A STUDY ON OPERATIONAL ISSUES FACED BY MANUFACTURING FIRMS IMPLEMENTING TRADITIONAL KANBAN SYSTEM (TKS)

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ABSTRACT

Just-In-Time (JIT) manufacturing philosophy is a systems that were originally designed for deterministic production environments such as constant processing times and smooth and stable demand. However, once implemented, JIT is fraught with numerous types of uncertainties, including variations in processing time and demand, planned interruptions such as preventive maintenance and unplanned interruptions such as equipment failure. These uncertainties lead to lowered production throughput, decreased machine utilization, increased order completion time and greater backlogs and overtime requirements. This disquisition focus on the study of the operational issues existed in the tool employed as control mechanism in JIT, the Traditional Kanban System (TKS). After an extensive qualitative study using in-depth interview and literature reviews, the performance of TKS were analysed and the weakness and flaw of the system were used as data of this research. The operational issues were then analysed and suggestion to address those issues were drawn out based on the variation (modification) of Kanban system.

Keywords: JIT, Kanban, TKS, Kanban variation, operational issues, system improvement
ABSTRAK

Just-In-Time (JIT) adalah sistem falsafah pembuatan yang pada asalnya direka untuk persekitaran produksi deterministik seperti masa pemprosesan yang malar dan permintaan yang lancar dan stabil. Namun, setelah dilaksanakan, JIT penuh dengan pelbagai jenis ketidakpastian, termasuk variasi dalam masa pemprosesan dan permintaan, gangguan dirancang seperti penyelenggaraan pencegahan dan gangguan yang tidak dirancang seperti kegagalan peralatan. Ketidakpastian ini membawa kepada penurunan pemprosesan pengeluaran, penurunan kadar penggunaan mesin, meningkatkan masa penyiapan pesanan dan tunggakan yang lebih besar dan keperluan kerja lebih masa. Fokus kajian ini ialah mengenai masalah operasi yang wujud dalam teknik yang digunakan sebagai mekanisme kawalan dalam JIT iaitu Sistem Kanban Tradisional (TKS). Selepas kajian kualitatif yang meluas menggunakan wawancara mendalam dan ulasan kesuasteraan, prestasi TKS dianalisis dan kelemahan dan kecacatan sistem yang telah digunakan sebagai data kajian ini. Isu-isu operasi telah dianalisis dan cadangan untuk menangani isu-isu tersebut telah dirangka berdasarkan variasi (pengubahsuaian) sistem Kanban.

Kata kunci: JIT, Kanban, TKS, variasi Kanban, isu-isu operasi, penambahbaikan sistem
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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Just-In-Time (JIT) is a production methodology that encompasses economically designed product, efficient plant layout to reduce lead-time, worker involvement and motivation, improved data accuracy, reduced scrap, continuous improvement in all areas and implementation of the Kanban system. Kanban system is favorable because of its capacity to rule the production, its simplicity in production planning and scheduling, decrease burden on operators, simplicity identification of parts by the Kanban card attached to the container and significant reduction in paper work. Despite the fact that JIT is intended for an impeccable environment, for example, smooth and stable demand, steady processing time among stations and no breakdowns, in most practical cases, it is exceptionally uncommon to attain. JIT is loaded with various sorts of issues, for example, processing time variability, line unevenness and machine breakdown.

Traditional Kanban System (TKS) is the original Kanban system developed by Taiichi Ohno that were introduced as an instrument of accomplishing Just-in-Time manufacturing (Monden, 1993). However, rapid transformation of the manufacturing condition around the world is making TKS outdated. As a tool in JIT, TKS is also affected by the variability in the manufacturing and market condition. The market driven by highly variable and customize demand of product is making the demand unstable, thus impose challenges to the traditional way of how Kanban works.

Over the years, researchers have done numerous study on how to responds to variability in manufacturing environment that employs Kanban system. Theoretically, they have developed many models in order to respond to unstable manufacturing environment such as unstable demand and supply, variability in process time and lead
time, line imbalance and information system of the traditional Kanban system to better works in nowadays challenging business. Through the research and development in previous research, it can be implemented in the manufacturing firm that use traditional Kanban to do a change in their old system without throwing out the Kanban system out of their firm.

1.2 BACKGROUND OF STUDY

The research is carried out to fulfill my personal interest in studying the operational issues of manufacturing system that employs Traditional Kanban system (TKS) to better understand how Kanban works theoretically and practically as well as to understand how Kanban system works theoretically and practically in unstable manufacturing environment. The study will also focus on the variation of Kanban system that would help give me insight about the solution to the problems faced by manufacturing firm that use traditional Kanban system. This research is also carried out based on the research by Junior and Filho (2010) on The Variation of Kanban System that study the numerous research done by previous researchers developing modified model of Kanban system.

1.3 PROBLEM STATEMENT

Nowadays, the unpredictable demand from customer is the most challenging factor in Just-In-Time (JIT) manufacturing. Without the proper information about what customer want, how many they want and when they want can really give problems to the stability of the manufacturing process. Worse, other factor that can contribute to manufacturing issues such as machine breakdown, variability in process and lead time, if not addressed properly can make the firm that employ JIT face serious trouble in term of customer satisfaction, thus lead to low revenue and profits.

The philosophy of JIT which main objective is to reduce inventory in the manufacturing process and warehouse is becoming thorn in a flesh because it disallow any over-production thus deny any managerial decision to simply produce more in advance to respond to unstable demand. The Traditional Kanban System (TKS) which were developed decades ago, is becoming outdated with its manual information system
without the ability to respond to variability in manufacturing process because it only works well in a stable manufacturing environment.

Therefore, this study aim to study the operational issues faced by manufacturing firms that employ Traditional Kanban System (TKS) in their Just-In Time (JIT) manufacturing environment. The operational issues then can be used as the basis to find any improvement opportunity to address the operational issues properly without changing the nature of the Kanban system.

1.4 RESEARCH OBJECTIVE

The objective of this study is to:

i. To identify the operational issues that exist in the Traditional Kanban System (TKS) implemented in a manufacturing firm.

ii. To suggest improvement to address the operational issues exist in the Traditional Kanban System (TKS) implemented in a manufacturing firm.

1.5 RESEARCH QUESTION

Based on the objective of this study, the following research question can be developed:

i. What are the operational issues that exist in the Traditional Kanban System (TKS) implemented in a manufacturing firm?

ii. How can the operational issues exist in the Traditional Kanban System (TKS) implemented in a manufacturing firm be addressed?

1.6 SIGNIFICANCE OF RESEARCH

This study is primarily conducted to study the operational issues of Traditional Kanban System (TKS) implemented in a manufacturing firm and the improvement that can be done to address those issues. I hope that this study will help students in management class to better understand what Kanban System is and what are the advantages and disadvantages of the system.

I'm also hoping that this study will help give some insight to the people in manufacturing firm about the operational issues that they might encounter if the firm
employs Kanban System and what they can do to improve the Kanban system if any of the operational issues arise in the process.

1.7 SCOPE OF STUDY

The focal point of this research is to study the operational issues of Traditional Kanban System (TKS) of a manufacturing system. Thus, only manufacturing firms that implement and follow the Traditional Kanban System (TKS) without any modification on the system, whether on the Kanban control or the information system will be used as the subject in this study. I'm well-aware that most big company are using a modified type of Kanban system with advanced information technology. Thus, finding a subject of study might find be hard. This in turn may cause this research to fail in achieving its objective.

The research also aim to propose improvements to Traditional Kanban System (TKS), if and only if there’re operational issues exist. Improvement proposed to address the issues will be based on literature review and theoretical assumption. The limitation on is the improvement proposed is not entirely feasible in the targeted firm.

1.8 EXPECTED RESULT

At the end of this research, I’m expecting to have the ability to answer the research questions thus achieve the objective. I am expecting to be able to reveal some of the operational issues which I think exist in the Traditional Kanban System (TKS). In addition, I’m expecting to be able to offer improvement solution to solve those operational issues.

Also, upon completing the research, the outcomes is expected to be able to help targeted manufacturing firm improve the Kanban system employed in the factory. It is also expected that this research can reveal some of the operational issues that exist within the Kanban system, so that it’ll help people from manufacturing firm to understand the disadvantages that exist in the Kanban system and how can they overcome it if encountered.
1.9 OPERATIONAL DEFINITION

1.9.1 Just-In-Time (JIT)

Calvasina et al. (1989) characterize JIT as an rule of production control that tries to minimize raw materials and WIP inventories; control (take out) deformities; balance production; constantly simplifying the production process; and make an flexible, multi-talented workers.

1.9.2 Kanban

Kanban is the Japanese word for visual card of giving data to manage the stream of inventory and materials. Kanban framework underscores least level of inventory. It guarantees the supply of right part, in right amount, in the ideal spot and at the perfect time (Kumar and R. Panneerselvam, 2007). Kanban framework is a component to oversee and control stream of material in manufacturing. Card is utilized to manage material flow through all process. It was determined from downstream need and trigger upstream production. Upstream production is then started to re-stock those parts that have been withdrawn. (Bonvik and Gershwin, 1996)

1.9.3 Withdrawal Kanban

This is a visual card that determines the kind and amount of the part which the manufacturing process ought to withdraw from a past process. The withdrawal Kanban recognizes area in the past process where the parts can be withdrawn from.

1.9.4 Production Kanban
This kind of Kanban card points out the kind and amount of the segment which
the past process must produce. The card will recognize the part to be created and the
area where it must be put.

1.9.5 Waste

Waste can be characterized as something besides the minimum amount of
resource which are completely fundamental to increase the value of the item
(Rawabbdeh, 2005). It speaks to the useless resource, in this manner a methodical and
consistent recognition and disposal of waste can free up resource and lead to more
efficient, enhanced profit and improved competitiveness.

1.9.6 Manufacturing Firm

A manufacturing firm is any firm that uses parts, parts or crude materials to
make a finished product. These products can be sold straightforwardly to customers or
to other manufacturing organizations that utilize them for making an alternate item.
Manufacturing businesses in today's world are normally comprised of machines, robots,
computers and humans that all work in a specific manner to create a product.
Manufacturing business frequently utilize an assembly line, which is a procedure where
an item is assembled in arrangement starting with one work station then onto the next.
By moving the product down an assembly line, the finished good can be put together
quicker with less manual labor. It is important to note that some industries refer to the
manufacturing process as fabrication.

1.9.7 Pull System

A pull type of production system comprises of a succession of workstations
including valued adding activity in every workstation (WS). In the pull system, from the
current workstation, each one of the part or work is withdrawn by its succeeding
workstation. As such, the work is pulled by the next workstation as opposed to being
pushed by its previous workstation. The stream of parts all through the product list is
controlled by Kanban Cards (Turbo, 1996).
CHAPTER 2

LITERATURE REVIEW

2.1 LEAN MANUFACTURING

The theory of lean manufacturing was primarily introduced and popularize in Japan, and the Toyota production system was a leader to employ lean practices. Lean manufacturing helps in enhancing production processes and boosting up the employees job satisfaction (Singh et al., 2010). Lean manufacturing is different from traditional manufacturing. The traditional manufacturing concept focuses on the inventory of the system, whereas lean manufacturing opposes this concept. The ‘Lean’ concept considers inventory as a waste in the organization. Understanding the differences between traditional manufacturing and lean manufacturing is very important for organizations if they want to follow lean practices (Andrew, 2006). The market is becoming more volatile day by day, so understanding market dynamics is a crucial factor if one wants to design manufacturing systems better (Gadalla, 2010). Lean manufacturing believes the simple fact that customers will pay for the value of services they receive, but will not pay for mistakes (Rawabdeh, 2005).

Introducing lean manufacturing in any type of industry has a straightforward impact on manufacturing processes. Today people have a different perspective on manufacturing processes. They comprehend that the value of any goods is determined from the client's perspective, not from an internal manufacturing perspective. Lean manufacturing concentrates on the end of squanders from the association. A waste is characterized as anything that does not increase the value of the goods. Lean tool
techniques when combined with SWOT (strength, weakness, opportunity, threats) analysis help in eliminating wastes within the organization (Upadhye, Deshmukh, & Garg, 2010). Lean manufacturing when implemented successfully results in an increase in production output per person and a reduction in the finished goods inventory and work in process (Seth & Gupta, 2005). Lean manufacturing when executed effectively brings about an increase in production yield for every individual and a decrease in the finished product inventory and work in process (Seth & Gupta, 2005). A definitive objective of a lean manufacturing framework is to eliminate all waste from the production. A lean framework is spoken to as two pillars: the first one is "Jidoka" and the second is 'Just-In-Time'. The main objective of a lean manufacturing framework is to create results of higher quality at the most minimal conceivable expense and at all time by eliminating waste (Dennis, 2007).

![Figure 2.1: Basic Lean Concepts and Methods. (Source: Dennis, 2007)](image_url)

2.1.1 The Lean Philosophy

The definition of lean, its principles and main ideas, come from lean philosophy. According to Womack and Jones (1996), lean is defined as an action that includes five
steps: the first step is defining customer value, then defining value stream, making it 'flow', establish pull, and the last step is pursue for excellence. According to Wong et al. (2009), lean manufacturing can be portrayed by an aggregate set of key elements or key regions. These key elements are accepted to be critical for its usage. In the 1980s, changing plant to lean production from large scale manufacturing was thought to be extremely troublesome. Workers did not assume liability for the quality of the item. They reacted just when they realized that administration really esteemed their abilities. The quote 'do it right the first time', urges workers to feel responsible for the items. Womack et al. (1990) explained how the development of vehicles manufacturing occurred from specialty generation to large scale manufacturing and afterward to lean manufacturing. The institutionalization of vehicle parts and assembly systems was carried out by Henry Ford. It takes a revolution, and as an issue low talented workers and specific machines made the cars affordable for the customers (people).

From the point of perspective of Bhasin and Burcher (2006), lean is seen as a theory rather than a strategy. Supplier involvement is an unquestionable requirement if a firm wants to harvest the benefits of lean practices. In addition, lean manufacturing ought to be considered as continuous improvement to yield better outcomes. Bhuiyan and Baghel (2005) outlined the continuous improvement from the past to the present situation. Continuous Improvement (CI) utilizes distinctive philosophies to yield more favorable outcomes to the business. These philosophies include lean manufacturing, six-sigma, lean six-sigma and the Balanced Scorecard. Hopp and Spearman (2004) found that continuous improvement deliberations are intends to attain remarkable level of pull production (production is focused around genuine day by day request) through eliminating inconsistency in the system and subsequently reducing waste in the firm.

Clarity of the term waste must be caught on. There are two sorts of waste, the first one is visible waste and the second one is hidden waste. Visible waste is the outcomes from overproduction, waiting, transportation, improper processing, over the top inventory, overabundance movement and flaw. Visible waste is outcomes of variability. Dhamija et al. (2011), in his work expressed lean firm are those which use less material for their production, less people to perform the work, less time to design and develop, and lesser energy and space used. Lean firm concentrate on client wants and consequently producing high quality goods and services in most economical and effective way. Rose et al. (2011) purposed 17 lean practices which are thought to be
best possible and applicable to little and medium scale qualities. They proposed that execution of lean practices ought to be carried out in a continuous manner. Inconsistency in the endeavors may not lead any firm to rip full from lean practices.

2.1.2 Benefit of Implementing Lean Principle

Numerous creators have disputed that lean helps competitiveness (Billesbach, 1994; Nystruen, 2002; Oliver, 1996; Parker, 2003; Siekman, 2000; Taylor & Brunt, 2001; Vasilash, 2001). According to Sohal and Eggleston (1994), two-thirds of organizations accepted strategic gain had been produced with greater enhancements coming from relationship with customers, quality constraints and market competitive positioning. Lathin (2001) expressed that conventional mass makers could expect a shrink of 90% in inventory, 90% in cost of quality, 90% in lead time and a half increase in the workers' productivity. Claudivus Consulting (2004) insisted that lean manufacturing can help firms to cut expenses by somewhere around 15% and 70%, reduce waste by 40%, push productivity up to 15% to 40%, and reduce space and inventory necessities by 60%. Nystruen (2002) expressed that goods flow time can be lessened by 90%, inventory by 82% and goods lead time by 11% by applying lean manufacturing ideas in the firms.

2.2 JUST-IN-TIME (JIT)

2.2.1 What Is JIT?

Just-in-time (JIT) is the name ordinarily used to depict a manufacturing system where fundamental parts to produce finished goods are produced or conveyed at the assembly site as required. Taiichi Ohno (1988), originator of the JIT idea, defined JIT as “Just-in-time means that, in a flow process, the right parts needed in assembly reach the assembly line at the time they are needed and only in the quantity needed”. Schonberger, an American researcher on operation management, had the same standpoint as Taiichi Ohno when he alluded to JIT as an issue which: deliver and convey finished merchandise just-in-time to be sold, sub-assemblies just-in-time to be built into finished products, manufactured parts just-in-time to go into sub-assemblies
and obtained materials just-in-time to be changed into assembled parts (Schonberger, 1982).

JIT is a Japanese creation manufacturing theory that speaks to “an aesthetic ideal, a natural state of simplicity” in the efficiency of production (Zipkin, 1991). In spite of the fact that absolutely defining JIT is always difficult (Mia, 2000; White and Ruch, 1990), JIT production is by and large alluded to as a manufacturing system for achieving greatness through continuous improvement in productivity and waste elimination (Crawford and Cox, 1990; Lummus and Duclos-Wilson, 1992; Orth et al., 1990; Suzaki, 1987). A more particular definition is given by Calvasina et al. (1989) which expressed that JIT is a system that control production, and seek to minimize waste materials and WIP inventories; control (eliminate)flaws; production stabilization; continuously ease the production process; and make an adaptable, multi-talented workers. According to Schonberger (1987), JIT is the most paramount productivity enhancing system innovation since the turn of the century. Gleckman et al. (1994) expressed that JIT has grew up, and is perceived as a logical management theory. The idea of JIT has finished its development from a manufacturing strategy to a much more extensive theory of improvement (Vokurka and Davis, 1996) that can help the US producers once again, gain and maintain competitiveness in the worldwide business (Yasin et al., 1997).

2.2.2 Progression of the JIT Concept

Based on history, the Just-in-Time (JIT) methods previously put into operation during the late 1920s at Henry Ford's incredible industrial complex in River Rouge, Michigan as he streamlined his moving assembly lines systems to make cars. In My life and Work, Henry Ford stated that, "We have found in buying materials that it is not beneficial to purchase for other than prompt needs. We purchase sufficiently just to fit into the arrangement of production... If transportation were flawless and an even stream of materials could be guaranteed, it would not be important to have stock at all" (1922)

Then again, JIT did not authoritatively set out in its progressive track until the Toyota Motor Company of Japan gave careful consideration to Ford's operation strategies and built its creation framework with respect to what it saw. Toyota took in an
incredible arrangement from studying how Ford's plant worked and was even ready to perform something that Ford proved unable to achieve: a framework that could deal with diversity (Stevenson, 2005).

The JIT methodology began to be created at Toyota by Taiichi Ohno, its VP of manufacturing, and a few of his associates since 1940s. At that time it was known as the Toyota Production System (TPS). The framework developed bit by bit and turned into a triumph during the 1980s when Toyota made astonishingly brilliant quality with a low price car contrasted with their American rivals. The advancement of JIT in Japan was presumably influenced by Japan that have few natural resources, yet crowded nation (Lim and Low, 1992). It's not surprising when Japanese are exceptionally touchy towards waste and inefficiency. Scrap and rework are seen as waste whereas overabundance inventory as a shrewdness in light because of the fact that it use up much room and depleted the resources. Lehner (1981) point out that a great part of the TPS started in the late 1940s and early 1950s, when Toyota was producing only for a local market that was not exceptionally solid. The organization had been operating on the traditional belief that it was most adequate to mass produce in large number of lot, "yet that kind of thinking has pushed us nearly out of business, in light of the fact that the large number of parts we were producing couldn't be sold", said Toyota's leader Mr. Fuji Cho (Lehner, 1981). Toyota couldn't lay off laborers due to "Japan's a "lifetime" employment framework", so Toyota administrators hit upon the basic yet profound thought that still infests its operations which is "overproduction is waste". Based upon that, Toyota make their production system better thus culminated the JIT idea.

As the triumph of JIT has become very popular, quality specialists W. E. Deming and J. M. Juran addressed on the requirement for American makers to implement numerous JIT principles from their Japanese rivals (Chase et al. 2006).

2.2.3 Benefit of JIT Implementation

In the latest investigation of the normal advantages accumulated to US producers from implementing JIT demonstrated some great figures: 90% lessening in cycle time in manufacturing process, 70% decrease in inventory, 50% of labor expenses are diminished and 80% decrease in space necessity (Russell and Taylor, 2006). Salaheldin (2005) inquired about on the JIT execution in Egyptian manufacturing firms
and further discovered ample alluring advantages, for example, enhanced quality; lower expenses; better relationship with laborers and suppliers; amplified utilization of space; full usage of workers, machine and equipment, parts and materials; and enhanced competitiveness with lesser paper work. Accordingly, there is most likely no ambiguity about the benefits and advantages of JIT on the operation of the organizations.

**Other Benefits of JIT Implementation.**

i. Waste are eliminated in production and material (Hobbs, 1997; Tesfay, 1990).

ii. Improved relationship internally (within a firm) and remotely (between the firms and its clients and suppliers) (Inman and Mehra, 1991).

iii. Reducing procurement expenses which is a biggest cost to most firms (Ansari and Modarress, 1990; Gargeya and Thompson, 1994).

iv. Reduced lead-time, decreased throughput time, improving quality of production, higher productivity and enhancing client responsiveness (Arogyaswamy and Simmons, 1991; Cook, 1996; Crawford and Cox, 1991; Hobbs, 1997; Norris et al., 1994; White, 1993).

v. Cherish authoritative discipline and managerial involvement (Francis, 1989). Integration of the distinctive practical areas in the firm. It particularly overcomes any problems between production function and accounting (Johansson, 1988; O'grady, 1988).

### 2.3 KANBAN SYSTEM

#### 2.3.1 What Is Kanban?

Kanban system is one of the apparatuses in lean manufacturing system that can attain minimum inventory at a time. Kanban system gives numerous benefit in managing operations and business in the firm. Using Kanban system is a key operational choice to be utilized as a part of the production lines. It serves to enhance the organization's productivity and in the meantime reduce waste in production process. The Kanban system obliges production if the needs of items is existed in the production
process. Manufacturing organizations particularly in Japan have executed Kanban system effectively as this system originates from this nation (Azian et al., 2013)

Kanban system is another theory, which assumes a critical part in the JIT generation system. Kanban is fundamentally a plastic card containing all the information needed for generation or assembly of any goods at each one stage and specifics all the way to be finished goods. The Kanban system is a multistage production scheduling and inventory control system. These cards are utilized to control production stream and inventory. This system encourages high production quantities and full utilization with diminished production time and work-in-process (WIP). (Kumar and R. Panneerselvam, 2006)

Kanban (kah-n-bahn) is a Japanese word; when interpreted it actually signifies "visible record" or "visible part" (Surendra et al., 1999). In general, it alludes to some kind of signal; where in manufacturing, it alludes to Kanban cards. The Kanban system is focused around a client of a part pulling the part from the supplier of that part. The client of the part can be a real user of a finished item (outside the firm) or the production staff at the succeeding station in a manufacturing plant (internal). In like manner, the supplier could be the individual at the preceding station in a manufacturing line. The use of Kanban is that material won't be created or moved until a client sends the signal to allow it to do so. (Surendra et al., 1999)

2.3.2 Key Determinants in Kanban System

Based on the literature, there were key determinants in setting up the Kanban system. To guarantee the execution of Kanban system is beneficial, certain elements ought to be viewed as, for example, management of inventory, seller and supplier support, quality upgrades and quality control and worker and top management engagement. (Kumar, 2010)

i. The Inventory

Heizer and Render (2005) stated that the organization never accomplishes a low-cost strategy without great management of inventory. These researcher said that inventory are arranged into four classes. They are raw material inventory, work-in-
process inventory, finished products and maintenance, repair, operating inventory. Since inventories are vital in a firm, managing these inventories gets to be confounded since it involved capacity and holding expenses and space in manufacturing factory. Inventory management is a complex issue owing to enhance of genuine circumstances of a manufacturing firm. (Kobbacy and Liang, 1999)

ii. Supplier Engagement.

Kanban system obliges supplier engagement in giving quick responses to give supply of raw materials effectively. Essentially Kanban system just need least level of inventories in the production line where the inventories number ought to be equivalent with the production requirement. Thus, supplier engagement plays an essential part keeping in mind the end goal to is guarantee production lines works without any problems and productively. There are five vital criteria when picking suppliers which are quality, readiness to cooperate, specialized competency, location, and cost. The just-in-time (termed as JIT) is to kill stocks as opposed to move them to another point in the supply network. Once more, the best approach to accomplish this is through is the cooperation (Donald, 2003). The Japanese Kanban procedure of production is off and on again erroneously portrayed as a straightforward just-in-time management method, an idea which endeavors to keep up least inventories. The Japanese Kanban techniques includes more than adjusting production and supplier planning systems, where inventories are minimized by supplying these when required in production and work-in-process in is monitored closely (Donald, 2003).

iii. Quality Improvement and Control.

Kanban system not just helps organization in saving their expense by having less inventories yet it likewise controls and maintains quality enhancement of the production. Just-in-Time (JIT) is one of the components constituted in Total Quality Management system (TQM) (Flynn et al., 1995). For a viable JIT, all conveyed parts and items must accomplished certain level of quality guidelines before those parts and items are acknowledged for the following operations or reaching the client in the other end of supply chain end (input). This is because of the four main reasons includes
enhanced methods can make items with ensured qualities, giving the firm a competitive advantages, customers have ended up used to goods with high quality, and won't acknowledge anything less and quality also reduce expenses, for example, prevention, appraisal, internal failure and external failure expenses (Bernstein, 1984). Conventional organizations consider quality is expensive, deformities are brought on by workers and the minimum level of quality that can bring delight the client is sufficient. Firms practicing the Kanban system accept that quality prompts lower costs, which systems created most defect, and that quality can be enhanced within the Kaizen system (Balram, 2003).

iv. **Employee Participation and Top Management Commitment.**

These days, engagement and great affinity among workers and management get to be as society in a firm to guarantee their peoples in the firm ready to cooperate with one another to accomplish their goals. The analyst has ordered Japanese society issue into two general classifications labor related and management related. This distinction among labor and management has helped Japanese managers to execute JIT effectively (Narender et al., 1995). All workers ought to be concerned and completely be a participator with the achievement of the new system and the achievement of the firm for the future; so they ought to be dealt with just as and reasonably. For the Japanese laborers, they are totally dedicated to their work and the organization. They are reliable, co-agent, adaptable and willing to work extend periods of time when required (Altman, 2000).

2.3.3 **Rules of Kanban**

So as to understand the JIT aim of Kanban system, the following principles (Monden, 1993) must be emulated:

**Law 1:** The consequent process ought to withdraw the vital items from the preceding process in the fundamental amounts at the right time. Any withdrawal without a Kanban ought to be precluded. Any withdrawal which is more prominent than the number in the