Analysis of Digital Just-in-Time (JIT) Systems to Improve Business Efficiency

Dr. Zobia Zaman
Trainer at IQCS Innovative Solutions Ltd. South Australia
zobiazaman@yahoo.com

Babaruddin Ghuryani

babaruddinghuryani@hotmail.com

Abstract

JIT (just-in-Time) has become widely employed in modern production, and every modern manufacturing business incorporates certain JIT procedures into its design. Because of the evolution of the logistics industry, JIT technology is maturing, creating more value for businesses. Many businesses are attempting to increase revenues by implementing efficiency in their operations, i.e., decreasing waste while improving production. The just-in-time system is one such system that aims to accomplish this. As a result, the goal of this research was to examine the application of the just-in-time (JIT) system in the digital era to increase corporate efficiency. In this regard, the researcher gathered information from managers and senior-level employees from various firms in order to answer the research questions. The study's independent variables are the JIT system, the Kanban manufacturing system, inventory management, pull manufacturing, cooperation and involvement, and business efficiency. To obtain responses from the intended audience, a structured questionnaire was used. The quantitative technique was applied in the investigation. The sample size was N = 200, with all responses coming from Karachi-based organisations. The obtained data was examined using a correlation and regression model, and the study discovered that the JIT system, Kanban manufacturing system, inventory management, and pull manufacturing had a considerable beneficial impact on business efficiency. Cooperation and involvement, on the other hand, have a negligible impact on business efficiency.

Keywords: *Pull Manufacturing, Kanban Manufacturing, Inventory Management, Cooperation and Involvement, High Quality Level, Business Efficiency*.

Introduction

The Just-in-time inventory management concept is a brilliant inventory management or production technique stemming from a Japanese car manufacturing firm – Toyota Manufacturing Company. This concept was introduced with the Japanese industry was faced with a massive crisis (Schonberger, 2018). Majority of the Japanese industries faced the issue of resource shortage including financial, human, and even materials after the World War Foreign companies also battled with these problems. This eventually led to the birth of the manufacturing and inventory management concept called Just in Time (Womack, 1990).The JIT System's main objective is to create efficiency within an organization without giving birth to the need of storing excess inventory. The JIT system can be explained as a production process that has the ultimate objective of enhanced productivity while reducing and eliminating waste. This process is required to have a lot of company personnel involved in order to reach the optimal level. Just in Time (JIT) is an inventory management system which includes coordination between supply and demand in order to ensure shortest time in inventory and fastest time to consumers. In this system, the purpose of controlling inventory is to know the actual use or shelf-life of a product and the timings of receiving order to its arrival from the supplier. Therefore, these elements enable the business to formulate items ordering procedures, so the items arrive for use without requiring to store them for any time period.

Former entrepreneurs were expected to muster up significant capital in order to initiate ay new venture. However, this concept is gradually fading away as many new entrepreneurs are commencing new ventures and business with almost little or no capital at all. Formerly, people expected that the higher they invest, the higher returns they will receive. In simpler words, the riskier the project, the higher the return. The reason behind the success of current entrepreneurs is assumed to be linked to the use of more efficient inventory management systems. Many businesses are striving for profits through the implementation of efficiency in their operation i.e. reducing wastage while increasing productivity. One such system that

strives to do so is the Just-in-Time system. This research will help entrepreneurs understand the usefulness of the Just-in-time or JIT system for efficiency in their business operations.

Scope of the Study

With the ever-increasing competition within the market, it has become extremely crucial for businesses to establish their competitive advantage otherwise they will be pushed out of the market. Sometimes the only competitive edge businesses can gain over one another is through making their operations run more efficiently. The Japanese have introduced any systems which have brought about efficiency in business operations. One such system is the Just-in-time system. This research aims to help young entrepreneurs analyze whether the JIT system truly has a positive influence on the efficiency of a business or not. Since JIT and efficiency are both very popular business concepts, this thesis study seems very promising and will offer a great deal to the research world. Hopefully, this research will aid future researchers on this topic as well.

Objectives of the Study

1. To analyze the effect of Pull Manufacturing of the JIT system on the efficiency of a business.
2. To assess the impact of the Kanban Manufacturing of the JIT system on the efficiency of a business.
3. To investigate the effect of Inventory Management in the JIT system on the efficiency of a business.
4. To find out the influence of Cooperation and Involvement in the JIT system on the efficiency of a business.
5. To analyze the impact of High-Quality Levels in the JIT system on the efficiency of a business.

Hypotheses

H_1: To analyze the effect of Pull Manufacturing of the JIT system on the efficiency of a business.

H_2: To assess the impact of the Kanban Manufacturing of the JIT system on the efficiency of a business.

H_3: To investigate the effect of Inventory Management in the JIT system on the efficiency of a business.

H_4: To find out the influence of Cooperation and Involvement in the JIT system on the efficiency of a business.

H_5: To analyze the impact of High-Quality Levels in the JIT system on the efficiency of a business.

Review of the Literature

Just in Time (JIT) System

JIT system aims to keep the synchronization of material and information flow in production in order to get right quantity of material in real-time and an appropriate quality of product. It helps in costs reduction, reduced inventory, and increased production efficiency (Mukwakungu et al., 2019). According to Ukil, Ahmed and Rahman (2016), after World War II, JIT has been appeared as an important production method. First it originated from the Toyota Motor Corporation in Japan, and also named as "Toyota production method." Later, the effectiveness and uniqueness of this system made it the most researched, recognized, and applied system. In 1950, Japan's Toyota Eiji studied the car factory of Detroit Ford Company in the United States with the idea of learning advanced American experience (Ukil et al., 2016).

Toyota Eiji was concerned about how to build a Japanese automobile industry. It is obviously impossible to copy the mass production method in the United States. The first was the post-war Japanese economic depression, lack of foreign exchange and funds, and the inability to fully import American equipment to produce cars. Second, the technological and economic foundation of Japan was also far from the USA after the war. Japan's production at that time was only a few tenths of that of the United States. Third, Japan is also varying from United States in terms of social and cultural background and it is certainly not feasible to completely copy the American model. Obviously, according to the national conditions of Japan, we should give play to the Japanese family concept and team spirit and explore a path different from Ford's assembly line production model (Mazanai, 2015).

Javadian-Kootanaee et al., (2017) added that the focus on reducing logistics cost has been increased due to the consistent development of the logistics sector and advanced business management theories and practices are also moving towards refinement. Among them, punctuality is showed by the electronic technology and automobile manufacturing sector. In modern manufacturing, JIT system has been extensively used. Today, JIT system

has been applied by various multinational organizations in order to achieve economic benefits. For instance, IBM Corporation, Ford Motor Company, and Toyota Motor Corporation used this system. Therefore, the indication of best manufacturing organizations is successful JIT system application. The benefits of JIT system are explicit in some developed countries. According to the study of 200 organizations in Europe the progress of JIT management's system capabilities includes an average reduction of 50% in inventory, a 50% to 70% reduction in product production cycles, a 50% reduction in delivery time, and a 20% to 50% increase in production efficiency. JIT's payback period is less than 9 months (Javadian-Kootanaee et al., 2017).

Hou et al., (2016) stated that the automotive industry in China has completely implemented JIT system and established a logistics process control centered on market demand and oriented to the requirements of the main assembly line of the host, and gradually formed a set of logistics system suitable for its own development. The flexibility to meet the requirements of production of an organization today's competitive market environment. The JIT system aims to produce required items whenever required, but not over-producing because the enterprise does not need to invest any more raw materials, energy, and time. In the case of JIT, the ideal batch size is 1. The JIT idea stands in stark contrast to the practice of relying on additional inventory in order to avoid mistakes in the work. The inventory investment is reduced when the entire pending quantities become zero as well as the lead times are greatly shortened. Enterprises can quickly expose the quality issues and can respond quickly to demand changes. Compared with the traditional production material management, the implementation of JIT logistics improves the management of the enterprise, saves a lot of costs for the enterprise, and generates huge economic and social benefits (Hou, Chan, & Wang, 2016).

According to Oisamoje and Onyekachi (2019), in the logistics system, due to the instantaneous changes in customer demand and continuous improvement, the product life cycle is shortened, and the time to market is more critical. This requires companies to reduce middle management, thus decreasing the time between decision-making and action as well as improve response to competitive and market dynamics. It also converts the organization into a "reactive organization" that can creatively solve problems facing consumers. The product or service responds quickly to the market. Organizations must be able to meet changing market

demands at all times and maintenance of flexibility in distribution at a high degree (Oisamoje & Onyekachi, 2019).

Kanban Manufacturing System

Just in time or JIT is a production method that is still new and is known to carry out production highly efficiently in all aspects. Its main aim is to minimize costs. Kanban management tools are also adopted by JIT. These Kanban management tools play an extremely significant role as they are able to link and connect various processes together. Their main purpose is to transfer information or logistics before and after the process or the same process. Furthermore, through information flow, information is passed from one process to another. The messenger or carrier of this information is known to be a Kanban. JIT is incomplete without Kanban. Therefore, JIT is sometimes referred to as Kanban Production method (Rahman et al., 2017).

According to a study carried out by Naufal et al., (2016), they stated that shipping and production orders are one of the most integral jobs of Kanban. The production management department formulates the production instructions that are based on the forecasts done by the headquarters and these orders reach the assembly line. Each process is passed and carried according to Kanban. Kanban basically records the shipping quantity, destination and time, place of placement, transportation tools and other information, and traces back from the assembly process to the process. In the assembly line brought on billboards removed parts will be used, a process before receiving this go. The front process only produces the amount taken away by these Kanbans. “Appropriate and timely production” and "Post process receipt" are achieved through these Kanbans. However, Apreutesei et al., (2010) emphasized the fact that the way to use Kanban is to follow the rules that have been established. One of the rule states that "Cannot be produced or shipped without Kanban”. This rule basically tells that no transportation or production can take place unless or until Kanban is involved in the process. If there are less Kanbans in within the production process, the volume of production will reduce automatically. This is because Kanban is able to provide the necessary amount. The usage of Kanban avoids and prevents over delivery and over production (Naufal et al., 2016).

Mayilsamy and Pawan (2014) stated that Kanban improvement is mainly achieved by reducing the number of Kanbans. This reduction means that there will also be a reduction in WIP between processes. If work in process inventory is higher despite the fact that the

equipment is not working efficiently and there is an increase in defective products, this will not cause a subsequent impact on the following processes; therefore it is easy to shield the problem. However, on the other hand Just in time production method makes it difficult to ignore the problem of reduced inventory of work in progress. This helps solve issues through improvement doings and helps the 'physical fitness' of the production line as well (Mayilsamy & Pawan, 2014).

According to Mojarro-Magaña, et al. (2018), Toyota has created an efficient production method in its production process, JIT (Just in Time). For JIT theory, Kanban management is an important part of realizing just-in-time production. By putting Kanban into the production process, it is convenient for enterprise managers to monitor and manage the entire production process in real time. This article applies the relevant theories and methods of information management systems and database systems, adopts B/S architecture, VS2010 software development tools, and through the investigation and analysis of the production process of WCDL enterprises, introduces JIT theory into its management process, and designs and develops Kanban distribution. Management system and analyzed and discussed its further application and development in WCDL. By introducing the production Kanban management system into the WCDL enterprise for operation, we found that in addition to fulfilling the production management requirements, it also improves the entire coordination of production management and helps the production department to monitor all aspects of production in real time, and Real-time and efficient transmission and processing of information improves its production efficiency and greatly improves the management level of the enterprise (Mojarro-Magaña, et al., 2018).

The method of Kanban basically urges teams to specifically craft various rules keeping in mind organizations so that they are able to process signals and use lean management system to review and optimize signal processing modes. A proper feedback loop is thus formed through this process and an adaptive system is established, that has an ability to self-improve itself and is able to evolve continuously with various changes that impact the environment. In short, the essential meaning of Kanban system is to promote team members to reach a common understanding of operating processes, processes and risks, and the role of visualization is to enhance the amount of information about uncertain risks (faults, obstacles, delay reasons, special requirements, etc.) and promote the system. All parties respond in a

timely manner, or review at any time through the snapshot mechanism and study improvement measures (Mayilsamy & Pawan, 2014).

Inventory Management

In the JIT mode, the product is shipped directly to the customer after completion. It is very important to carry out JIT inventory management. This inventory management can improve the profit of the enterprise. This management mode can improve the efficiency of inventory management, save as much as possible the use of funds for product inventory, and effectively control the labor expenditure related to product storage. Reducing product storage costs is the goal of JIT inventory management. This aspect of management can eliminate valueless operations and capital consumption in the production and storage of commodities (Singh & Singh, 2017).

According to Bon and Garai (2018), every enterprise must pay attention to JIT inventory management. Inventory management can improve the production efficiency of enterprises, and the overall quality of goods can be gradually improved. JIT inventory management and enterprises bring huge economic benefits, and their competitiveness in the same industry or cross-border industries can also be improved. JIT inventory management requires a relatively long cycle, and the company's internal culture and management model will change accordingly.

Mukwakungu et al., (2019) stated that it is important to create a JIT inventory management model, and we must ensure that all employees participate in the management. JIT inventory management combines the various teams in accordance with the production principles, and the procurement of raw materials and product quality can be guaranteed. This management mode can improve the circulation efficiency of products. The JIT management mode can promote production management, and the production chain and production rhythm of the enterprise can be improved. Zero machine tuning time, zero product defects and zero equipment failures the goals of this management model (Mukwakungu et al., 2019).

A longer time period is required for JIT system establishment. It requires a huge change in corporate culture and management methods, which cannot be easily accomplished. However, enterprises adopting the JIT management system will obtain huge benefits, improve the competitiveness of the market, and survive (Wyk & Naidoo, 2016).

However, Gélinas et al., (2016) stated that enterprises adopting the JIT management system will obtain huge benefits and improve market competitiveness, the JIT management

system requires a longer time period for establishment, and it requires a huge change in corporate culture and management methods, which is not easy. Generally speaking, building a JIT pattern requires different steps such as enterprises need to establish cross-post training and a multi-functional workforce. The production principles according to product classification are reorganized to form several teams, and the employees of each team are responsible for the quality of raw materials and products in the department. The Improve circulation efficiency needs to be improved through Kanban management mode. This system is different from supply-driven management method and known as a demand-driven production method. Production is carried out in batches in the traditional sector in accordance with the processing sequence, and production instructions are issued step by step. Each instruction only produces containers with full parts and no backlogs and delays (Gélinas et al., 2016).

This demand-driven production management effectively forms a tightly associated production chain, and fast schedule for production time, reducing work in process inventory and the related workload of measurement, handling, and recording. Furthermore, there should an emphasis on quality management. The introduction of JIT management mode will inevitably reduce the amount of inventory. To this end, we must improve quality management. In terms of resources, we attach great importance to the quality assurance of raw materials, careful selection of suppliers, put more focus on quality of work and employee's sense of responsibility for quality of product in the processing process, we attach great importance to quality process control (Abdallah & Matsui, 2017). At last, JIT system needs consistent improvement. The main purpose of JIT system is zero defects, zero failure of equipment, zero inventory, zero adjustment time of machine, thus it is an ongoing process.

Pull Manufacturing

The production process method of Kanban is specifically used to construct rules targeting organizations so that they are able to effectively process the signals and are able to optimize signals, review the system as well as analyze it. This weaves a proper feedback system and establishes an adaptive system that has the ability to improve itself and is able to adapt itself with the changes in the environment. The concept of Just in Time production method is analyzed by lean manufacturing system and examines it in the perspective of customer value. The very first principle of lean manufacturing method is adding value and considers the actual value of the product. After everything else has added value, it is

eliminated from the process, this makes the manufacturing process much more efficient. At this stage JIT and Lean manufacturing system are same. The next part basically states that lean manufacturing focuses on customer orders and requests, this is because the demands from customers are for 'pull' drive production. This resembles with that of Just in time as unique or new parts are ordered that are specifically based on short term requirements. On the other hand, customer value is the driving force that backs the efficiency of the process rather than cost reduction (Spearman & Zazanis, 2014).

Pyke and Cohen (2016) have highlighted the fact that JIT logistics is more or less a 'pull system'. In this specific system the products are pulled into the market in terms of supply chain management and this then allows the demand to be recognized for these particular products and parts for production processes. Having said that, within the production process, the target is to produce those varieties and quantities that are needed the most immediately. When there is a certain part or component demanded by the supply chain, this is ensured that it is satisfies through the previous stage providing them parts at the right time. This pulling strategy acts as a guide beginning with customers demand and operations to provide products and materials (Pyke & Cohen, 2016).

Similarly, Prakash and Chin (2018) added that with the introduction of the "pulling" mode of punctual logistics, the status of consumers has improved significantly. This model has changed the direction of value-added in the traditional logistics supply chain. In this model, the value of the customer, not the value of the company, is put at the center. All members of the logistics system take the customer's maximum value as the basis of their own activities. In this way, the just-in-time logistics system provides convenient and efficient information and services for enterprises, suppliers, distribution channels, and customers, and uses this to coordinate the actions of members to provide customers with high-quality products and services. In this way, the ultimate goal of logistics management has also completed the transformation from the traditional pursuit of corporate value addition to providing customers with the greatest value (Prakash & Chin, 2018).

Strasser (2016) stated that when an organizations is educated at to what their customer preferences are and they should make it a priority to repeat the process more than one time and make it a target to develop the product at the perfect quality as well as price. In the pull-type production system each process and workshop submit requirements to upstream workshop and previous process according to the needs of the time, and issues work instructions, and the upstream processes and workshops fully produce according to these

instructions. Although the pull-type system is simple, it can only be used in repetitive production workshops. It is difficult to implement in a single-piece small-batch cluster layout workshop, because the pull-type system cannot handle some burst orders, which are exactly the characteristics of single-piece small-batch production (Strasser, 2016).

According to Pyke and Cohen (2016), when trying to use the Kanban system to achieve on-time delivery, small and medium-sized enterprises should consider the transportation quantity and specific requirements, as well as the materials and adjustment and preparation costs, and make a decision after careful balancing. When small and medium-sized enterprises implement JIT, they should choose the content that is suitable for the enterprise in the JIT for implementation on the basis of careful consideration. Moreover, the organizations should not give up some of its advantages and characteristics in order to pursue the full implementation of JIT. The implementation of JIT cannot copy the dogma of the book but must be flexibly changed according to the actual situation of company (Pyke & Cohen, 2016).

Cooperation and Involvement

Manufacturers and suppliers establish a strategic partnership of mutually beneficial cooperation. The implementation of just-in-time procurement strategy depends on the establishment of a long-term new type of mutually beneficial cooperation between manufacturers and suppliers, mutual support, and mutual benefit. Good transportation and communication conditions are an important guarantee for the implementation of just-in-time procurement strategy. The construction of common standard infrastructure between enterprises and the implementation of just-in-time procurement are also very important. Moreover, there should be an emphasize supplier participation. Time purchasing not just enterprise material purchasing department to do, cannot do without the active participation of the supplier, not only in time, the quality of supply required by the manufacturer of the original material on and purchased parts, but also reflects the active participation of manufacturers Product development and design process (Gupta et al., 2015).

According to Trevor (2017), the wide involvement of workers is the key to JIT. The basis of JIT activities is at the grassroots level and at the production site. Implementing JIT requires all front-line employees to master the basic theory of JIT and carry out practical activities. Therefore, JIT system implementation requires consistent training and employee's education in order to learn the latest theories and methods about JIT. Through the comparison before and after the introduction to guide more employees to participate, and

regularly let them exchange experience, this method does not take much time and effort, but it can effectively instill the JIT philosophy and methods for employees. Improve their awareness (Trevor, 2017).

Different from the traditional push-type method of production, lean production system is described by pull-on-time method of production. The focus of each department, position, and process is increased in the push-type production method to its own work schedule and focuses on its own quality of work and efficiency. They are separated from each other. The pull-on-time production method implements post-process collection. The main point is that the next process is a customer of the previous process, and the previous process is based on the information requirements of the latter. The process uses the form of "Kanban" to strictly require the quantity, quality, and time of the previous process to achieve a balance between logistics and production, to eliminate waste and the pursuit of zero inventories. Therefore, in lean production, all departments, processes, and positions are no longer isolated individuals, but teams that work together to meet the customer's ultimate needs. For each process, the focus is on giving the previous one on time and rationalization. Due to the use of pull-on-time production, the production planning and scheduling are completed by each production unit instead of the traditional centralized production plan, which not only strengthens the autonomy and thinking of employees, but also strengthens production. In addition, a significant feature in lean production is the Impact assessment and team performance evaluation of internal work by the team performance (Qureshi et al., 2018).

Danese et al., (2016) stated that employees are advocates and practitioners of the company's lean culture. Lean emphasizes that all employees are present. Lean belongs to the entire staff, not the elites. Full staff participation is an important sign of a lean company. Beijing Lean Production Training Company believes that only every cell of the company is lean. Enterprises can truly be considered to have lean capabilities. Looking at the global lean enterprises, it is found that the implementation of lean production is a comprehensive systematic project. It is not the implementation of several rapid improvement projects or a model project that just stays in a certain business distribution or production line; lean production is a long-term continuous improvement process, and radical changes can be achieved overnight; lean production is not a certain stage Lean thinking is not just a management idea. It is as a culture deeply rooted in the thinking and consciousness of all employees and in the daily behavior of all employees. Among them, cultivating the lean culture of employees is the key to the implementation of lean production in enterprises. Dr.

Yu Shiwei, a well-known management trainer, believes that corporate culture is a value that integrates the thinking and behavior of employees, so he cultivates the lean culture of employees only then can employees insist on reform in long-term daily work. The pursuit of perfection, so that the company's lean production success. Take Toyota as an example: Toyota's 37 factories around the world, each year, and employees submit more than one million improvement proposals, and 5,000 improvement proposals are being implemented every day, which means: First, companies have more than 95% of employee's involved achieved improvement everywhere. Toyota changes every day. The relentless pursuit of perfection has led competitors to be insurmountable. That is. Lean thinking goes beyond the level of "art", incorporating the "Tao" of corporate culture (Danese et al., 2016).

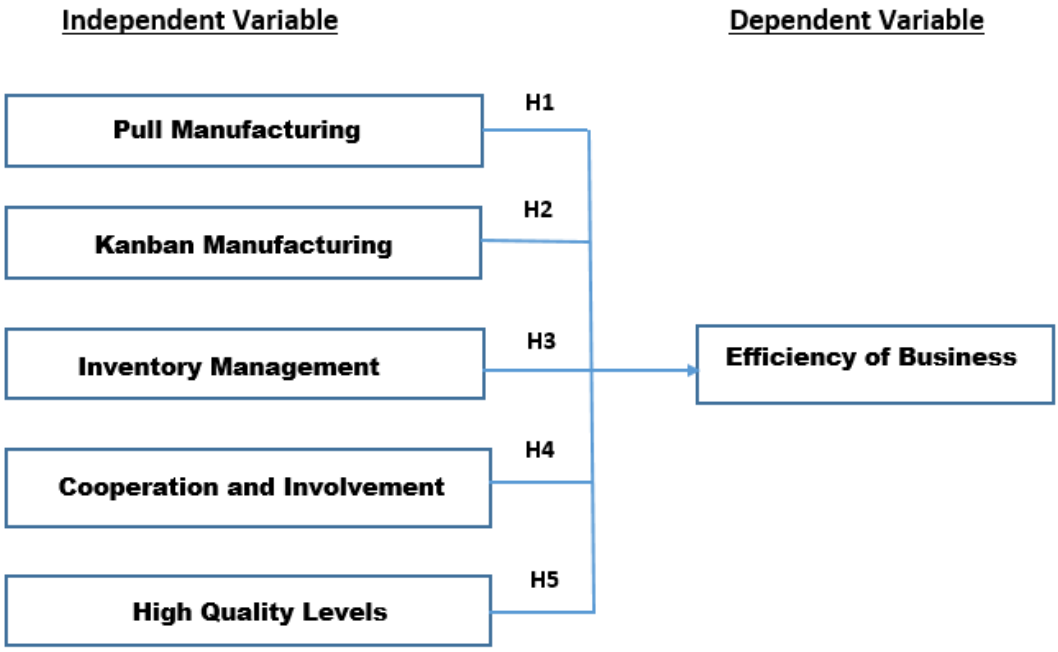
Research Methodology

Research Design

The current study has used quantitative study and the results have been formulated in the form of numbers and statistics. The study used a questionnaire in order to draw conclusions to the research problem. The study in question has conducted a quantitative analysis on the data retrieved through calculating averages of various responses through the samples collected and dividing the data into percentage. Most often, we find the results of quantitative studies in the form of statistical tables or graphs. The main aim of a quantitative research method is to find out what relationship exists between independent variable and dependent variables.

Furthermore, quantitative study comprises of using statistical techniques which include regression, variance, classical statistical tests, modeling by structural equations, multi-level analysis etc.

Figure 1
Conceptual Framework



Description of Instrument

The researcher used a questionnaire survey to collect responses of the targeted respondents. The questionnaire survey is a methodological observation tool that includes a set of questions

linked in a structured and logical manner. This type of survey aims to obtain quantifiable and comparable statistical data on a specific population. For this, the questionnaire is administered to a representative sample of the target population that is to say to a group whose size is sufficient, in terms of number of individuals, so that the answers given are representative of the overall opinion of this population.

Furthermore, a Likert scale is used in questionnaire. A Likert scale is an attitude scale most often comprising 5 to 7 degrees by which the individual is asked to express his degree of agreement or disagreement relating to an assertion. Likert scales are most often used in the context of quantitative studies carried out by means of questionnaires. Unlike free field responses where the respondent freely answers a question, the Likert scale leaves no room for ambiguity. Very popular in online surveys, it provides precise information.

Procedure of the Study and Data Collection

This study is backed by both primary and secondary data. Primary data is data generated for the first time by the researcher through direct efforts and experience, specifically with the aim of solving a research problem. Also called first-hand or raw data. Collecting primary data is quite expensive, as the research is carried out by the organization or agency itself, which requires resources such as investment and staff. Data collection is under the direct control and supervision of the investigator. The researcher in this study collected data from managers and senior level employees to answer the research questions. In this method, data can be collected using different methods: surveys, observations, physical tests, postal questionnaires, questionnaires completed and sent by interviewers, personal interviews, telephone interviews, focus groups, case studies, etc. for this study, a structured questionnaire is used.

On the other hand, secondary data involves second-hand information that is already collected and saved by someone other than the user for a purpose not related to the current research problem. This is the readily available form of data collected from a variety of sources such as censuses, government publications, internal organization records, reports, books, journal articles, websites, etc. For this study secondary data collected from journal articles, books, reports, and websites.

Reliability and Validity

Measuring validity refers to the validity of the scale and that whether the scale is measuring what it is supposed to measure. It is quite different from reliability as reliability is

basically a statistical test that informs the researcher whether the data retrieved is reliable enough to be further scrutinized or not. Pearson Product Moment Correlation was used to test validity of the questionnaire. Reliability can be described as a measurement tool that gives results that are consistent if measurement is made repeatedly. Various approaches are used to check the reliability of the data. The research in question has used Cronbach's alpha to extract the reliability of the data collected. One of the most renowned and popular methods of checking internal reliability of data is through Cronbach's alpha and it is usually used for questionnaires that have Likert scale and reliability is thus tested to check whether the scale is reliable or not.

Data Analysis and Results of the Study

Reliability Analysis

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability.

Table 1
Reliability Analysis

Variables	Items	Cronbach's Alpha
Just in Time System	4	0.625
Kanban Manufacturing System	4	0.620
Inventory Management	4	0.662
Pull Manufacturing	4	0.709
Cooperation and Involvement	4	0.662
Business Efficiency	4	0.756
All Variables	24	0.738

According to the above table, the Cronbach's alpha value for Just in Time System is 0.625. Kanban Manufacturing System is 0.620, Inventory Management is 0.662, Pull Manufacturing is 0.709, Cooperation and Involvement is 0.662, and Business Efficiency is 0.756. The Cronbach's Alpha values of entire variables are above 0.05 which shows the reliability of instruments.

Correlation Analysis

Table 2

Correlation Analysis

		JIT System	Kanban Manufacturing System	Inventory Management	Pull Manufacturing	Cooperation And Involvement	Business Efficiency
JIT System	Pearson Correlation	1	.310**	.353**	.290**	.196**	.483**
	Sig. (2-tailed)		.000	.000	.000	.006	.000
	N	200	200	200	200	200	200
Kanban Manufacturing System	Pearson Correlation	.310**	1	.527**	.237**	.339**	.602**
	Sig. (2-tailed)	.000		.000	.001	.000	.000
	N	200	200	200	200	200	200
Inventory Management	Pearson Correlation	.353**	.527**	1	.452**	.120	.350**
	Sig. (2-tailed)	.000	.000		.000	.091	.000
	N	200	200	200	200	200	200
Pull Manufacturing	Pearson Correlation	.290**	.237**	.452**	1	.145*	.266**
	Sig. (2-tailed)	.000	.001	.000		.040	.000
	N	200	200	200	200	200	200
Cooperation And Involvement	Pearson Correlation	.196**	.339**	.120	.145*	1	.176
	Sig. (2-tailed)	.006	.000	.091	.040		.068
	N	200	200	200	200	200	200
Business Efficiency	Pearson Correlation	.483**	.602**	.350**	.266**	.176	1
	Sig. (2-tailed)	.000	.000	.000	.000	.068	
	N	200	200	200	200	200	200

The above correlation matrix shows relationship between two variables. JIT system has a correlation coefficient of 48.3 percent with business efficiency at a p-value of 0.00 which indicates statistically significant relationship between JIT system and business efficiency. Kanban Manufacturing system has a correlation coefficient of 60.2 percent with business efficiency at a p-value of 0.00 which indicates a statistically significant relationship between Kanban manufacturing system and business efficiency. Inventory management has a correlation coefficient of 35 percent with business efficiency at a p-value of 0.00 which indicates a statistically significant relationship between inventory management and business

efficiency. Pull manufacturing has a correlation coefficient of 26.6 percent with business efficiency at a p-value of 0.00, which indicates a statistically significant relationship between pull manufacturing and business efficiency. Cooperation and involvement have a correlation coefficient of 17.6 percent with business efficiency at a p-value of 0.068, which indicates statistically insignificant relationship between cooperation and involvement.

Regression Analysis: Model Summary

Table 3

Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.711[a]	.505	.487	.60088

a. Predictors: (Constant), JIT System, Pull Manufacturing, Kanban Manufacturing System, Cooperation and Involvement, Inventory Management

Regression Analysis: ANOVA

Table 4

Regression Analysis: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	70.788	7	10.113	28.008	.000[b]
	Residual	69.322	192	.361		
	Total	140.111	199			

a. Dependent Variable: Business Efficiency

b. Predictors: (Constant), JIT System, Pull Manufacturing, Kanban Manufacturing System, Cooperation and Involvement, Inventory Management

ANOVA helped to determine whether there are any statistically significant differences between the means of independent groups. The above ANOVA Table shows a

high F-value of 28.008with a p-value of 0.00. The F-value is greater than 4 and p-value is less than 0.05 which means that the analysis is statistically significant.

Regression Analysis: Coefficients

Table 5

Regression Analysis: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.830	.226		3.672	.000
	JIT System	.463	.073	.360	6.345	.000
	Kanban Manufacturing System	.645	.069	.605	9.412	.000
	Inventory Management	.324	.080	.303	2.545	.011
	Pull Manufacturing	.231	.079	.196	2.059	.044
	Cooperation and Involvement	.102	.055	.102	1.674	.068

a. Dependent Variable: Business Efficiency

JIT System has a beta value of .463 with t-value of 6.345 and p-value of 0.00. Kanban Manufacturing System has a beta value of .645 with t-value of 9.412 and p-value of 0.000. Inventory Management has a beta value of .324 with t-value of 2.545 and p-value of 0.011. Pull Manufacturing has a beta value of .231 with t-value of 2.059 and p-value of 0.044. Cooperation and Involvement has a beta value of .102 with t-value of 1.674 and p-value 0.068. The t-values of independent variables (JIT system, Kanban manufacturing system, inventory management, and pull manufacturing) are greater than 2 and p-values are less than

0.05 which indicates that these variables have significant impact on dependent variable (Business efficiency). However, the t-value of cooperation and involvement is less than 2 and p-value is greater than 0.05 which indicates that this variable does not has any significant impact on dependent variable.

Hypothesis Testing

Table 61

Hypothesis Testing

Hypothesis	Path	Co-efficient	t-value	Accept/ Reject
H_1	JIT System – Business Efficiency	.463	6.345	Accepted
H_2	Kanban Manufacturing System – Business Efficiency	.645	9.412	Accepted
H_3	Inventory Management – Business Efficiency	.324	2.545	Accepted
H_4	Pull Manufacturing – Business Efficiency	.231	2.059	Accepted
H_5	Cooperation and Involvement – Business Efficiency	.102	1.674	Rejected

According to the above table, the hypotheses (H_1, H_2, H_3, and H_4) have been accepted and hypothesis (H_5) has been rejected.

Discussion and Conclusion

The study aimed to "Analyze the Use of Just-In-Time (JIT) System in Digital Era to Generate Efficiency in the Business." Therefore, the researcher collected data from managers and senior level employees from different organizations to answer the research questions. A structured questionnaire was applied to collected responses of the targeted audience. The study used quantitative approach. The sample size was N=200 and the entire respondents

were from Karachi based organizations. The selected independent variables of the study are JIT system, Kanban Manufacturing System, Inventory Management, Pull Manufacturing, Cooperation and Involvement and dependent variable was Business Efficiency. The study found a significant positive impact of JIT system, Kanban Manufacturing System, Inventory Management, Pull Manufacturing on Business efficiency. However, Cooperation and Involvement has an insignificant impact on Business efficiency.

Discussion

As mentioned above, the ever-increasing competition within the market made it extremely crucial for businesses to establish their competitive advantage otherwise they will be pushed out of the market. Sometimes the only competitive edge businesses can gain over one another is through making their operations run more efficiently. In this regard, JIT has been widely used in modern manufacturing, and every modern manufacturing enterprise uses some methods of JIT in the design of the enterprise. JIT technology is becoming more mature due to the development of the logistics industry, which will create greater value for enterprises. The reason behind the success of current entrepreneurs is assumed to be linked to the use of more efficient inventory management systems. Many businesses are striving for profits through the implementation of efficiency in their operation i.e. reducing wastage while increasing productivity. One such system that strives to do so is the Just-in-Time system. Therefore, this study builds to analyze the use of Just-In-Time (JIT) System in digital era to generate efficiency in the business. The study found a significant positive impact of JIT system on business efficiency. In modern manufacturing, JIT system has been used extensively. This system has been applied by many famous multinational organizations in order to achieve high economic benefits. The finding is similar to the findings of Javadian-Kootanaee, Babu and Talari (2017), that benefits of JIT are obvious in some developed countries. An analysis of 200 European companies showed that the improvement of JIT management's corporate capabilities includes an average reduction of 50% in inventory, a 50% to 70% reduction in product production cycles, a 50% reduction in delivery time, and a 20% to 50% increase in production efficiency. Therefore, it can be said that JIT system can improve business efficiency.

The second variable was Kanban manufacturing system, which also has significant positive impact on business efficiency. It is indicated in literature the competition in the automobile manufacturing industry has gradually intensified in recent years. In order to

improve production efficiency, automobile manufacturing enterprises have begun to use manufacturing technology implemented by information technology, which has made important impact on improving product's quality. In the material pulling system, the Kanban pulling system plays an important role. The efficiency of production process can be improved through Kanban pulling system as well as it helps in reasonably utilization of inventory. It also assists in real time monitoring of production process.

Similarly, the study also found that inventory management also has significant positive relationship with business efficiency. The JIT inventory management model attaches great importance to quality management, and the quality of raw material procurement and purchased parts can be guaranteed. In order to meet the inventory management needs of different enterprises, the JIT model has been continuously improved.

Moreover, according to the findings of this study, there is a positive relationship between pull manufacturing and business efficiency. With regard to the arrangement of production processes, the businesses should maintain standardization, stability, and management of production process across the supply logistics for smooth running of raw materials to finished products. Thus, pull manufacturing has made the process easier and smooth. The last variable of the study was cooperation and involvement which have minimum and insignificant impact on business efficiency. However, the literature discussed the importance of cooperation among stakeholders for successful implementation of JIT system. But the current study did find strong association between these two variables.

Conclusion

JIT system helps to reduce inventory of components, parts, finished products, and raw materials in the process of production as well as minimize waste of different raw materials and human resources and organizes distribution processing, procurement, transportation and distribution activities according to the customer's needs and expectations. Furthermore, a lot of money has been saved from logistics cost for the organization. It also helps employees to improve their coordination, reinforce the concept of time and significantly enhance the operating efficiency of logistics system. In terms of cost and efficiency, punctual logistics has improved the efficiency of enterprises. Therefore, the study found a significant positive

impact of JIT system, Kanban Manufacturing System, Inventory Management, and Pull Manufacturing on Business efficiency.

Findings

The study aimed to "Analyze the Use of Just-In-Time (JIT) System in Digital Era to Generate Efficiency in the Business." The selected independent variables of the study were JIT system, Kanban Manufacturing System, Inventory Management, Pull Manufacturing, Cooperation and Involvement and dependent variable was Business Efficiency. According to the Reliability table, the Cronbach's alpha value for Just in Time System is 0.625. Kanban Manufacturing System is 0.620, Inventory Management is 0.662, Pull Manufacturing is 0.709, Cooperation and Involvement is 0.662, and Business Efficiency is 0.756. The Cronbach's Alpha values of entire variables are above 0.05 which shows the reliability of instruments.

The correlation matrix showed significant positive relationship between independent variables (JIT system, Kanban Manufacturing System, Inventory Management, Pull Manufacturing) and dependent variable (Business Efficiency) as their values are positive with p-values of less than 0.05. However, the matrix showed insignificant relationship of cooperation and involvement with business efficiency as their value is minimum with p-value greater than 0.05.

Moreover, the t-values of independent variables (JIT system, Kanban manufacturing system, inventory management, and pull manufacturing) are greater than 2 and p-values are less than 0.05 which indicates that these variables have significant impact on dependent variable (Business efficiency). However, the t-value of cooperation and involvement is less

than 2 and p-value is greater than 0.05 which indicates that this variable does not has any significant impact on dependent variable.

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