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Just-in-Time Manufacturing practices and Strategic Performance: An Empirical Study Applied on Jordanian Pharmaceutical Industries

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Abstract

The study aimed to measure the level of application of Just-in-Time (JIT) manufacturing practices (just in time delivery, setup time reduction, equipment layout, preventive maintenance commitment, daily schedule adherence, and suppliers quality), and to investigate its impact on the strategic performance of Jordanian Pharmaceutical Manufacturing Firms (JPMF). In

order to achieve these objectives the study developed a questionnaire that has been distributed to a simple random sample of 140 managers and supervisors involved in the manufacturing process in the JPMF. A number of 92 complete answered questionnaires have been received back at a response rate of 65. 7 %. After data analysis and hypothesis testing the study revealed that JPMF apply JIT manufacturing practices at an accepted level (at test value $\mu \geq 3.5$, and significance $\alpha \leq 0.05$). The study also revealed the impact of the JIT practices on the strategic performance of JPMF. And finally the study concluded that JIT practices: daily schedule adherence, equipment layout, setup time reduction, just-in-time delivery have an impact on strategic performance of JPMF, meanwhile preventive maintenance commitment and suppliers quality have no impact on the strategic performance of those firms.

Keywords: JIT manufacturing practices, strategic performance, just-in-time delivery, setup time reduction, equipment layout, preventive maintenance commitment, daily schedule adherence, suppliers quality, Jordanian Pharmaceutical Manufacturing Firms (JPMF).

1. Introduction

Just in time (JIT) manufacturing is a production system that had been born and developed in Toyota Motor Manufacturing Company in the last quarter of the 20th century. Gupta (2012) illustrated that JIT became a philosophy and a managerial system, i. e. a collection of management methods, and techniques that improve operations efficiency and effectiveness by producing the right product, in the right quantity, on the right time, at the right place. He also debated that using JIT system enables operations to reduce both waste and variability. Waste reduction means getting rid of, and driving out anything that does not add value to customers, such as defective products, inventory, and delay of material flow. Variability reduction means standardizing the production process to avoid either bottleneck or idle time and to secure smooth and laminar flow of material and other resources through the production process. This can be achieved by using small lot size, lower setup time of machines, accurate scheduling, on time delivery, preventive maintenance commitment, ……etc.

Applying JIT is supposed to improve strategic performance. Gerb(2009) debated that in spite of the advantages and benefits of applying JIT manufacturing system, the global pharmaceutical industry was slow in the application of it, compared with other industries such as automobile and electronic counterparts. This can be attributed to the differences in the nature of the production process in pharmaceutical factories compared with this process in the automobile and electronic ones, and can be also attributed to other reasons related to the specific nature of pharmaceutical industry that has different requirements as it is concerned with sensitive and vital issue associated with human health, making it subjected to a group of regulations and strict operating procedures that meet the public health safety recommendations, and social responsibility needs. Gerb (2009) also argued that some experts in the pharmaceutical

industry believed that the increasing pressures exercised on pharmaceutical factories by different parties (i. e. governments and consumer associations) to reduce medications' prices push those companies to become more receptive to the idea of applying JIT manufacturing system, in order to benefit from its advantages such as quality improvement and cost reductions. What supports this is that Novartis Pharmaceuticals developed a strategy says that at 2010 Novartis will become the Toyota of pharmaceutical industry. Gerb continued that those experts also believed that the generic pharmaceutical companies (companies that imitate not originate products) will be more careful to implement JIT manufacturing system because of their lower profit margins relative to originator companies (innovative product companies).

1. 1 Problem statement and Questions

(JAMP, 2013) mentioned that Jordanian pharmaceutical companies are generic companies, and play a key role in supporting the national economy, where medications occupy the second place among export oriented sectors in Jordan, and they achieved a steady growth in recent years at the value of gross domestic product of medicine equal to us dollar 538 million, worth of gross domestic medicine increase of 14. 2 percent from year 2011. Despite that pharmaceutical manufacturing companies still face real challenges and difficulties as a result of hyper competition in the field, and because of government intervention in the pricing of medical products. Competition and government intervention, as well as other economical and political factors keep low profit margins to those companies and push them to improve their performance (specially cost reduction), that may be achieved by adopting JIT manufacturing system.

Based on all of what is mentioned above, this field study has been conducted to answer the following questions:

1. What is the level of application of JIT manufacturing practices (JIT delivery, equipment layout, setup time reduction, preventive maintenance commitment, daily schedule adherence and suppliers quality) among the Jordanian Pharmaceutical Manufacturing Companies?
2. What is the impact of applying these JIT manufacturing practices on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies?

1. 2 Hypotheses

First Main Hypothesis

H_1: There is a significant impact (at $\alpha \leq 0.05$) of applying JIT manufacturing practices on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF).

This main hypothesis has been subdivided into the following hypotheses

$H_{11:}$ There is a significant impact (at $\alpha \leq 0.05$) of applying JIT delivery on the: strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF)

$H_{12:}$ There is a significant impact (at $\alpha \leq 0.05$) of applying equipment layout on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF)

H_{13}: There is a significant impact (at $\alpha \leq 0.05$) of applying setup time reduction on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF)
H_{14}: There is a significant impact (at $\alpha \leq 0.05$) of applying preventive maintenance commitment on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF)
H_{15}: There is a significant impact (at $\alpha \leq 0.05$) of applying daily schedule adherence on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF)
H_{16}: There is a significant impact (at $\alpha \leq 0.05$) of applying supplier quality on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies(JPMF)

2. Literature Review

2. 1 JIT Manufacturing Practices

At the beginning it is important to point out that there is no consensus among scholars and researchers on the accurate requirements and elements of JIT manufacturing practices, despite of the agreement among them on a number of these elements. Heizer & Render (2006) believe that the amount of benefits taken from the application of JIT manufacturing system depend on the comprehensiveness (i. e. depth and breadth) of the application process. Gupta (2012) argued that as JIT manufacturing is a philosophy, so in order to succeed in it, organizations need to do some changes and amendments on the followed standard operating procedures, and on systems used for production, and also on the prevailing culture. Fateha et al (2012) emphasized that to have successful application of JIT manufacturing, it is important to get top management commitment and support beside the other manufacturing and managerial practices.

Sakikabara et al (1993) conducted a study to set out a frame of the main JIT manufacturing practices. He applied the study on a sample of 41 factories implementing JIT manufacturing in the United States of America. Sakikabara and his colleges concluded in their study that first and foremost the top management commitment is a crucial condition for the success of JIT manufacturing. In addition, they categorized five main groups of practices necessary for successful JIT application: production line arrangement, supplier relationship, facility layout, teamwork and scheduling. Each of them include some branch practices (see figure 1), from all of those practices the equipment layout, adopting pull strategy, suppliers quality and Kanban system are the most important practices for the success of JIT manufacturing.

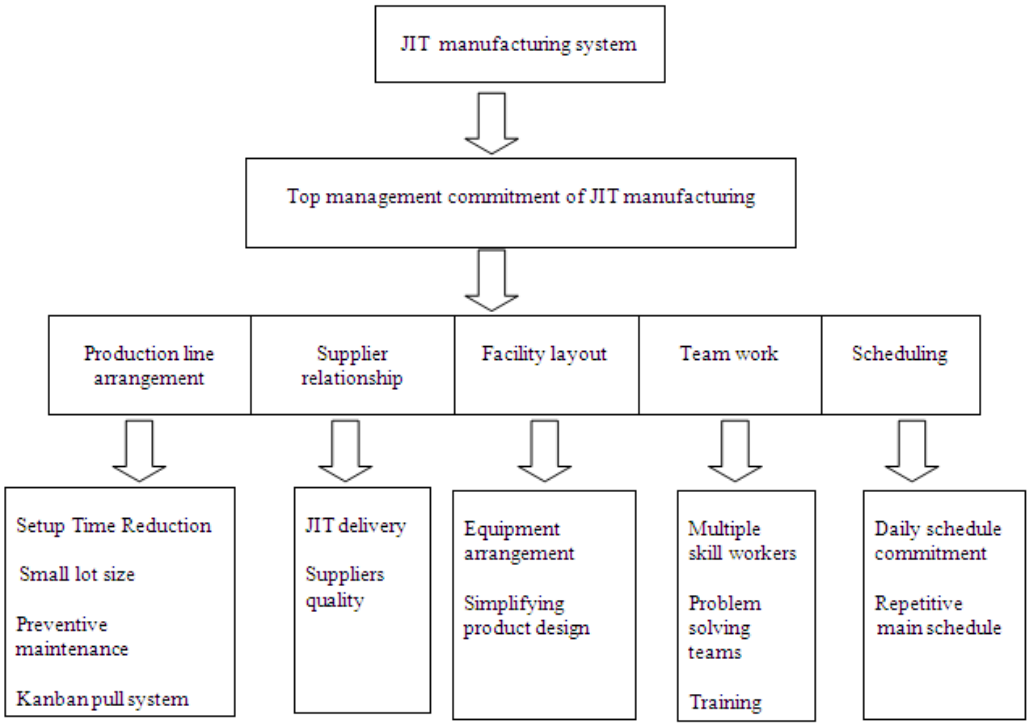

Figure 1: Just in Time(JIT) manufacturing Practices

2. 2 Strategic performance

Wheelen and Hunger (2006) defined performance as the actual end result of the activity, and defined objective as the desired end result of the activity. Comparing the actual with the desired end results, provides the level of performance of any process or operation, and enables to make the necessary corrections to improve its performance. Thompson et al (2007) debated that strategic performance is the operational performance that aims to achieve strategic objectives as a step of translating organizational mission. They also added that the ability to achieve strategic objectives will strengthen marketing capabilities, enhance competitive position, and improve the prospect of future work. Phan and Mastisui (2004) argued that strategic objectives should be measured using leading indicators, because they are more credible and able to indicate the company's strengths and competitiveness (opposite to financial indicators that reflect the past performance only). Achieving strategic objectives can also improve company's financial performance in future and increase profitability year after year. Swink et al (2005) debated that as a result of the continuous change of the business environment, organizations need to relay on balanced customer measures of strategic performance instead of traditional performance measures. For manufacturing, the most important customer indicators are: time-based indicators, flexibility-based indicators, cost based indicators, and quality-based indicators as illustrated in table 1. Matsui (2004) performed a field study to evaluate the impact of just in time practices on the competitive performance

of Japanese manufacturing companies. The study revealed that some of JIT practices, i. e. scheduling, setup time reduction and equipment layout play a positive role in reducing the production cycle time and production cost, in addition they improve production flexibility and increase inventory turnover in the studied Japanese companies. Fullerton and Watters(2001) conducted a study to conclude the performance benefits coming from JIT performance in the manufacturing sectors, i. e machines, electronics and plastic companies in USA. The results revealed that quality and continues improvement practices, waste reduction strengthened the companies competitiveness. The study concluded also that the implementation of JIT practices reduced inventory level, reduced cost of quality and improved the response to customer needs.

Table 1: Strategic Performance Dimensions

Strategic Performance Dimensions	Concept	Some performance indicators
Time Performance	The ability to do job quickly	Cycle Time Queuing Time On-time Delivery Corrective actions Time
Flexibility Performance	The ability to respond to changes at lower cost & time	Time to change marketing mix Time to change production Volume Time of product Development Change of delivery time
Cost Performance	The ability to do job with lower amount of resources	Cost of unit production Inventory turn around Cost of poor quality
Quality Performance	The conformance of product to needed specifications	Percent of defective product Percent of raw material waste Percent of qualified suppliers

3. Methodology

3. 1 Population & Sample

The population of the study is composed of the middle managers and the supervisors who are involved in the production process in the seventeenth Jordanian Pharmaceutical Manufacturing Companies. A simple random sample composed of (140) managers and supervisors of those factories has been selected. After distributing the instrument to the sample, the number of complete answered

questionnaire have been received were (92), at a response rate of (65. 7%). The descriptive analysis revealed that 65. 2% of the sample elements were male gender, the education level of the respondents was 76. 1% bachelor, 16. 4% master level and4. 3% of doctoral level. Regarding the age 74% were between 25 & 45 years old and 87%of them exceeded five years of experience in pharmaceutical manufacturing.

3. 2 ***Research Instrument***

For the purpose of gathering the necessary data from its primary resources, the research developed a questionnaire that consists of three parts: the first is designed to gather data necessary to define the descriptive characteristics of the sample, the second part include (29) questions to gather the data necessary to measure the independent variable: the JIT manufacturing practices (JIT delivery, equipment layout, setup time reduction, preventive maintenance commitment, daily schedule adherence and supplier quality), and the third part includes (28) questions to gather the data necessary to measure the dependent variable: strategic performance (time-based indicators, flexibility-based indicators, cost based indicators).

3. 3 ***Data Analysis and Interpretation***

The Statistical Package for Social Sciences (SPSS) was used to perform the necessary statistical analysis, in order to answer research questions, and test research hypotheses:

1. Answering the first question of the study: Measuring the level of application of JIT manufacturing practices among Jordanian Pharmaceutical Manufacturing Companies

To measure JIT manufacturing practices and its six individual components, the study applied one sample T-test, at mean test value($\mu \geq 3.5$), and significance level ($\alpha \leq 0.05$), T-tabulated at this significance = 1. 99, the complete results of the test are shown in table-2. From the table we can see that the Jordanian Pharmaceutical Manufacturing Companies apply JIT manufacturing practices (combined as one package) at an accepted level, with a mean value of (4. 1) that is higher than the mean test value (3. 5), T-calculated (16. 659) that is higher than T-tabulated (1. 99), and P-value (0. 000) that is less than the significant level ($\alpha \leq 0.05$).

In the same way we can interpret the other test results which clearly reveal an acceptable level of application of the six individual JIT manufacturing practices, as all of their application means are higher than that of test value, all of their calculated T-values are higher than tabulated T-values, and all of their P-values are less than the significance level. From the results shown in the table we can notice that suppliers' quality is applied at the highest level (Rank-1) and then successively: equipment layout (Rank-2), preventive maintenance (Rank-3), setup time reduction (Rank-4), daily schedule adherence (Rank-5) and finally JIT delivery(Rank-6).

Table-2: Tow Tailed-T-test, Level of Applying JIT Manufacturing Practices

Practice	Rank	Mean	Standard Deviation	T-value	P-value (sig)	Level of Applying
Combined JIT Practices	_	4. 10	0. 34	16. 659	0. 000	Accepted
JIT-Delivery	6	3. 70	0. 51	3. 701	0. 000	Accepted
Equipment Layout	2	4. 25	0. 46	15. 535	0. 000	Accepted
Setup Time Reduction	4	4. 12	0. 45	13. 292	0. 000	Accepted
Preventive Maintenance Commitment	3	4. 23	0. 48	14. 405	0. 000	Accepted
Daily Schedule Adherence	5	3. 95	0. 50	8. 542	0. 000	Accepted
Supplier Quality	1	4. 35	0. 40	20. 594	0. 000	Accepted

Test value (μ) $\geq$ 3. 5, p-value (α) $\leq$ 0. 05, degree of freedom (df) =91, tabulated t-value=1. 99

The study also conducted Pearson Correlation Factoracticies Test to measure the level of correlation among different JIT manufacturing practices selected in this study. The results as shown in table-3 show medium level of correlation among these practices (0. 4-0. 6).

Table-3: Pearson Correlation Factoracticies Between JIT Manufacturing Practices

JIT→ Practices ↓	Just in Time Delivery	Equipment Layout	Setup Time Reduction	Preventive Maintenance Commitment	Daily Schedule Adherence	Supplier Quality
Just in Time Delivery(JIT)	1					
Equipment Layout	0. 311	1				
Setup Time Reduction	0. 453	0. 550	1			
Preventive Maintenance Commitment	0. 256	0. 609	0. 567	1		
Daily Schedule Adherence	0. 454	0. 565	0. 468	0. 474	1	
Supplier Quality	0. 408	0. 386	0. 494	0. 384	0. 323	1

2. Testing the research main hypothesis and its six sub-hypotheses associated with the impact of applying JIT manufacturing practices on the strategic performance of Jordanian Pharmaceutical Manufacturing Companies (JPMF).

To test these hypotheses the study applied three types of regression tests: the first was Linear Regression to test the first main hypothesis (H_1) that measures the impact of the combined JIT manufacturing practices on the strategic performance, the results as shown in table-4, reveal a significant impact of JIT manufacturing practices on strategic performance: R^2 = 0. 587, this mean that the change in JIT manufacturing practices is responsible for 58. 7% of the change in the strategic performance, with a calculated F-value = 127. 73 that is higher than the tabulated F-value = 2. 2, and also P-value =0. 000 that is less than the significant level ($\alpha \leq 0.05$).

Table-4: Linear Regression Test Impact of JIT Manufacturing Practices on Strategic Performance Elements

Description	R	R^2	β	Std. Error	F	T	P-value Sig
Impact of JIT on St Performance	0. 766	0. 587	1. 053	0. 306	127. 73	11. 302	0. 000

p-value (α) ≤ 0. 05, degree of freedom (df) =91, tabulate t-value=1. 99, tabulated f-value=2. 2

The second test was Multiple Regression to test the six sub hypotheses (H_{11}, H_{12}, H_{13}, H_{14}, H_{15}, H_{16}) that measure the impact of each individual practice of JIT manufacturing on the strategic performance. The results as shown in table-5 reveal that daily schedule adherence came first and has the highest impact (calculated T-value = 4. 5, P-value = 0. 000), equipment layout came second in rank of impact on strategic performance (calculated T-value = 3. 762, P-value = 0. 000), then in the third rank comes the set up time reduction (calculated T-value = 2. 453, P-value = 0. 016), and the fourth practice that has an impact on strategic performance is JIT delivery(calculated T-value = 2. 00, P-value = 0. 045). All of these results show higher calculated T-value than the tabulated T-value =1. 99, and lower P-value than level of significance $\alpha \leq 0.05$, accordingly we accept the sub-hypotheses $H_{15,}$ H_{12}, H_{13} and $H_{11.}$ On the other hand, the multiple regression test revealed that there is no impact of each of preventive maintenance commitment (calculated T-value =-1. 118, P-value = 0. 27), and suppliers quality (calculated T-value =-0. 002, P-value = 0. 999) on strategic performance of JPMF as their results show lower calculated T-value than tabulated T-value =1. 99, and higher P-value than level of significance $\alpha \leq 0.05$. Accordingly we reject the sub-hypotheses $H_{14,}$ H_{16}.

Table-5 Multiple Regression Test Impact of Each JIT Manufacturing Practice on Strategic Performance

Description	β	T	P-value Sig	Rank Impact
Impact of JIT-Delivery on strategic Performance	0. 163	2. 000	0. 045	4
Impact of Equipment Layout on strategic Performance	0. 342	3. 762	0. 000	2
Impact of Setup Time Reduction on strategic Performance	0. 226	2. 453	0. 016	3
Impact of Preventive Maintenance Commitment on strategic Performance	-0. 094	-1. 118	0. 270	5
Impact of Daily Schedule Adherence on strategic Performance	0. 373	4. 55	0. 000	1
Impact of Supplier Quality on strategic Performance	0. 000	-0. 002	0. 999	6

p-value (α) ≤ 0. 05, degree of freedom (df) =91, tabulate t-value=1. 99,

[1] The third test applied was stepwise regression in order to measure the accumulated impact of applying JIT manufacturing practices successively, in this test we excluded both preventive maintenance commitment and supplier quality practices because they originally have no impact on strategic performance. The results of the test for the remaining practices are shown in table-6, and revealed that the change in daily schedule adherence is alone responsible of 0. 519 of the change in strategic performance, and when we add the change of the equipment layout, the tow practices together become responsible of 0. 615 of the change of the strategic performance, and adding setup time reduction to the practices will make the three practices together responsible for about 0. 650 of the change in the strategic performance. and finally adding the forth practice JIT delivery make the accumulated JIT Manufacturing Practices are responsible of 0. 666 of the change happened in the Strategic Performance.

Table-6 Stepwise Regression Test Accumulated Impact of JIT Manufacturing Practices on Strategic Performance

Description	R^2 Change	R^2 Accumulated	F Change	F Accumulated	P-value Accumulated
Impact of Daily Schedule Adherence on Strategic Performance	0. 519	0. 519	97. 244	97. 244	0. 000
Impact of Daily (Schedule Adherence+ Equipment Layout) on Strategic Performance	0. 096	0. 615	22. 181	119. 452	0. 000

Impact of Daily (Schedule Adherence+ Equipment Layout+ Setup Time Reduction) on Strategic Performance	0. 035	0. 650	8. 762	128. 214	0. 004
Impact of (Schedule Adherence+ Equipment Layout+ Setup Time Reduction+ JIT-Delivery) on Strategic Performance	0. 016	0. 666	4. 270	132. 484	0. 042

p-value (α) ≤ 0. 05, degree of freedom (df) =91, tabulated f-value=2. 2

4. Conclusion & Discussion

The Jordanian Pharmaceutical Manufacturing Companies apply JIT manufacturing practices at an accepted level, weather as group or separately. The highest applied practice is suppliers' quality, and the lowest applied practice is JIT delivery. The application of these two practices do not depend completely on the efforts of the workers of the Jordanian Pharmaceutical Manufacturing Companies, but is also dependent on other environmental factors, how?, for example, one of the requirements before marketing of manufactured medicines is to get the certificate of good manufacturing practice (GMP) issued by the Jordanian Food and Drug Administration (JFDA), that requires to use raw materials just from approved, certified for quality and esteemed sources.. This may explain the higher rank of application of suppliers' quality practice among JPMF. On the opposite side the lowest rank practice is JIT delivery, where there is delay in arrival of input materials departing from their planned time due to several factors including bad performance of clearance companies, slow procedures in the arrival ports and transportation channels to the factory, or negative bureaucratic government actions and regulations that slow delivery. Thus the most three JIT practices that depend completely on the efforts of the manufacturing companies are equipment layout, setup time reduction, and preventive maintenance commitment, both of those three practices have good and close results i. e. means of 4. 25, 4. 12, 4. 23, and the Pearson correlation between the three practices are 0. 55, 0. 609, 0. 567.

Regarding the impact of the JIT manufacturing practices on Strategic Performance of The Jordanian Pharmaceutical Manufacturing Companies, the study revealed that each of supplier quality and preventive maintenances commitment practices have no impact on strategic performance. Regarding the impact of supplier quality on strategic performance, our study measured only three components of strategic performance: time-based, cost-based, and flexibility-based performance, and didn't measure quality-based performance, this may explain the lack of impact of supplier quality on our measured strategic performance. On the other side the study revealed a significant impact of each of JIT-delivery, equipment layout, setup time reduction, and daily schedule adherence practices on strategic performance. all of these practices are associated with reducing the time needed or/and improving the flexibility of job

performance and thus reducing the manufacturing cost, i. e. JIT delivery means the arrival of the resources at the required time and prevents the delay in the supply chain at this stage, good equipment layout can minimize the production cycle time and speedup production process, the reduction of machine setup time plays a crucial role in reducing the needed time, and improving the flexibility of production process, and the adherence to the schedule helps to perform job on the planned and scheduled time without delay. Time saving and good performance resulted from these practices will help in speeding up the supply chain and then reduce the cost of flow of resources among the supply chain which will increase the supply chain efficiency and improve its competitiveness.

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Appendices
Appendix-1
Study Questionnaire
Part I: Personal information
Kindly write (√) in the box that applies to you:
1. Gender:
Male
Female

2. Age:
Less than 25 years
25-34 years
35-44 years
45 years and above

3. Qualifications:
PhD Masters Bachelor
Diploma
Others (please specify).....

4. Job Title:
Department Manager or equivalent
Supervisor or equivalent
Others (please specify).....

5. Duration of work for the current company:
Less than 5 years 5-9 years 10-14 year
15-19 years 20 years and above

6. Total practical experience in pharmaceutical manufacturing sector:
Less than 5 years 5-9 years 10-14 year
15-19 years 20 years and over

Part II: Just in Time Manufacturing practices:

The following paragraphs reflect the application of Just in time manufacturing practices at the plant in which you operate.

Kindly write (√) in the box which represents the degree of your acceptance of each of the following statements in light of daily practice in the plant in which you operate:

No.	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A. **Setup Time Reduction**						
1	We are aggressively working to lower setup times in our plant.					
2	Our crews practice setups, in order to reduce the time required.					
3	We have low setup times of equipment in our plant.					
4	We are constantly training staff to reduce setup time.					
5	Manufacturing molds are kept near the machines in order to reduce setup times.					
B-Suppliers' Quality						
6	Quality is our main criterion in selecting suppliers.					
7	We rely on a small number of high-quality suppliers.					
8	We strive to establish long-term relationships with suppliers.					
9	Our suppliers are actively involved in our new product development process.					
10	Our suppliers are certified for quality.					
C-**Equipment Layout**						
11	We have laid out the floor so that processes and machines are in close proximity to each other.					
12	We have eliminated many long conveyors to move materials.					
13	Our machines are grouped according to the product family to which they are dedicated.					
14	The layout of our floor facilitates low inventories and fast throughput.					

15	We have located our machines to support JIT production flow.					
D-Preventive Maintenance Commitment						
16	Our equipment is in a high state of readiness for production at all times.					
17	We dedicate a portion of every day solely to preventive maintenance.					
18	We emphasize good maintenance as a strategy for achieving quality and schedule compliance.					
19	We have a separate shift, or part of a shift, reserved each day for maintenance activities.					
E-.-Just-in-Time Delivery by Suppliers						
20	Our vendors supply us on just-in-time basis.					
21	We receive daily shipments from most suppliers.					
22	Our suppliers respond quickly to our emergent needs of materials.					
23	We have long-term arrangements with our suppliers.					
24	We can depend upon on-time delivery from our suppliers.					
F-Daily Schedule Adherence						
25	We usually meet the production schedule each day.					
26	Our daily schedule is reasonable to complete on time.					
27	We usually complete our daily schedule as planned.					
28	We build extra slack into our daily schedule, to allow for catching up.					
29	We build time into our daily schedule to allow for machine breakdowns and unexpected production stoppages.					

Part III: Strategic Performance:
Kindly write (√) in the box that represents the degree of your acceptance of each of the following statements in light of daily practice in the plant in which you operate:

No.	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A- Time-based Performance						
1	Our efforts in eliminating unnecessary activities led to reduction in manufacturing cycle time.					
2	Our plant is currently characterized by low lead time.					
3	We currently deliver our customers' orders on time.					
4	We currently have limited number of customers' complaints for delays in delivery.					
5	We currently ship our products to customers directly after manufacturing without being stored.					
6	Our company currently develops products faster than competitors.					
7	Our products currently reach markets faster than competing products.					
8	Our company rapidly process customer complaints.					
9	Our plant is currently characterized by rapid taking of corrective actions.					
B-Flexibility-based Performance						
10	Our current manufacturing system allows making changes to product mix that is manufactured within a specific period of time.					
11	Our current manufacturing system responds with various levels of changes in production volume.					
12	Our current manufacturing system is responsive to customers' demand of frequent shipments of products.					

13	Our plant has currently greater ability than competitors to launch new products.					
14	Our plant has currently greater ability than competitors to modify marketed products.					
15	Our plant has currently greater ability than our competitors to develop new products.					
16	Our company currently responds to changes made to prearranged delivery dates.					
17	Our workers currently masters different jobs allowing flexibility in programming of manufacturing process.					
18	Mastered the workers in the factory currently functions lead to a variety of programming flexibility in the manufacturing process.					
C-Cost-based Performance						
19	Our efforts in eliminating unnecessary activities led to reduction in manufacturing unit cost.					
20	Our efforts in decreasing nonconformance products led to reduction in manufacturing unit cost.					
21	Our plant is currently characterized by lower manufacturing unit cost than our competitors.					
22	Our efforts in decreasing inventory levels led to current increase in inventory turnover.					
23	Our plant is currently characterized by higher inventory turnover than our competitors.					
24	Our emphasis on suppliers' quality level led to reduction in cost of defective production.					

25	Our plant is currently characterized by lower cost of defective production than our competitors.					
26	Our emphasis on suppliers' quality level led to reduction in cost of raw materials' inspection.					
27	Our efforts in maintaining smooth flow of manufacturing process led to reduction in cost of production breakdown & stoppage.					
28	Our efforts in maintaining smooth flow of manufacturing process led to reduction in cost of rework.					