Abstract—The JIT production approach have specific tools and necessities in such environments based on production philosophy. The tools and facilities should able to adapt with all of the needs and to have appropriate mechanism to provide the achievement to the JIT objectives. This article is studying the optimum application of and measurement of the JIT system. The research methods are based on both survey and descriptive study. the tools of gathering information are questionnaire and interview which collected from Iranian industrials experts. The sample size was 70 experts of which is 23 from public and 47 from private companies to recognize the difference significant between private and public companies. The Mann Whitney U has employed, while the Wilcoxon test has supported the gap exception between Iranian companies to use JIT in their production process.

Keywords— Just In Time, public, private, application, measurement, Iranian Companies.

I. INTRODUCTION

The production technology principle Japan contributed to the world in the latter half of the 20th century was the Japanese-style production system typified by the Toyota Production System (TPS). This system was enhanced by the quality management technology principle generally referred to as Just In Time (JIT). Today, however, improvements in the quality of Japanese-style management technology principles are strongly desired in the face of unexpected quality-related recall problems breaking out among industrial leaders, while at the same time delays in technical development cause enterprises to experience crises of existence (Goto, 1999). To realize manufacturing of the best quality for the customer in a rapidly changing technical environment, it is essential to create a core principle capable of changing the technical development work processes of development and design divisions. Similarly, it is important for the production division to develop a new production technology principle and establish new process management principles to enable global production (Hayes and Wheelwright, 1984). The globalization and intense competitiveness of the current marketplace has forced firms to reexamine their methods of doing business. Despite an abundance of both natural and economic resources, the US manufacturers have struggled with growing trade deficits and outsourced operations. With fewer available natural resources, strong market competitors have emerged, specifically in the Pacific Rim, using superior manufacturing practices in the form of just-in-time (JIT) and continuous process improvement (CPI) (Cammarano, 1996).

JIT is a manufacturing philosophy that emphasizes achieving excellence through the principles of continuous improvement and waste reduction. Some of its purported benefits include higher quality production, lower inventory levels, improved throughput times, and shortened customer response times. In the US, JIT has been both praised and criticized for its effectiveness, accounting, in part, for its relatively conservative adoption rate (Bowman, 1998; Clode, 1993; Milligan, 1999; White et al., 1999). This study has two principal objectives: first, it investigates the benefits received from the implementation of JIT; second, it examines the dependence of these benefits upon the level of commitment in adopting specific JIT practices. The competitive benefits of just-in-time (JIT) manufacturing, including the key elements of cellular production along with empowered teams, are well documented in both academic and trade literature, such as in Costanza (1994), Deming (1982), Lahidji (1997), and Richardson (1997). Studies on these topics typically focus on benefits, management theories, and technical aspects of JIT. But to maximize success one must also consider the individual person who works in the newly modified environment.

II. JIT OBJECTIVES

JIT looks beyond the short run to the long-term optimization of the entire production/distribution network (Jones, 1991). Successful JIT implementation should accomplish two major objectives: improve quality and control the timeliness of the production and delivery of products (Davy et al., 1992; Monden, 1981; Walleigh, 1986). By concentrating on quality, companies should experience less scrap and rework and more effective communication among departments and employees. In addition, long-term commitments with fewer suppliers should result in fewer inspections. The achievement of these results requires an even production flow of small lot size, schedule stability, product quality, short setup times, preventive maintenance, and efficient process layout (Chapman and Carter, 1990).

III. THEORY OF JIT PRODUCTION

JIT Based Quality management is combination of inventory control. Quality control and production management function that make sincere efforts for quality improvement by mo ways. First, it concentrates on philosophical aspect of quality improvement by making the quality everyone's responsibility, and then focused on effective implementation of quality control techniques (Vikas Kimiar. Dixit Gar and
It is recognized that most valuable resource, of an organization is its workers, and workers work best when they are motivated. Valued, encouraged to contribute, and allowed to make their own decisions. Under this approach, workers inspect the product quality after each successive operation. They are trained along with managers in preparation and interpretation of process control charts. Managers motivate the workers, to think quality first and production rate second. The workers have authority to halt the production line or cell. If quality problems are uncovered thus, this concept not only gives the quality responsibility to workers but also match that responsibility with authority to shire the quality, control functions so that quality problems can be uncovered and solved quickly (Ebrahillipour, M. and Schonberger R. J., 1984). Also, JIT production system demands to buy parts in small lots. Small lots require less space and time. Less space and Lillie require less peoples and facilities to complete the same job. Besides, small lots easy to inspect, and defects call immediately detected. Thus, the parts that are purchased steadily in small lot sizes with frequent deliveries contribute to higher quality and productivity through lower lei of nib and scrap, lower inspection costs for incoming parts, and early detection of defects (Gang. D. 199-7). In short, JIT based approaches has potential to improve the product quality and Productivity to significant level but organizations must adopt its principles in way that meet their own organizational structure, design and processes.

IV. JIT IMPLEMENTATIONS

Implementations of JIT in US manufacturers often involve adopting just a few of the management practices associated with JIT (Goyal SK, Deshmukh SG, 1992 and Golhar DY, Stamm CL, 1991). As a result of this selective process the frequencies of JIT practices implemented by US manufacturers often differ among the various JIT practices (Im JH, Lee SM, 1989 and Baldwin RE, Gagnon R 1989). In addition, researchers suggest the practices implemented are typically the ones easiest to implement, but not necessarily the ones that provide the greatest benefits (Im JH, Lee SM, 1989 and, Gilbert JP, 1990). The piece-meal approach to adopting JIT used by US manufacturers occurs despite research findings that suggest the synergic benefits desired by US manufacturers cannot be fully realized until all JIT practices are integrated into a holistic management system (Sakakibara S, Flynn BB, Schroeder RG, Morris WT, 1997).

V. US PRODUCTION SYSTEMS

The framework for understanding JIT implementations in US manufacturers draws from Thompson's (Thompson JD. Organizations in action, 1967) concept of traditional US organizations and Hayes and Wheelwright's (Hayes RH, Wheelwright SC, 1984) continuum of production processes. Thompson (1967) posits that US manufacturers have traditionally used buffers or inventories to reduce the effects of uncertainties on the organization's internal core (technological activities). Buffers between the internal core and the external core (input and output activities) allow for developing greater efficiencies among the activities within the internal core; this is achieved by increasing the level of independence across the activities in the internal core. A reclassification of the ends of Hayes and Wheelwright's (1984) continuum of production processes (project/job shop and assembly line/continuous flow) provides a clearer distinction of processes and associated characteristics that support Thompson's (1967) concept. For example, with movement from one end of Hayes and Wheelwright's (1984) continuum (project/job shop) to the other end (assembly line/continuous flow) increasingly higher levels of raw materials and finished goods exist to protect the in internal core and increasing lower levels of work-in-process inventories exist among the activities of the internal core At the project/job shop end, high levels of work-in-process inventories exist to buffer among the technological activities and lower levels of inventories exist to buffer the internal core from the input and output activities. Batch, the production process that falls in the middle, in a sense, is a hybrid of the revised processes on the ends of the continuum. Since batch does not provide a clear distinction for differentiating from either of the ends, it is not included as a classification of production processes in this study. Traditional no repetitive production systems (project/job shop) are capable of producing a high variety of products; however, the high levels of WIP inventories.

VI. MEASURING JIT SUCCESS

This investigation seeks to identify factors that lead to successful JIT implementation in manufacturing and service operational environments. We recognize, however, that JIT evaluations encompass activities and attitudes that were not previously subjected to objective measurement. Traditionally, evaluation methods focused on easily quantifiable metrics such as cost, price, quality, and delivery. However, recent performance evaluation systems place emphasis on a wider variety of measures including worker and management attitudes and buyer-supplier collaboration, thus, placing greater emphasis on data that is less easy to quantify (Huson M, Nanda D, 1995 and Billesbach TJ, Harrison A, 1991). We believe that firm performance on some of these less traditional measures must be gauged to enable a more holistic assessment of JIT performance. In general, it has been shown that JIT does promote efficient, effective and flexible utilization of productive resources. Many potential benefits of JIT, which are oftentimes just as relevant to service as they are to manufacturing, are cited in the literature. JIT tends to eliminate material waste and waste in production or in the delivery of services (Tesfay B, 1990). JIT also has the potential to reduce purchasing cost which is a major cost to both manufacturing and service organizations (Gargeya VB, Thompson JP, 1994). In addition, JIT is instrumental in reducing lead-time, decreasing throughput time, improving production or service quality, increasing productivity and enhancing responsiveness to customers (Green FB, Amenkhiernan F, Johnson G, 1991 and Cook RL, 1996). Service operations have often been distinguished from
manufacturing operations on the basis of the higher labor content of service jobs. As such, minimizing worker grievances and improving worker safety are of paramount importance to firms in the service sector. In this regard, JIT has also been credited with the ability to improve the practice of safety in service organizations (Pierce FD, 1997). Moreover, switching to JIT operations has encouraged some service firms to use their human resources more effectively. For example, Eisenhower Memorial Hospital has reorganized their materials management function by assigning their materials coordinators to user departments on a full-time basis. While these workers still perform their materials management duties, they are physically located in the user departments (DeJohn P, 1998).

VII. SOME IMPORTANT FEATURES OF JIT BASED QUALITY MANAGEMENT

This section explains the some unique features of this concept that play a vital role to achieve its objectives of continuous quality improvement, waste elimination and cost reduction.

- One most outstanding feature of JIT is that it generates great number of scarification by worker's involvement in centimes improvement. Management works hard to implement these suggestions. The number of suggestions is regarded as all important Criterions in reviewing the performance of a worker. Thus, management recognizes Worker's efforts for quality improvement. Quality circles are also act as group oriented suggestion system for making improvement. In short, JIT requires efficient suggestion System to involve employees in manufacturing actives.
- JIT emphasizes awareness, and provides clues for identified, problems. Once problem identified, it must be solved. Therefore, this concept requires training for using various problem-solving tools.
- Improvement reaches new heights with every problem that is solved. In order to consolidate new levels, improvement must be standardized. Thus, JIT also requires standardization of methods and procedures.
- Often, the heterogeneous composition of workforce and adverse relation between labor and management makes difficult to introduce changes for improve productivity and quality control. Therefore, high motivation, employee empowerment, and an Open Organizational culture are essential for efficient implementation of JIT.
- JIT requires the habit of working with hard data. It therefore put more emphasis on the use and analysis of statistical data for quality control and problem solving.
- Because workers work on many different types machines at once, this system leads to significant expansion of worker responsibilities, and skills. Therefore, effective training programs are primary requirements of JIT to develop the multiplicity of skills, in the workers.
- JIT encourages the suppliers to make commitment to supply the excellent quality products. To fulfill this commitment, a permanent quality program is required for supplier's operations, with constant communication between buyer and supplier.

VIII. THE RESEARCH METHODOLOGY

The research methodology used in this study is based on both survey and descriptive methods. So far accurate answer to the research questions, the authors design and developed a questionnaire which it is the most suitable for this study. A survey questionnaire was completed by the industrial expert of Iran. The research implemented at the end of 2009 and in the mid. Five-Point Likert Scale questionnaire was employed in this research. The Five-Point Likert’s scale having the ratings of “strongly disagree” (1) and “strongly agree” (5) were used. Keeping in view the hypotheses of the study, the questionnaire was prepared with 37 questions. Questionnaires were drawn for two public and private companies. The questionnaire (A) was designed with 22 questions for application of JIT and the questionnaire (B) was designed with 40 questions to test the performance measurement of JIT. Existing variables, application and performance measurement of JIT as well as gap expectation. In order to measure the qualitative groups such as opinion, attitude, perception and etc, the qualitative scale was converted to quantitative one. If any of two groups (respondents) ranked on attribute in place of The Five-Point Likert’s scale having the ratings of “strongly disagree” (1) and “strongly agree” (5) were used. Further the questionnaire is sub-divided into two parts in this section, part one the actual application of JIT which renders by experts and second part shows the expected level of application of JIT which renders by the Iranian industrial experts. The statistical tools used in the study included mean value, standard deviation, and Mann-Whitney U and Wilcoxon test for the purpose of analysis and interpretation. The sample fat this study has been selected from the experts and consultants were those who activating in capital industrial environment. The simple random techniques have been used for selecting people as a sample which 70 of them from well-known experts and consultants of the Iranian industrial environment from two private and public companies were the final samples for this research. The universe in this research is all of the Iranian industrial experts and consultants.

IX. THE HYPOTHESIS RESEARCH

There are four hypotheses as follows:

1. There is difference significant between public and private firms in case of optimum application of JIT!
2. There is difference significant between public and private companies in case of performance measurement of JIT!
3. There is gap between actual and expected situations in case of optimum application of JIT in Iranian companies!
4. There is a gap between actual and expected situation in case of performance measurement of JIT in Iranian companies!
X RESULT AND ANALYSIS

There are two types of hypotheses. In the first one the difference significant is going to test for hypotheses No. 1 & 2. In the second type the gap expectation between actual and expected situation for hypotheses No, 3 & 4. Will be tested respectively.

1) Testing Of First Hypothesis

According to the amount of mean ranked in table No. 1. Which are 25.57 and 40.36 for public and private companies, also the amount of ranks are 588 and 1897 for public and private companies respectively. According to the amount of p-value with the 1% Alfa, and above results we can state that there is difference significant between two type of companies in case of optimum application of JIT in both Companies. So the optimum use of JIT in Iranian companies is not as expected as actual one.

2) Testing Of Second Hypothesis

According to the amount of mean ranked in the table No. 1. Which are 23.72 and 41.27 for public and private companies, also the amount of rank are 545 and 1939.5 for public and private companies respectively. According to the amount of p-value with the 1% Alfa, and above results we can state that there is difference significant between two types of companies in case of performance measurement of JIT in both Companies. So the performance measurement of JIT in Iranian companies is not as expected as actual one.

3) Testing Of Third Hypothesis

According to the table No.2 which shows that the amount of Z=-4.356 so the result of Wilcoxon ranks are as follow: with the amount of p-value=0.000 there is a gap between two situation and the researchers’ assumption is accepted by obvious difference between them and the mean of expected situation is less them actual one at the level of 1% Alfa.

4) Testing of Fourth Hypothesis

According to the table No.2 which shows that the amount of Z=-3.814 so the result of Wilcoxon ranks are as follow: with the amount of p-value=0.000 there is a gap between two situation and the researchers’ assumption is accepted by obvious difference between them and the mean of expected situation is less them actual one at the level of 1% Alfa.

<table>
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<tr>
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<th>N</th>
<th>Mean</th>
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<th>Z</th>
<th>P - Value</th>
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<table>
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<tr>
<th>Description Hypotheses</th>
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<th>Z</th>
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<th>Expected Situation</th>
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<td>70</td>
<td>2.537</td>
<td>0.317</td>
<td>0.297</td>
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XI. CONCLUSION

The use of JIT is one of the important reasons in order to implement this research. As the results stated there are difference significant between application and performance measurement of JIT in public and private companies in Iran. Also there is considerable gap expectation in application and performance measurement at the Iranian public and private companies. The JIT based production quality makes outstanding improvement in area of cost and quality through best use of that and to get feedback, the performance measurement of JIT is necessary for Iranian companies.

the results stated that, the situation of private companies to use optimum JIT is much better than public companies in Iran of course we cannot expect that, the JIT program has to be run very fast. Therefore, we have to enter such technical knowledge of production slowly and logically. In this way the companies have to equality themselves and organized the resources. The attitude of both management and employees has to shift on the advantages of using JIT for the production of the company. At first they have to allocate appropriate resources for implementing of JIT is a long-lasting and need expensive process. JIT is one of the parts in the value chain that bring the satisfaction to the customers. Thus for JIT we need hierarchy of employees and drawing all workflow processes in the companies. In the bottom line, the concept of true JIT is the first step to start producing based on JIT.

XII. REFERENCES

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