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# An Empirical Study about Assessment of the JIT System: on korean semi-production firm

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## Abstract

This study is focused on evaluating the computer-integrated just-in-time (CI-JIT) production system of a semi-conductor manufacturing firm in Korea.

Approaching the mid-1980s, the emphasis was on low price, low-cost operations, and quality, especially in USA. American companies have shifted output to low-wage countries like the Philippines, Korea, Japan, Malaysia and allied countries that can make quality products at low prices. Korea and other Asian countries forego short-term profits to gain a solid foothold in a product market, recognizing that larger market share leads to lower cost and higher profit in the long run. They bring manufacturers and suppliers together to improve material management and operation management, using project teams that investigate topics, such as Just-In-Time(JIT)manufacturing, among others. The "Kanban" word means "card" in Japanese, and is used to indicate the desired final delivery schedule. The operation for a particular item produced is scheduled for a specific time. The same process is extended to the external suppliers. More recently, the cards are gradually being replaced by electronic procedures that follow the same concept. Its capacity must be capable of handling the various transactions required by the JIT coverage as well as some allowances for expanded applications.

Key Words : JIT, external suppliers, marketplace, Total Quality Control (TQC)

# I. Introduction

Years after World War II, the marketplace was confined to the United States, which resulted in a pent-up demand for products that had not been widely available. This led to a lush market for products of almost any quality.

Approaching the mid-1960s, the competitive arena started to move beyond domestic boundaries. Germany had established a presence in the United States with its attacks on the low-end automobile market. The emphasis was on low price, low-cost operations, and quality. The first attempts by Japan to penetrate these markets failed, for years but quietly raked up points in several U.S. markets during those years. As the Japanese chipped away at the U.S. market share, American funds were preoccupied with the larger, more lucrative customers and with their major competitors. Financially oriented top managers treated the corporations as a set of profit-generating business units whose destinies were based on short-term financial performance. Manufacturing technologies were neglected, as firms shifted to competitive strategies that were less ordinary than merely manufacturing competence.

In contrast, economic necessity was propelling Asia's post war industrial miracle with a limited domestic market and strong reliance on imported materials with the help of borrowed technology, highly motivated and disciplined managers and workers, and government-industry cooperation.

U.S. firms began feeling the effects of foreign competition in the mid-1970s but the real impact had yet to come. Ultimately, Korea and the other South Asian producers' combined forces were too powerful to overcome.

Summarizing the situation, Morita[1]was quoted saying that American companies have either shifted output to low-wage countries like the Philippines, Korea, Japan, Malaysia and allied countries that can make quality products at low prices.

The Manufacturing strategy has been to produce superior quality products that meet the demand of the customers and sell at attractive prices, which are often less than those of U.S. competitors. Korea, the Philippines, Japan and other Asian countries forego short-term profits to gain a solid foothold in a product market, recognizing that larger market share leads to lower costs and higher profits in the long run. They also reinvest profits in programs that further increase market share and reduce costs. That increases profits in a continuing upward spiral referred to as the "Winners Competitive Cycle".[2]

The lower product costs - apart from currency exchange rates are not based on lower wages. They spring from the efficient use of production resources labor, material, and money. The security of these resources was based on the concept of waste consciousness and on a move with every effort to eliminate the sources thereof their process and technology focus on maximum output with maximum input.

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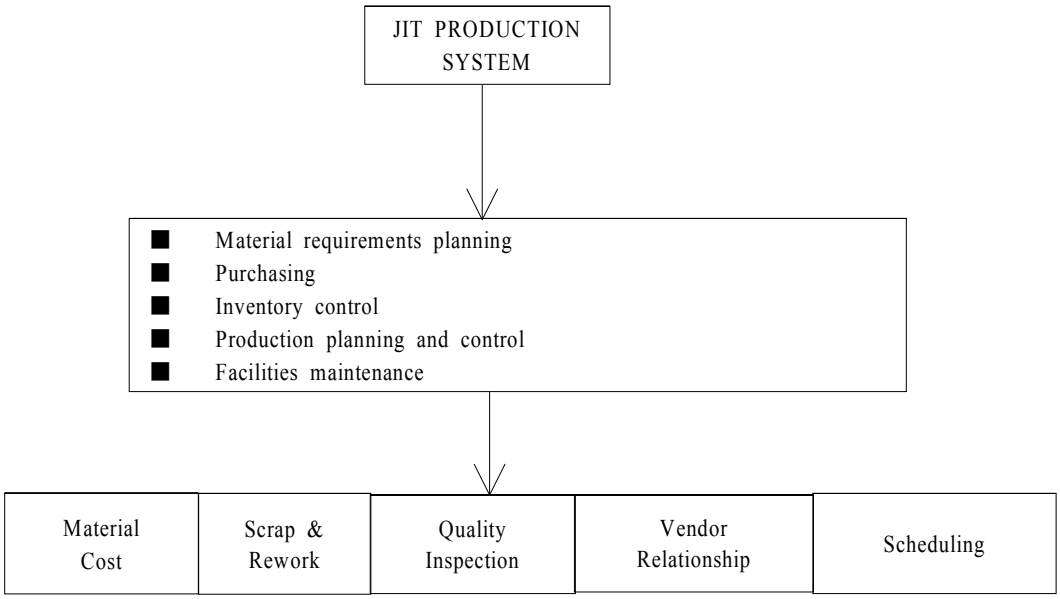
1) Akio Morita, Business Week, March 3, 1996.
2) James C. Abegglen and George Stalk, Jr. Kaisha: The Japanese Corporation, (New York: Basic Books, 1995).

Stratton[3]aptly described the condition of U.S. industry as a competitive shock of the early 1980s and a "Second Pearl Harbor". Some American companies started to gain insights on their problems by analyzing Asian products and processing technology, quality concepts and their manufacturing philosophy. They launched a program of competitive benchmarking.

Groups and associations were formed to study productivity and competitiveness. They bring manufacturers and suppliers together to improve material management and operation management, using project teams that investigate topics, such as Just-In-Time (JIT) manufacturing, among others. The goal is to develop better methods and standardize them across the industry, with emphasis on supplier final assembler coordination.




(Figure 1. Research Paradigm)

## 1. Back ground Information

It is ironic that Henry Ford invented half of the Toyota production system between sixty and seventy years ago. Henry Ford's original assembly line and its feeder operations were real process flow operations. but he only made a single product without change. In such a situation, if one used the same amount of raw material every day at the same place at the same time, then just-in-time (JIT) delivery would be very easy. The shortcoming

3) Frederick Stratton, Jr., "The Slumbering Giant is Awakening," Target, Summer 1996

was that his process required using an assembly line that made only a single model in identical quantities every day. Ford said, "You can have any color that you want as long as it is black".

The time came when the model T had to give way to the model A. Undergoing this changeover just as the Great Depression began in 1929 was unfortunate. The year and a half that was needed to make the factory changes necessary to produce model A cost Ford the leadership in the automobile, industry which it has never quite regained.[4)]

## 1) Conceptual Framework

This study rests on the theory evolved in part by Henderson[5)], stating that JIT is basically a system of supplying parts and materials at the very moment they are needed in the factory production process, so that those parts and materials are instantly put into us

The competitive and strategic advantage of this system is enormous. Factory inventories of parts, component materials, and even assemblies can be kept to an absolute minimum. Thus, the warehousing of inventory, storing of parts, checking, counting, rejecting damaged goods, etc., are eliminated or greatly reduced.

While the JIT production system may be adopted with the aid of manual coordination, the application of a computer system is of paramount importance, due to the massive communication that is required in order to hasten quick responses from all parties involved. A computer hardware/software system is designed to cover the planning and coordinating requirements for material, purchasing, inventory control, production and maintenance facilities.

### (1) Computer Integration

Clearly, JIT operational communication must be computer driven. Electronic Data Interchange (EDI) is the most appropriate computer linkage. A common approach is for the manufacturer to provide the customer with a proprietary terminal for placing orders and getting transactions-related information.[6)]

True EDI is accomplished via computer-to-computer linkage. This can be done either directly with the computers, or indirectly, through a third party network. In either case, the manufacturer and the customer both have electronic mail boxes from which they retrieve electronic messages. Up-front security measures safeguard both parties, internal files unless they purposely make them available to outsiders. The EDI system should be able to handle:

① On-line transmittal of basic orders and order revisions

② Line-set transactions, including the suppliers' production schedule translated into the manufacturer's part

4) Ahmad Ahmadian, Rasoul Afifi and William D. Chandler, Production and Operation Management : A Productivity Perspective, (Needham Heights, MA: Simon & Schusts, Inc., 1999).

5) Bruce D. Henderson, ibid., pp. 139 - 149

6) Margaret Emmalhainz, Electronic Data Interchange in Purchasing, (Oradell, NJ : National Association of Purchasing Management, 1996).

number, supplier's inventory position and the like

③ Advance shipping notices ④ Bill of material inquiries

⑤ Purchase order transmittal ⑥ Order acknowledgment

JIT manufacturers' customers' need to communicate logistical and technical data fast, often, and accurately makes EDI essential for success, particularly as the JIT relationship progresses.

### (2) Material Cost

One great advantage of the JIT system is its impact on the material cost, especially on the work-in-process. These are the materials that are either sitting on the floor between the machines, sitting on the conveyor, stored in off-line centralized inventory, or actually being processed. All forms of storage take up room and floor space. Only material that is actually being processed represents irreducible work-in-process.

The obvious benefit of a faster set-up time is that it permits reduction in work-in-process.

Purchasing may have enlist the help of its own production personnel to assist suppliers in overcoming many of the above objections, but there is no doubt that those firms that do not have JIT supplies will soon be at a distinct advantage both domestically and internationally.

# Ⅱ. Review of literature and Studies

The review of literature and studies covered discussions on JIT, especially its significance to industrial operations. Lengthy discussions on benefits derived from the system encourage the researcher to dig deeper into the subject under study. Several significant applications and directions were deliberated by local authors, which were supportive to the researcher's desire to adopt existing conditions. The studies touched extensively on JIT policies and experiences of various industrial organizations.

The present investigation however, differs in most parts from existing studies in certain areas. This study gives particular attention to the extent of JIT application and the effectiveness of the system to the local manufacturing environment.

## 1. Related Literature

Today, the expectations of society and age have given big business multiple roles that compel us to invent

new and higher measure of performance.[7]Production management is one of these roles.

The above observation boils down to the concept of planning and control procedures. Several factors that enter into the production of an item from purchasing to the finished product need to be planned and controlled, which is the very essence of Just-In-Time.

Comprehensive control over inventories must likewise be implemented as these inventories serve to decouple successive operations in the process of making a product and getting it to the consumers just-in-time.

There are several factors to consider in the just-in-time (JIT) system.[8] These factors are the following:

### 1) Geographical Concentration

The secret of best factory location is "proximity". to construct new plants where they will complement sister plants and warehouses, to place its factory where other allied competitors are doing their businesses, and to save on transport costs arising from long distance deliveries. The locations of the competitors' plants and warehouses should well be studied to determine the advantages over competitors both in freight and costs and fast customer service. [9]

Further, companies consider relatively short transit times from vendor plants.

### 2) Dependable Quality

The users must be able to receive only good parts from suppliers. This places a strong emphasis in having relationship with very dependable, high quality suppliers. Hence, when deciding who gets an order, buyers should consider not only the price but reliability as well.

### 3) Manageable Suppliers Network

This factor considers that a minimum number of suppliers working under long contracts help make the just-in-time system work.

The best method for developing this process is to establish a company policy on the use of resources and then train employees to constantly adhere to and understand what is required and why.

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7) Andres Soriano III, "On Rural Development", (Speech delivered before the 15thPhilippines Business Conference on November, 1999, at the Nikko Manila Garden Hotel, Makati, MM).

8) Joan R. Schermerhorn, "Management of Productivity", (USA : John Wiley and Sons, Inc., 1999), pp. 495

9) Franklin G. Moore, "Production Management", Sixth Edition, (Homewood, Illinois : Richard D. Irwin, Inc., 1993), p. 109.

## 2. Related Studies

The Just-In-Time production system seems to be a relatively new concept to local researchers in view of the fact that only a limited amount of unpublished material related to this topic is available. The more significant ones are hereby discussed.

The concept of Just-In-Time, according to Zamora[10], can work in the Philippines, and its impact on business operations is likely to be comparable with that in Japan. The extent of actual improvement, however, would tend to differ from company to company depending on the status of certain factors. She said that the most important factor is top management support. In addition, JIT campaigns might meet resistance in the beginning but will eventually succeed as long as efforts are intensified and at least sustained by management.

It was disclosed that the JIT programs of companies that carefully planned and maintained their projects performed better.

Of equal importance is the study of La csamana Mallari[11]regarding inventory management and control. The findings demonstrated the usefulness of JIT in several areas, namely: carrying cost which include interest on expenses of storage facilities, expenses on rent, obsolescence, breakage and spillage keeping unnecessary large bulk on inventory and in currency of high inventory costs due to non-familiarity with the many known quantitative tools and techniques for forecasting demands, such as economic order quantity (EOQ) for inventory levels, maintaining large inventories in the form of raw materials, and even work-in-process inventories.

JIT in these situations can very well fit to minimize high carrying costs and interest charges on inventories.

Elahi,[12]in his research, has quite different findings. He said that the foremost reason that prompted his respondents to adopt JIT was their desire to increase productivity and reduce costs and waste. This is coupled with their desire to obtain maximum efficiency of workers and machines in production of improved quality products by making available the necessary raw materials and resources just in time of need. With these as the bases, and as the respondents so declared, JIT is applicable in the Philippines.

# Ⅲ. Research Design & Methodology

This section presents the research method used in this study. Likewise discussed, were the respondents, data

10) Elvira A. Zamora, "JIT System of Selected Philippines Manufacturing Companies", (Unpublished Dissertation, University of the Philippines, 1998

11) Teresita Lacsamana-Mallari, "Inventory Management Control and Policies of Selected Manufacturing Industries in Metro Manila', (Unpublished Dissertation, Polytechnic University of the Philippines, Manila, 1999

12) Nabeel Elahi, "JIT as a Tool of Productivity Improvement", (Unpublished Master's Thesis, University of Santo Tomas, Manila, 1998

gathering procedures and statistical treatment of data.

## 1. Research Method

The researcher utilized the descriptive method to gather information. Descriptive research covers the elements of interpretation of meaning and significance of what is described, which combines comparison and contrast involving measurement, classification, interpretation and evaluation.[13)]

## 2. Respondents of the Study

The review of the documents from management indicated that the company has a manpower complement of 1,400. Of this total, 23 are managers, and 1,377 are to the rank and file employees. This information served as the basis for the determination of the sampling technique that was adopted in this study.

Purposive sampling was used in the survey process. The choice of the respondents was established on the premise that they met the following criteria:

① employees have served the company for at least one year ② in their existing position ③ occupied their present position for the past year ④ are carrying out functions having direct bearing on the facilitation of and conversion of input resources to planned outputs.

Interview

The researcher also interviewed some employees to clarify vague and unclear responses to supplement data gathered through the questionnaire. The unstructured interview focused mainly on the experiences of the respondents regarding existing practices of the JIT observed by them.

Observation

The researcher conducted visual inspections on the various sections of the plant to observe the activities of the employees. The plant tour was intended to augment the data gathering process.

## 3. Statistical Treatment Of Data

The data that were gathered were tabulated and analyzed. The following statistics were used:

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13) John W. Best, Research in Education. (New Delhi: Prentice Hall of India, Ltd., 1992

1) Percentage the tabulated frequencies were translated into percentages. The formula[14] is:

$$\%=n / N \times 100$$

where:

%=symbol for percentage of frequency

n=number of responses

N=total number of respondents

The weights of opinions on the extent of application and benefits derived from the system were measured according to Likert Scale method. From these opinions, the weighted means were determined. The mean was computed as the sum of the scores divided by the number of responses. In this study, the means are computed, thus:

$$XW=\frac{E(Xw)}{n}$$

where

XW= weighted mean

w=weight of each item

x=item value

The concept boundary of numerals is arbitrarily set according to the following criteria:

| Mean Value | Extent of Application | Effectiveness |
|---|---|---|
| 4.51-5.00 | Large extent | Highly Effective |
| 3.51-4.50 | Moderate extent | Moderately Effective |
| 2.51-3.50 | Fair extent | Fairly Effective |
| 1.51-2.50 | Poor extent | Quite Effective |
| 1.01-1.50 | None at all | Ineffective |

2) T-test. This inferential statistic is used when comparative studies between two means are conducted this is applied to group means, representing the assessment of the managers and rank-in-file, to determine their significant difference.

Decision Criteria. The null hypothesis is accepted if the t-test result is lower than the critical tabular value and the null hypothesis is rejected if the generated result is higher than the tabular value.

14) Leonard I. Kazmier, Theory and Problems of Business Statistics, (New York: Mcgraw-Hill Book Co., 1996

## 4. Presentation, Analysis and International of Data

The data gathered were presented in tabular form, analyzed and interpreted in this section.

### 1) The Extent of Computer Integrated Just-In-Time (CI-JIT) Implementation

As could be gleaned from Table 1, the CIJ-IT production system is observe to have been implemented to a "moderate extent"with only the Quality Control function to a "fair extent". These indicators further reveal that the CI-JIT system has not yet been fully implemented and integrated in the various functions of in the operation.

The null hypothesis on no significant difference in the opinions of the managers and rank and file on the extent of implementation of the production system is accepted indicating that indeed, the opinions do not vary significantly. Such finding is drawn from the calculated value of 0.9087, which is lower than the critical value of 2.228 at a degree of freedom of 10 and at 0.05 significance level.

<Table 1>Extent of Implementation of the CI - JIT Production System

| Operational Function | Mean (X) | Managers' Interpretation | Mean (X) | Rank-and-file Interpretation |
|---|---|---|---|---|
| Material requirement planning | 3.95 | Moderate Extent | 3.53 | Moderate Extent |
| Purchasing | 4.21 | Moderate Extent | 3.66 | Moderate Extent |
| Inventory tracking & control | 3.89 | Moderate Extent | 4.16 | Moderate Extent |
| Quality control | 3.47 | To a Fair Extent | 3.79 | Moderate Extent |
| Production facility maintenance | 3.95 | Moderate Extent | 3.57 | Moderate Extent |
| General Mean<br>Standard Deviation | 3.9033<br>0.2402 | | 3.7767<br>0.2426 | |
| Computed Value = 0.9087 | | df=10 | | Tabular Value= 2.228 |

### 2) Effectiveness of CI-JIT Production System's Implementation

It is clear in Table 2 that the implementation of the CI- JIT system to computer hardware is highly effective in hardware design particularly in the acquisition and installation. This further demonstrates the company's resolve in integrating computer system to CI- JIT to speed up data processing.

<Table 2> Effectiveness on the Implementation of Hardware Design in the Production System

| Particulars | Mean (X) | Managers' Interpretation | Mean (X) | Rank-and-File Interpretation |
|---|---|---|---|---|
| Selection | 4.05 | Moderately Effective | 4.62 | Highly Effective |
| Acquisition | 4.58 | Highly Effective | 3.97 | Moderately Effective |
| Installation | 4.84 | Highly Effective | 4.56 | Highly Effective |
| General Mean<br>Standard Deviation | 4.4900<br>0.4026 | | 4.3833<br>1.3592 | |
| Computed Value = 0.3424 | | df = 4 | | Tabular Value = 2.776 |

The null hypothesis of no significant difference in opinions on the effectiveness of the hardware designs accepted when the test showed 0.3424 against the critical value of 2.776 at 0.05 level of significance. By chance, the opinions do not vary significantly.

### 3) Software Compatibility

As shown in Table 3, it is implied that the computer program designed and installed have been effectively compatible with the requirement of the CI- JIT production system. Such design compatibility reduces occurrence of bugs in the programs thereby making the system operate more efficiently.

The null hypothesis of no significant difference in opinions on the effectiveness of software compatibilities rejected when the test showed 2.8120 against the critical value of 2.776. These indicators prove that there is, in effect, a wide variation in opinions of the respondents.

<Table 3> Effectiveness of the Software Compatibility with the CI-JIT Production System

| Particulars | Mean (X) | Managers' Interpretation | Mean (X) | Rank-and-File Interpretation |
|---|---|---|---|---|
| Design | 4.26 | Moderately Effective | 3.99 | Moderately Effective |
| Selection | 4.05 | Moderately Effective | 3.62 | Moderately Effective |
| Installation | 4.42 | Moderately Effective | 3.84 | Moderately Effective |
| General Mean<br>Standard Deviation | 4.2433<br>0.1856 | | 3.8167<br>0.1861 | |
| Computed Value = 2.812 df = 4 | | | Tabular Value = 2.776 | |

### 4) Information Flow

It is deduced from Table 4 that information flow generated from the CI - JIT system has been "moderately"

to "highly effective" which provide for an effective exchange of data to facilitate quick and prompt decision-making.

〈Table 4〉 Effectiveness of the Implementation Process in Terms of Information Flow

| Particulars | X | Managers' Interpretation | X | Rank-and-File Interpretation |
|---|---|---|---|---|
| Management and Work station | 3.95 | Moderately Effective | 4.56 | Highly Effective |
| Among work stations | 4.32 | Moderately Effective | 4.53 | Highly Effective |
| Suppliers and the plant | 4.42 | Moderately Effective | 3.90 | Moderately Effective |
| General Mean<br>Standard Deviation | 4.23<br>0.2476 | | 4.33<br>0.3727 | |
| Computed Value = -0.3871 | | df = 4 | | Tabular Value = 2.776 |

The null hypothesis of no significant difference in opinions of the effectiveness of Information Flow is accepted when the T value of 0.3871 turned out lower that the critical value 2.776.

### 5) System Maintenance, Database Management, User Service, and Operating Staff

Implied in Table 5, the database management is so effective that appropriate information are being disseminated according to the needs of the suppliers and the members of the management at short notice.

〈Table 5〉 Effectiveness of the Implementation Process in Terms of Other Related Factors

| Particulars | Mean (X) | Managers' Interpretation | Mean (X) | Rank-and-File Interpretation |
|---|---|---|---|---|
| System Maintenance | 3.84 | Moderately Effective | 4.34 | Moderately Effective |
| Database Management | 4.84 | Highly Effective | 4.55 | Highly Effective |
| User Service | 4.47 | Moderately Effective | 4.58 | Highly Effective |
| Operating Staff | 4.05 | Moderately Effective | 3.95 | Moderately Effective |
| General Mean<br>Standard Deviation | 4.30<br>0.4452 | | 4.355<br>0.2903 | |
| Computed Value = -0.207 | | df = 6 | | Tabular Value = 2.447 |

In addition, the data outputs are promptly modified each time users of information desire to transform them

into data that best fit to new business situations. This flexibility could have been made possible through efficient operating staff and through proper maintenance of the computer system.

As regards the null hypothesis of no significant difference in opinions on the effectiveness of the system maintenance and related factors, the calculated T value of 0.2070 is seen to be lower compared to the critical value of 2.447, leading us to believe that there is really no significant difference in the opinions on this aspect.

### 6) Extent of Benefits Derived from the CI – JIT Production System

It is clear from the Table6 that a considerable amount of benefits are being derived from the implementation of the CI-JIT. Accordingly, material cost has been substantially reduced as a result of keeping a much lower inventory, hence, lesser investment. Scrap and rework costs are controlled because the operation stopped when rejections occurred and resumes only after the cause has been identified and resolve .Quality control becomes very effective since the staff are on guard all the time to identify rejects and effect the suspension of the process immediately when rejects are found so they do not pile up in the rework area.

〈Table 6〉 Extent of Benefits Derived from the System

| Particulars | Mean (X) | Managers' Interpretation | Mean (X) | Rank-and-File Interpretation |
|---|---|---|---|---|
| Material Cost | 4.32 | Moderate extent | 4.18 | Moderate extent |
| Scrap and rework | 4.47 | Moderate extent | 4.06 | Moderate extent |
| Quality inspection Process | 4.26 | Moderate extent | 3.81 | Moderate extent |
| Vendor relationship | 4.47 | Moderate extent | 4.35 | Moderate extent |
| Scheduling | 4.37 | Moderate extent | 4.08 | Moderate extent |
| General Mean<br>Standard Deviation | 4.378<br>0.0926 | | 4.096<br>0.1968 | |
| Computed Value = 2.8994df = 8Tabular Value = 2.306 | | | | |

### 7) Most Common Problems Related to the Implementation of CI-JIT Production System Integrity of the System

Gleaned from the presentation in Table 7, problems that adversely affect the integrity of the system rest

<Table 7> Problems Encountered on the Integrity of the System*

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Frequent breakdown of the hardware | 59 | 61 | 2 |
| Inadequate computer peripheral | 10 | 10 | 7 |
| Limited computer system capacity | 58 | 60 | 3 |
| Limited software applications | 20 | 21 | 4 |
| Unstable software performance | 14 | 15 | 5.5 |
| Inadequate system maintenance technicians | 80 | 83 | 1 |
| Unreliable hardware supplier | 14 | 15 | 5.5 |

*multiple responses

on the aspect of maintenance of the hardware specially on shortage of skilled technicians who should undertake immediate and reliable repair when breakdown occur. It follows that the hardware breakdown is of significant influence to the performance of the business and that the limited computer system's capacity could bring down efficiency of data processing.

### 8) Management of Implementation

It is obvious from Table 8, the monitoring system attached to the CI JIT is still not fully established. This could have transpired from poor transaction or, more possibly, the new vendors are not yet fully aware of the system employed. In a similar situation, the poor coordination among the suppliers concerned could have been the result of inadequate understanding of the functions of the various aspects of the system.

<Table 8>Problems Encountered on Management of Implementation*

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Poor coordination among managers involved | 60 | 63 | 2 |
| Inadequate understanding of the system by many of the superiors | 54 | 56 | 3 |
| Slow monitoring of internal and external transactions | 69 | 72 | 1 |
| Poor control of JIT system activities | 20 | 21 | 5 |
| Decision making is quite slow and ineffective | 25 | 26 | 4 |
| Poor coordination of auxiliary firms | 9 | 9 | 6 |
| Inadequate management support | 5 | 5 | 7 |

* Multiple responses

### 9) Capability of Employees

Given in Table 9, refresher courses on the system appear to be lacking. This aspect has been given lesser attention apparently due to efforts to stabilize the computer applications. The organization is busy with setting up system control to ensure smooth functioning of the software but it has left the staff aspect of reorientation on the whole concepts so that coordination of the internal transactions has become more complicated. Such an understanding of the total concept of the production and computer systems could have contributed to the inadequate preparation for more effective preparation for the JIT production system.

〈Table 9〉 Problems Encountered on the Capability of Employees*

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Inadequate preparation for the: | | | |
| JIT system | 60 | 63 | 2 |
| Very dependent on superior intervention | 21 | 22 | 4 |
| Poor plan for retraining | 64 | 67 | 1 |
| Insufficient understanding of supplier production system | 8 | 8 | 7 |
| Inadequate exposure to the brand of computer system | 38 | 40 | 3 |
| Deficient in communication skill | 19 | 20 | 5 |
| Insufficient guidance from management | 16 | 17 | 6 |

*Multiple responses

### 10) Suggested Measures to Minimize Problems on the Implementation of the CI-JIT Production System

#### (1) Integrity of the System

Found in Table 10-1, the integrity of the JIT system could well be maintained by keeping abreast with system development programs. Only when updated concepts of computer application are developed and fully understood could appropriate upgrading the undertaken. The management can carry out these activities only with the able support of seasoned programmer sand system analysts. As a matter of course, management normally encourages the programmers to visualize new computer applications in the aspect of JIT that could enhance the capabilities of the existing system so that more meaningful information could be utilized for better implementation of the production system.

<Table 10-1> Suggested Measures to Minimize the Problems Related to the Integrity of the System*

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Engage technical support from suppliers | 58 | 60 | 5 |
| Maintain adequate well seasoned systems analysts to maintain the software | 81 | 84 | 2 |
| Encourage programmers and system analysts to conduct a continuing upgrading of programs | 76 | 79 | 3 |
| Maintain a back up system | 68 | 71 | 4 |
| Keeping abreast of system development programs for possible incorporation to the system | 85 | 89 | 1 |

*multiple responses

(2) Management Implementation

Gauged from the presented suggestions in Table 10-2, management could well be more effective in implementing the production system by making the suppliers aware of the company's existing system and

<Table 10-2> Suggested Measures to Minimize Problems on Management of Implementation*

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Deeper involvement in sourcing better vendors (suppliers) | 61 | 64 | 3 |
| More frequent meetings with auxiliary firms for effective coordination | 21 | 22 | 5 |
| Regular ocular inspections of vendor manufacturing systems | 31 | 32 | 4 |
| Design and implement a control system for reliable timing of activities | 68 | 71 | 2 |
| Orient suppliers with the company’s JIT system requirements | 81 | 84 | 1 |

*Multiple responses

its requirements. This way, they could react or adjust more reasonably or favorably to any changes in production demands. Responses of external parties to the system are favorable to existing production demand only when management can institute new control design for reliable timing of activities. There is therefore a need for upgrading the list of vendors that could cope up with the system's design and continue to transact with them according to accepted arrangements.

(3) Capabilities of Employees

From Table 10-3, meaningful reforms in the assignment of functions have to be instituted if only to optimize

the utilization of the individual employees proficiency. Such an organization study should delve on overlapping of functions and the concentration of more delicate jobs to a few. It must bring about job enrichment to provide the employees more challenging roles.

The familiarization of the production system serves to provide opportunities for the participants to think more creatively and productively towards the system's objectives. An updated knowledge of the machines of CI - JIT could encourage the employees to cooperate in the delivery of more services that support the operation.

〈Table 10-3〉 Suggested Measures to Minimize Problems on Capability of Employees

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Maintain an effective retraining program | 46 | 48 | 5 |
| Send selection employees for CI – JIT system familiarization on tour outside the country | 76 | 79 | 2 |
| Conduct an organization study to determine more appropriate assignments of functions | 87 | 91 | 1 |
| Conduct regular in-house seminars on communication to improve skill | 58 | 60 | 3 |
| Arrange a regular exchange visit with suppliers for production system orientation | 57 | 59 | 4 |

*Multiple responses

(3) Operating Cost

Table 10-3 showed there has to be an analysis or review of the usual information being disseminated and the frequency of their circulation. If the information is stream lined or simplified, and the frequency rationalized, the number of computer runs could be minimized effectively. On this basis, the computer running time would be reduced and all other related costs are correspondingly minimized.

〈Table 10-3〉 Suggested Measures to Minimize Problems on Cost of Operating the System*

| Problems | Frequency | Percent (%) | Rank |
|---|---|---|---|
| Review computer runs to minimize unnecessary supplies | 83 | 86 | 2 |
| Reduce power consumption by improving computer application | 76 | 79 | 3 |
| Conduct an organization study to determine more appropriate assignments of functions | 87 | 91 | 1 |
| Conduct regular in-house seminars on communication to improve skill | 58 | 60 | 4 |
| Arrange a regular exchange visit with suppliers for production system orientation | 57 | 59 | 5 |

*Multiple responses

# Ⅳ. Conclusions

The CI-JIT production system was observed to have been implemented to a moderate extent on material requirements planning, purchasing, inventory tracking and control, production planning and control and in production facilities maintenance. In the quality control function implementation was not fully integrated.

There was no significant difference in the assessment of the managers and the rank and file employees as to the extent of implementation of the CI-JIT production system on the various operational functions.

In hardware design both groups of respondents found the acquisition and installation of the computer hardware as highly effective, and the selection of hardware design, the managers found it to be highly effective but in the rank and file found it just moderately effective.

Software design was, to a moderate extent effective, according to managers and rank and file respondents. Similar assessments were gathered for the selection and installation of the software. The managers and rank and file rated the system maintenance and database management moderately effective. The managers assessed the user service as moderately effective while the rank and file rated it highly effective. The operating staff was moderately effective as observed by the managers and rank and file.

Information flow between management and workstations, according to the managers, was moderately effective but highly effective as observed by the rank and file. Information flow between-and-among workstations, was rated by the managers as moderately effective while the rank and file assessed it highly effective. Information flow between the supplier and plant was moderately effective.

The assessment of the managers and the rank and file employees did not differ significantly with respect to the effectiveness of the implementation of the (CI-JIT) production system.

In terms of material cost, the managers and rank and file assessed it as moderately effective. Rework and scrap, quality inspection, vendor relationship, and scheduling were all rated moderately effective.

The managers and rank and file employees did not differ significantly in their assessment on the benefits derived from the use of the system.

Fixing defects in the programs took time and involved programmers and systems analyst and even hardware technicians.

The lack of coordination among all parties to the system caused delay in communication, which had affected the processing of information downstream. In addition, the inadequacy of knowledge of some superiors on the operation of the production system created some misconception on the urgency of coordination.

Half-baked retraining program lead to poor preparation for the effective implementation of the JIT system.

Costs of implementing the systems had been rising consistently owing to the increasing need for information.

Due to the search in system applications available manpower were pushed to deliver. This caused the frequent reassignments of the staff to attend to various programs that have to be installed.

In addition supply consumption was increasing owing to the production of reports and documents.

The respondent managers and rank and file, understanding the need to address these problems, shared their views regarding measures that may minimize their occurrence. Substantial suggestions were noted and evaluated by this researcher.

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