reduces scheduling problems, improves quality, increases value, and provides added expertise [19, 22, 24, 31].

In general, it has been shown that JIT manufacturing does efficiently, effectively and flexibly utilize productive resources, and it is widely written that supplier relationships provide a vital link in the successful JIT system [3, 32–38].

3. MEASURING JIT SUCCESS

JIT evaluations must encompass activities and attitudes not previously subjected to measurement and must be oriented toward problem solving and continuous improvement utilizing factual data as opposed to the previously used subjective means. Evaluation relies heavily on buyer and supplier input as well as information provided by the purchaser. These evaluation tools provide checks on supplier selection and performance at the contract and aggregate level to serve as a guide to ensure satisfactory performance. Traditional methods focused on price, quality, and delivery. However, new performance based systems place the emphasis on total cost including quality, delivery, safety, environmental impact, cycle time, worker attitudes, and management backgrounds, placing a greater emphasis on factual data [38, 39].

Supplier management can be effectively accomplished by a combination of quantitative rating systems, in-depth performance reviews, and ongoing communications with the business partners. Landry [19] performed a study which indicated that respondents considered frequent, informal communication, creation of long-term business relationships, and joint or mutual benefits including business development, growth opportunities, and the potential for increased profits for parties to be strong motivating factors.

Motivated by the organizational, operational and strategic potential of JIT, the authors undertook this research. This study attempts to shed some light on the factors that lead to successful JIT implementation. Unlike other studies reported in the literature, this study utilizes a relatively large sample size of manufacturing firms to empirically examine factors contributing to JIT effectiveness from an organizational perspective.

4. FIELD STUDY

The first phase of this research project consisted of a Field Study the authors conducted a total of 15 site visits. The manufacturing facilities visited were located in the Mid-West and Southern United States. These facilities were large businesses in terms of revenues and number of employees producing products such as plastic products, solid state input/output electronics, steel casters, automobiles, glass products and mining machinery. The authors interviewed general managers, plant managers, directors of purchasing, production managers and senior vice-presidents and comptrollers. Structured and unstructured interviews were utilized to gain insights into the status of JIT in these manufacturing firms. Findings from this field study are highlighted next.

Reasons behind deciding to implement JIT as reported by subject included:

- Increase the efficiency of operations
- Increase customer satisfaction
- Improve quality
- Gain a competitive strategic advantage
- Improve management-workers relations

The benefits of JIT as reported by the subjects included:

- Elimination of some material handlers which resulted in labor cost savings
- Reduction in setup costs
- Reduction in work-in-process inventory
- Improved material flow and throughput
- Reduced lead-times
- Improvement in the quality level of incoming material
- Less paperwork, as few suppliers are dealt with
- Significant reduction in rejects of outgoing finished products
- Reduction in the number of grievances filed by workers

The interviewees indicated that the following system-wide modifications took place prior to JIT implementation:

- Reduction of the number of vendors
- Changing work center layouts and combining several operations to minimize distance travelled
- Training employees to improve job skills in technical matters and problem solving
- Changes in job classifications
- Grouping machines in cells
- Purchasing equipment with short setup times
- Changing inventory and order policies, as well as production runs policies
- Initiation of quality circles and quality control programs

Some interviewers indicated that their JIT experience has been a failure. They attributed such failure to:

- Lack of cooperation from vendors in the form of inconsistent lead times and capacity constraints imposed by suppliers
- The lack of resources to invest in direct linkages with vendors
- The unwillingness of workers to move from work center to other work centers as needed resulting in problems with unions
- Management's perception that JIT tends to shift power from management to workers
- The attitude of management knows what is best for the company along with lack of confidence in hourly workers' commitment to the organization
- Lack of an accurate forecasting system which might result in the inability of the company to make deliveries to customers as required

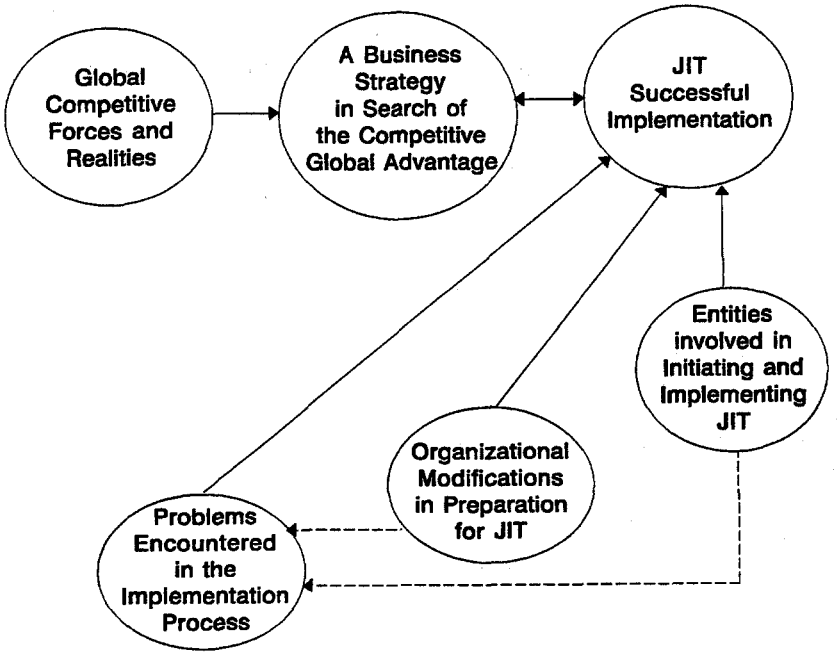

Fig. 1. A conceptual framework for the successful implementation of JIT

Table 1. Respondents' profile

Officer responding[a]	Percentage
President	34.61
Vice President	18.46
Operations Manager	28.46
Owner	10.00
Others	8.47

[a] Respondents were asked to share the survey with other officers in the organization if they did not know the answer to a specific question in the survey.

The site visits and interviews conducted during this phase of this research gave the researchers insights into JIT implementation requirements, hindering problems, and benefits as seen by those who practice JIT in a manufacturing environment. This facilitated the formulation of the questionnaire used in the empirical phase of this research.

Motivated by that field study, the literature review, and realizing the great potential of JIT, the objective of this research is to shed some light on the different organizational facets of JIT. Of a specific interest to this research, is the question of what do organizations need to do to ensure that JIT achieves its potential benefits. In this context, this research has practical and theoretical utilities.

5. THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESES

Based on the findings of the field study and the literature review, the framework in Fig. 1 was constructed to provide the context in which the following research hypotheses are formulated and tested.

H_1: In comparison with other firms, those that exert higher level of effort in modifying their organizations, in preparation for JIT implementation, should encounter less implementation problems.

H_2: In comparison with other firms, those that exert higher level of effort in modifying their organizations, in preparation for JIT implementation, should achieve higher level of success with JIT.

H_3: JIT success is associated with the type of entity (internal or external organizational group) which initiated/implemented JIT.

H_4: There is an association between a firm's business strategy and its success with JIT.

H_5: A firm's competitive standing in its own industry is associated with its success with JIT.

[1]Ed Burnett Consultants, 99 West Sheffield Ave., Englewood, NJ.

6. METHODOLOGY

6.1. Sample

This study consisted of two phases. The first was a field study, in which visits were made to 15 large manufacturing facilities. The insights gained from this field study in association with an exhaustive literature review were used to develop an extensive research questionnaire. The instrument was validated (face validity) by 15 business executives and 15 APICS members.

A purchased mailing list of manufacturing companies from Ed Burnett Consultants[1] was used to draw a sample of 700 organizations. Usable responses of 130 were obtained resulting in a response rate of 18.7%. The relatively low response rate is attributed to the extensive nature of the research questionnaire, and the type of information requested. However, this rate is consistent with similar studies reported in the literature [40]. An examination of respondents versus non-respondents including goodness-of-fit Chi-square tests revealed no significant differences in terms of annual sales, or number of employees at the 0.05 level.

Respondents were asked to specify their titles. Seven classifications were identified: president, vice president, operations manager, owner, manufacturing engineer, controller, and other. Table 1 provides the proportion of respondents in each category. The participating organizations produced both consumer and industrial products.

6.2. Measurement

6.2.1. JITRAT.. Measure of the rationale behind implementing JIT. This scale consisted of the following variables.

X_1: Inventory reduction.
X_2: Quality improvement of final product.
X_3: Lead time reduction.
X_4: Improvement of management-worker relationships.
X_5: In response to competition from competitors.

Table 2. JIT modification factors

Variable	Factor 1 loadings	Factor 2 loadings
Factor 1: *Procedures oriented modifications*		
Training management	0.862	0.401
Training workers	0.881	0.311
Reduction in the number of suppliers	0.689	0.208
Sharing production plans with suppliers	0.578	0.392
Establishing joint quality control procedures with suppliers	0.63	0.423
Factor 2: *Operations oriented modifications*		
Modifying plant layout	0.281	0.788
Reducing machine setup time	0.188	0.806
Use of multi-function machines	0.215	0.679
Increasing the level of automation	0.126	0.523
Standardization of operations	0.224	0.828
Simplification of operations	0.310	0.893
Reducing machine down time	0.101	0.740

X_6: Quality improvement of incoming material from suppliers.

Each of these variables was measured by a 10 point scale ranging from 1 (low) to 10 (high). The face validity of this scale was deemed to be acceptable by 15 business executives and 15 APICS members. Principal component analysis was used to assess the dimensionality of this scale. The eigen value greater than one criterion and the screen plot indicated that one factor would be sufficient.

The principal component solution accounted for 78% of the common variance. The construct validity of this scale was assessed by examining correlation between total scale score and individual variable score for all six variables. The corrected variable scale correlations (correlating the variable being correlated with the sum of all variables in the scale, except for the variable being correlated) were all above the minimum of 0.5. Thus, this scale satisfied the construct validity requirement [41]. Therefore, scores of the six variables were summed to obtain the score for the JITRAT scale based on equation (1) below.

$$\text{JITRAT} = \sum_{i=1}^{6} X_i \tag{1}$$

Consistent with the recommendation of Nunnaly [42], the scale reliability was tested resulting in a Cronbach's alpha of 0.84 which is considered acceptable [43].

6.2.2. JITMOD. Measure of modifications undertaken in preparation for JIT implementation. This scale consisted of 12 variables which are shown in Table 2.

The principal component analysis indicated that two factors should be extracted. The two factor varimax solution explained 0.791 of the common variance. The resulting factors and their factor loadings are presented in Table 2. The Cronbach's alpha reliability for factor 1 was 0.842, while for factor 2 it was 0.878. Factor 1 is labeled as procedures oriented modifications, and factor 2 is labeled as operations oriented modifications. Regression analysis was used to develop factor scores.

6.2.3. JITFAL. Measure of reasons (problems) contributing to JIT implementation

Table 3. JIT implementation problems factors

Variable	Factor 1 loadings	Factor 2 loadings
Factor 1: *Human related problems*		
Top management resistance	0.831	0.256
Top management lack of support	0.892	0.115
Unionized workers	0.791	0.231
Lack of consultants in the field	0.518	0.108
Lack of formal training for managers	0.811	0.119
Lack of formal training for workers	0.808	0.103
Workers' resistance	0.901	0.121
Lack of communication between management and workers	0.885	0.165
Problems with machines and plant configuration	0.758	0.323
Factor 2: *Suppliers related problems*		
Quality problems with supplied material	0.231	0.829
Timing problems with supplied material	0.179	0.853
Incorrectly supplied material by suppliers	0.139	0.896
Lack of information and communication with suppliers	0.211	0.796

Table 4. JIT success factors with corresponding factor loadings

Item	Definition	Loading
X_1	Extent of reduction of inventory due to JIT	0.761
X_2	Extent of reduction of rejects of finished goods due to JIT	0.882
X_3	Extent of improvement in on-time receipts from suppliers due to JIT	0.731
X_4	Extent of lead time reduction due to JIT	0.562
X_5	Extent of set-up time reduction due to JIT	0.591
X_6	Extent of improvement of relationship with suppliers due to JIT	0.801
X_7	Extent of improvement in customer service due to JIT	0.734
X_8	Extent of labor turnover reduction due to JIT	0.622
X_9	Extent of increased workers' morale due to JIT	0.659
X_{10}	Extent of improvement in the quality of finished products as perceived by customers due to JIT	0.570
X_{11}	Extent of reduction in the variability of work load levels due to JIT	0.799
X_{12}	Extent of improvement in overall production efficiency due to JIT	0.637
X_{13}	Extent of monetary savings due to JIT	0.556
X_{14}	Extent to which the company recommends JIT to others based on its own experience with JIT	0.610

Notes: The appropriateness of factor analysis is determined based on the equation:

$$\text{Number of empirical constraints implied} = 0.5[(n-r)^2 - (n+r)] \quad (2)$$

Where: $n =$ number of variables, in this case 14; $r =$ number of factors, in this case 1

failure. This scale consisted of 13 variables shown in Table 3.

The Cronbach's alpha for the JITFAL scale which included all 13 variables was 0.844. The principal component analysis revealed that a two factor solution was adequate. The two factor varimax solution explained 0.73 of the common variance. The resulting factors and their loadings are presented in Table 3. The Cronbach's alpha for Factors 1 and 2 were 0.832 and 0.851, respectively. Factor 1 is labeled as human related problems, while factor 2 is labeled as suppliers related problems. Regression analysis was used to obtain factor scores.

6.2.4. JITSCESS. Measure of JIT performance (success). This scale consisted of 14 variables shown in Table 4.

Principal component analysis was used to assess the dimensionality of this scale. The eigen value greater than one criterion and screen plot indicated that one factor would be sufficient in explaining the observed correlation. This principal component solution accounted for 81% of the common variance. Factor loading for the one-factor solution are presented in Table 4. Confirmatory factor analysis was conducted where the number of principal constraints was found to be 77 (see equation (2), Table 4). Based on Kim and Meuller [44], the greater the number of empirical constraints, the higher the confidence in the appropriateness of factor analysis.

The JIT performance success scale is defined as a composite score of several variables based on equation (3) below.

$$\text{JIT Success} = \sum_{i=1}^{14} X_i \quad (3)$$

Where:

X_1: The extent of reduction of inventory due to JIT.
X_2: The extent of reduction of rejects of finished goods due to JIT.
X_3: The extent of improvement in on-time receipts from suppliers due to JIT.
X_4: The extent of lead time reduction due to JIT.
X_5: The extent of set-up time reduction due to JIT.
X_6: The extent of improvement of relationship with suppliers due to JIT.
X_7: The extent of improvement in customer service due to JIT.
X_8: The extent of labor turnover reduction due to JIT.
X_9: The extent of increased workers morale due to JIT.
X_{10}: The extent of improvement in the quality of finished products as perceived by customers due to JIT.
X_{11}: The extent of reduction in the variability of work load levels due to JIT.
X_{12}: The extent of improvement in overall production efficiency due to JIT.
X_{13}: The extent of monetary savings due to JIT.
X_{14}: The extent to which the company recommends JIT to others based on its own experience with JIT.

Table 5. The correlation between level of modification exerted and implementation problems encountered

Implementation problems Modification effort	Factor 1 (The human factor)	Factor 2 (Suppliers related factor)
Factor 1 (Procedures oriented)	− 0.621	− 0.703
Factor 2 (Operations oriented)	− 0.501	− 0.593

Note: All correlation coefficients were found to be significant at $p < 0.01$

Table 6. Regression results for the relationship between JIT success and the modification effort

Regression stage	Regression model	t-Value	R^2	Change in R^2
1	JITSUCCESS = f(Firm size, number of years JIT in use)			
	Intercept	45.69**	0.24	
	Size	1.06		
	Number of Years JIT in Use	4.11**		
2	JITSUCCESS = f(Firm size, number of years JIT in use, MF1)			
	Intercept	20.8*	0.36	0.12
	Size	0.93		
	Number of Years JIT in Use	3.93**		
	MF1	3.81**		
3	JITSUCCESS = f(Firm size, number of years JIT in use, MF1, MF2)			
	Intercept	9.96**	0.47	0.11
	Size	0.43		
	Number of Years JIT in Use	3.42**		
	MF1,	3.16**		
	MF2	1.98*		

Notes:**$p < 0.01$; *$p < 0.05$.
MF1: Modification Factor 1 (procedures oriented).
MF2: Modification Factor 2 (operations oriented).

The face validity of this scale was assessed by 15 business executives and 15 APICS members. Based on the recommendation of Nunnaly [42], the scale was tested for reliability using Cronbach alpha resulting in a value of 0.85. This value is higher than the acceptable level of 0.70 [43].

The construct validity of the scale was assessed by examining the correlation between total score and individual item scores for all 14 variables in the scale [41]. The corrected item scale correlations (correlating the variable being correlated with the sum of all variables in the scale, except for the item being correlated) were all above the minimum of 0.5. Thus, the scale satisfied the construct validity.

It is to be noted that in addition to the variables addressed here, respondents were asked to provide other information such as:

1. Line of business.
2. Firm's performance relative to its industry.
3. Firm business strategy.
4. Firm size.
5. Type of production system used.
6. Automation strategy and systems.
7. Who initiated the JIT effort.
8. Number of years JIT has been in use.
9. Who was responsible for the implementation of JIT.

7. DATA ANALYSIS AND RESULTS

Table 1 provides a profile of respondents based on their position in the firm.

7.1. Hypotheses testing

After obtaining factor scores for both modification efforts and implementation problems, the relationship between the two factors in each category was examined using simple correlation. Based on the results in Table 5, hypothesis $\mathbf{H}_1$ was supported. This indicates that there is an association between the extent of modification effort undertaken in preparation for JIT and potential problems encountered during JIT implementation. Specifically, the more a firm invested in the modification effort, the less likely it encountered implementation problems.

Hypothesis $\mathbf{H}_2$ was tested using hierarchical regression. This procedure was required to control for the size of the firm and the number of years JIT has been in use. The results of this regression procedure are shown in Table 6. Based on the results in Table 6, it appears that modification efforts are very significant in explaining JIT success, even after correcting for firm size and the number of years JIT has been in use. Therefore, $\mathbf{H}_2$ was supported.

To test $\mathbf{H}_3$, a MANOVA procedure and pairwise mean comparisons were used. The MANOVA procedure detected significant differences with regard to impact of JIT initiation and implementation on JIT performance. Based on the results in Table 7, $\mathbf{H}_3$ was partially supported. The pairwise comparisons for JIT initiation revealed that top management involvement in initiating the JIT effort tended to make a difference in terms of JIT performance. However, with regard to the impact of JIT

Table 7. Initiation/participation in the JIT effort in relation to JIT success

Activity	JIT success	1	2	3	4	F-value	p-value	Significant group differences at $\alpha = 0.05$
Initiation of JIT	(Mean)	113.6	70.68	75.93		19.83	0.001	1-2, 1-3
	(SD)	13.20	16.36	14.81				
Participation in JIT implementation	(Mean)	69.32	106.69	128.61	130.6	28.32	0.001	All pairwise Comparisons are different except for 4 and 3
	(SD)	18.21	11.13	14.2	16.21			

Notes: For initiation of JIT:
1: Stands for Top Management
2: Accounting Department
3: Purchasing Department
For Participation in JIT implementation:
1: In-house personnel
2: Outside constant
3: Customers
4: Suppliers

initiation on JIT success, no difference was detected due to the involvement of accounting versus purchasing. On the other hand, with regard to participation in the JIT Implementation process, the participation of suppliers and customers were associated with the high JIT performance. However, no difference in JIT performance due to the involvement of suppliers as compared to customers involvement was detected.

Hypothesis $\mathbf{H_4}$ was tested using a MANOVA procedure and pairwise mean comparisons. Based on the results shown in Table 8, the MANOVA procedure revealed significant differences among the three strategic groups. The pairwise mean comparisons detected no difference between the differentiation strategy group and the mixed strategy group. However, both groups outperformed the cost leadership group. Therefore, $\mathbf{H_4}$ was partially supported.

In a separate analysis, the relationship between JIT success and the type of operations system used in association with the different business strategies was not found to be significant. This finding may lend some support to the notion that careful implementation of JIT is relatively more critical to its success than the type of production system used. However, this apparent lack of significance could also be attributed to the small sample sizes resulting from dividing data into the many business strategy-processing technology—JIT success subgroups. Future research is called for to explore this issue.

$\mathbf{H_5}$ was tested using a MANOVA procedure and pairwise mean comparisons. The results in Table 9 clearly show significant differences for both the MANOVA procedure and the pairwise mean comparisons. Industry leaders tended to be more successful with JIT than any other group. Also, the above average group outperformed the average group. Therefore, $\mathbf{H_5}$ was supported. Based on the data available, it is not feasible to determine if successful JIT implementation contributes to a firm gaining an industry leader status.

8. DISCUSSION AND CONCLUSIONS

Based on the field study, the literature review and this study, the following conclusions are drawn. First, firms with differentiation and mixed (both cost and differentiation) business

Table 8. JIT success and business strategy

JIT success	Business strategy			F-value	p-value	Significant group differences at $\alpha = 0.05$
	1 Cost leadership	2 Mixed	3 Differentiation			
(Mean)	76.79	119.38	122.62	32.19	0.001	3–1, 2–1
(SD)	12.44	9.83	15.32			

Table 9. Firm's industry standing and JIT success

JIT success	Industry strategy			F-value	p-value	Significant group differences at $\alpha = 0.05$
	1 Average	2 Above average	3 Industry leaders			
(Mean)	56.87	72.93	128.81	42.76	0.001	3–1, 3–2,
(SD)	9.62	16.82	8.67			2–1

strategies appear to realize significantly more JIT benefits relative to firms with a cost leadership business strategic orientation. Perhaps cost leadership businesses achieve only the efficiency component of the JIT benefits. On the other hand, firms which utilize a differentiated or a mixed business strategy may achieve the effectiveness component of the JIT benefits in addition to the efficiency component. Thus, firms may benefit from broadening their strategic posture. It appears that cost alone as a strategic weapon may no longer be a sufficient competitive weapon.

Second, firms considering implementing JIT are advised to invest extensively in modifying their procedures, workforce and operations. Such investment appears to lessen the likelihood of encountering implementation problems.

Third, top managers' involvement in the initiation of the JIT effort is critical. On the other hand, the involvement of customers and suppliers in the actual implementation of JIT is essential.

Fourth, it appears that firms which do the right things by becoming leaders in their industries, also do well in terms of JIT utilization. Perhaps this may be attributed to an organizational culture that promotes success and excellence in addition to efficiency.

Finally, the framework in Fig. 1 provides a context in which the actual and practical JIT related organizational concerns can be investigated. The results of this study appear to support the relationships outlined in the framework in Fig. 1.

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