

The Impact of Just in Time (JIT) in Inventory Management – Perspectives from Two Case Studies in a South African Environment

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Abstract

With the increasing pressure and competition from global forces on trade industries, supply chains, transportation and shipment, many countries have adopted the use of Just-In-Time (JIT) inventory systems. Over the years, many organizations have tried to use JIT to manage their inventory management systems and reduce costs related to inventory. This makes the technique the mostly tried system in inventory management. This research paper is based on assessing organizations within South Africa and the application of Just in Time Technique as a tool to manage inventory. By using this tool, cost can be reduced, and this is one of the advantages of using JIT. JIT is a Japanese philosophy, so it was established and developed in Japanese culture. Organizations that are not Japanese are therefore inclined to modify certain aspects of JIT to fully and seamlessly integrate it into their manufacturing process. This study will assess how South Africa have adopted the Philosophy and modified it to fit in cultures in both manufacturing and service industries. The research design that will be used is explanatory research. A correlational study will be done. The setting in which this study will be done is the normal setting of production, using analysis tools the impact of JIT will be assessed based on results and make recommendations.

Keywords: Just in time, Inventory Management, Enterprise Resource Planning

1. Introduction

In the nick of time (JIT) is an assembling reasoning that was produced by the Japanese. It is centered around streamlining generation effectiveness by finding the harmony among quality and amount to portray a stylish perfect (Wyk and Naidoo, 2016). This logic was first connected in the 1970's. Taiichi Ohno first created it at Toyota. Initially JIT was actualized essentially to guarantee the conveyance of merchandise to clients precisely, with respect to request time, item quality and amount. In any case, this comprehension and utilization of JIT has turned out to be increasingly mind boggling in the ongoing years. JIT is currently a key player in guaranteeing that generation of products happens with least waste. Toyota being one of the main cars makes, following quite a while of consistent enhancement, went to an acknowledgment that there are seven kinds of waste constantly present in assembling. These squanders result from: overproduction, misuse of holding up time, transportation squander, process squander, stock waste, misuse of movement and waste from item deserts (Suzaki, 1989).

JIT contains eight (8) components which incorporate consistent enhancement, disposing of waste, great housekeeping, setup time decrease, leveled/blended generation, Kanban, Jidoka and Andon. Japan is known for its real fares of cars, buyer gadgets and PCs, therefore it ought not to come as an unexpected that it was the Japanese that created and reasoning that would reform the manner in which the world does assembling and handle stock. The world has been watching, taking in and actualizing different methods of insight from the Japanese with regards to assembling and JIT is one of those rationalities.

The case of South Africa does not form part of the exception. The study, through this research paper, investigates the kind of influence regarding manufacturing industries that JIT application has had on how inventory is managed.

1.1 Background, Rationale and Scope of the Study

The focus of JIT is the reduction of waste that occurs during the process of production of services and goods while demands streams in. Therefore, the absence of work-in-process as well as stock being stored at times when there is no demand, or no production requests have been placed. It is mandatory for companies that implement the JIT approach to delay and launch production only as soon as customers have placed an order.

South Africa has an unemployment issue. As of July 2018, the South African unemployment rate stood at 27.5%. Figure 1 below depicts the historical representation of the South African unemployment rate between January 2016 to July 2018.

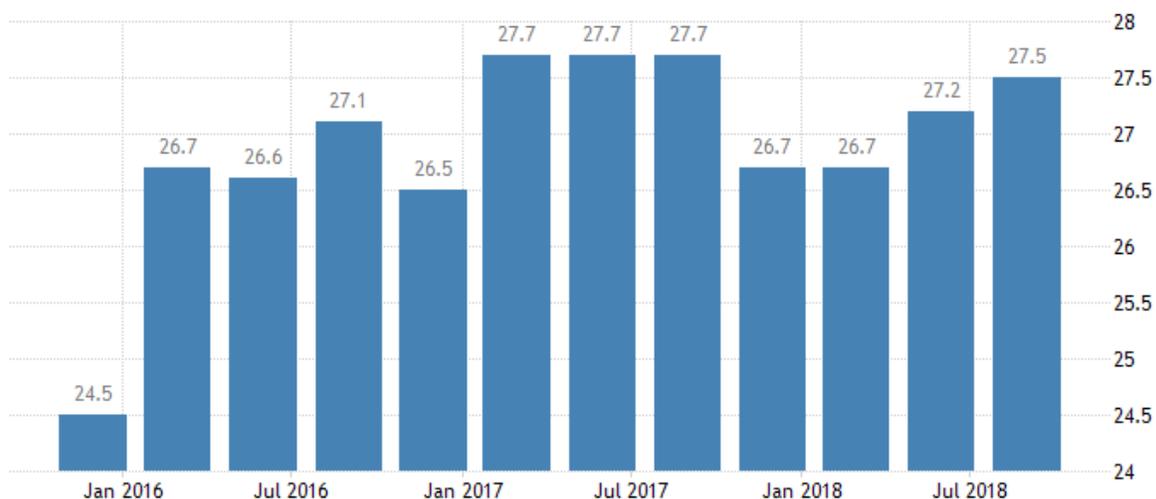


Figure 1. South African Unemployment Rate Jan 2016 to July 2018 (Moya, 2018)

Considering a nation such as South Africa with one of the highest joblessness rates in Africa, manufacturing companies that are large are facing the challenge of managing the resources and understanding the concept of supply-demand. JIT is a particularly popular approach for waste reduction and cost saving on expenses associated with storage in the production industry. One fundamental question the researchers pose is that although JIT is a popular approach for eradicating the above-stated issues, does it in fact work toward the reduction of joblessness in the Republic of South Africa considering its current economic situation?

1.2 Aim, Objectives and Value of the Study

The goal of this research is to identify the impact that the JIT philosophy has on the way inventory is managed in South Africa considering two case studies. This research paper will identify the advantages and disadvantages of JIT. It will identify whether JIT is a philosophy that South African small-to-medium enterprises (SME's) will benefit from when it is implemented. The result of this paper is to recognize whether the application of the JIT idea will provide an advantageous influence on the way inventory is managed in South Africa for production organisations.

2. Literature Review

2.1 Just-In-Time (JIT)

As a definition JIT is a philosophy that relates to the manufacturing industry which plans to dispose of waste, as waste is or results from any action that adds cost to the process of production without essentially increasing the value of the

item being produced, for example, transporting inventories from one distribution centre to the next or the basic demonstration of putting them into storage (Madanhire and Mbohwa, 2016).

Sustaining the advantage the organisation has over its competition is the main objective of JIT. It accomplishes this by focusing on its customers and delivering a performance that is exceptionally superior while keeping the cost of production of goods and services at minimum level, and continuously improving quality (Cheng, 1996). This is one of the reasons why JIT is one of the tools mostly used for inventory management systems and why it has been successful over the years. The financial implications of JIT, however, are very critical. As noted by, Juárez *et al.* (2017), JIT adds to the enhancement of business forms by applying basic leadership, operations research, and different points models, every one of them identified with procedures and activities. Which thus sparkles the light on the pertinence of JIT practice in organizations, which depends on its commitment to enhancing the money related aftereffects of the executives, assessed all the time through execution monetary pointers (Juárez, *et al.*, 2017).

Over the years, the application of JIT has been effective and efficient within the manufacturing entities globally. This has led to the philosophy being adopted and implemented within the service industries (Hay, 1988). The successful implementation and execution of JIT allow manufacturing companies to counter the vulnerability that they face due to the regularly changing financial climate. Based on research, the technique has played major roles and drastic impact for agencies that had to manage their finances (costs specifically), but for the context of this research, the question is, is South African one of those countries with organisations that have adopted the philosophy and benefited?

Organisations that have applied JIT have managed to gain competitive edge, improve quality of the products, and reduce waste. According to Suzaki (1989), there are three main objectives when applying Just in Time. Suzaki (1989) identified these objectives as enhancing the organization's ability to compete with rival firms and remain competitive over the long run and gaining competitive advantage, increasing the degree of efficiency within the production process and reducing the level of wasted materials, declining time and effort involved in the production process and inventory management. These points will be used as part of the guideline when assessing South African Manufacturing organisations. These points identified by Suzaki are extensive and consequently they allow the flexibility for applying JIT in various organisations regardless of size and complexities. These objectives of JIT approach can be a valuable instrument to assist businesses in the identification exercise of their peculiar precise purposes when it comes to using JIT within their organization.

JIT, as a philosophy developed in the past years, has evolved from the traditional way of doing thing within the manufacturing industries to a philosophy that is applicable in every sector, service and manufacturing alike. Table 1 below shows and contrasts the JIT Philosophy and the traditional methods of material handling.

Table 1. Difference Between JIT and Traditional Methods for Material Handling and Inventory Management System

TRADITIONAL		JIT
1. Push System		1. Pull system
2. Significant Inventories		2. Insignificant or zero inventories
3. Process structure		3. Manufacturing Cells (work centres)
4. Specialised Labour		4. Multifunction Labour
5. Acceptable quality level (AQL)		5. Total Quality Management (TQM)
6. Complex Accounting		6. Simple Cost Accounting

In addition to the above JIT's features in comparison to the traditional methods, JIT can also be characterized by the following traits; Consistency in high quality products and services, Small lot size, Development of standardized components and working processes, increased line flow, The establishment of automated production processes and systems, The adoption and application of preventive maintenance, Compliance to statutory and Regulatory and contractual requirements

The application of Just in Time has numerous advantages and disadvantages. Some of the benefits include Improved Efficiency, Declined waste and human errors, enhanced working relations between employees and Win-win customer

and supplier relationships. With the increase in today's marketplace, organisations have been pushed to the edge to reevaluate and modify the methods they use to conduct business. Among the mentioned benefits. Just in time also result into reduced cost of quality, escalated customer responsiveness, sustained continuous improvement.

Just in Time uses the following techniques, principles and practices; Designing for easy processing of production goods, using small machines with optimal utilization and intake of inputs, Reduction of set-up time before and during manufacturing, Adopting Just in Time Purchasing system, Total productive Maintenance, Focusing and emphasize on organizational focus and the basic work practices for Just in Time

2.2 Limitations of JIT

Irrespective of the great benefits associated with JIT, the philosophy also has its various limitations. These limitations are outlined below according to Ansah (2016):

- Cultural difference is one of the factors that may lead into unsuccessful implementation for JIT. This is due to some organizations find it hard to change and adopt to new organisational culture changes.
- Most organisations still followed traditional methods or handling material. These organisations pile up stock to meet supply in periods of high demand. Such agencies normally have problems with the use of JIT.
- Given that JIT was established in Japan, some of the countries need make amendments when applying JIT in their own countries and this poses a challenge when it comes to implementing JIT successfully.
- Changes in methods for problem solving.
- Resistant to change within the organisation to adopt, appreciate and acknowledge JIT principles and practices.
- Employees need to have multiple skills to apply JIT including being flexible.

2.3 Inventory Management

Inventory management is a method used to organize, hold and replenish stock. Its main goal is to have optimal levels of stock, neither excessive amounts nor a negative stock balance. For an organization to achieve this optimal level of inventory, two mutually dependent tasks need to be solved. The tasks being to 1) to have enough inventory to be able to fulfil the orders of internal and external customers and 2) to minimize inventory carrying costs. Trade-offs¹ are required to get the two above mentioned tasks done.

2.4 Objectives of Inventory Management

According to Reid and Sanders (2012), the objectives of inventory management are to provide the acceptable levels for customer satisfaction that will account for operations with efficient and declined costs to reduce investments exerted in inventory. In addition to above mentioned two objectives, other objectives for inventory management are; to reduce inventory carrying costs, to optimize investments for inventory on acceptable level, to decline reduce wastes, losses due to theft, to reduce ordering costs for inventory, and to ensure the supply of input raw material and finalized products will be sustained to ensure that manufacturing processes are not stopped and always meeting demands of the customers (Reid and Sanders, 2012).

Research have also identified other objective functions for applying JIT in inventory management as to meet predicted production demands, ensuring smooth production flow and needs and to prevent stock-outs.

Inventory management also involves the use of software's like Enterprise Resource Planning (ERP). Using this software also increase the objectives of inventory management but not limited to:

- a) Using scientific methods to calculate and manage inventory for accurate results
- b) Uninterrupted productions resulting from timely and sufficient supply of raw materials
- c) Ensuring the availability for safety production stock
- d) Proper records management systems and traceability.

¹ A balance achieved between two desirable but incompatible features; a compromise.

2.5 Constraints of inventory management

With the latest improvements and the application of software to aid management of inventory have numerous constraints. The first hindering factor is the software is very expensive. This is a constraint for mostly small sized organizations since they can't afford to buy the software. Secondly the ERP software have a lot of complexities which required extensive training to use the application (Devine, *et al.*, 2010). Thirdly, with the use of inventory management, there are production problems related to quality, reworks and incorrect shipping of materials. This is due to inventory management just focus on inventory. Fourthly, developing inventory management requires an addition on new systems which increase bureaucracy in the organisation.

3. Methodology

The research design used in this study is explanatory research. A correlational study has been conducted. The setting in which this study will be done is the normal setting of production. Non-participant, covert observation will take place in the factory. The best research strategy that was found is meta-analysis. This kind of research technique is the blend of results from a few investigations to decide the normal effect of a comparable mediation crosswise over examinations. Meta-analysis works best for studies where something can be said about the course in which the effect can be recognized. Observation (non -participant & covert), is the best data collection method for this study because there will be less influence from the researcher and a clear and concise overview of an issue is more achievable in this way. Participants are more likely to behave 'normally' if they aren't aware that they are being watched. The researcher is also less likely to influence the group.

4. DISCUSSIONS

4.1 Case Study 1 – Hewlett-Packard

Hewlett-Packard which at the time was one of the first JIT implementers in the Western industry conducted four (4) case studies from four (4) H-P division during the mid-1980's. The four divisions had at that time some of the same measures. The results are shown in Table 2 below (Goddard, 1986).

Table 2. Effective JIT Manufacturing at Hewlett-Packard

Inventory reduction	2.8 months	75%	75%	
Labour cost reduction	30%	15%		50%
Space reduction	50%	30%	33%	40%
WIP cost reduction	22 days to 1 day			
Production increase	100%			
Quality improvement		30% scrap, 79% rework	80% scrap	30% scrap & rework
Throughput time reduction		50%	17 days to 30 hours	
Standard hours reduction	50%			
No. of shipments increase				20%

The results in the table show vast improvements in majority of the departments of the divisions that implemented JIT management.

4.2 Case Study 2 – Company X

A critical assessment of the implementation of JIT system within a company operating in South Africa is provided through this case study. In this particular case, the company where JIT has been implemented is referred to as Company X.

Company X comprises of two distinct production plants whereby the one plant implements JIT, whereas the other plant does not. The collection of primary data, for the purpose of this study, was done through structured questionnaires which were chosen and administered to the various technical staff as well as senior staff located at each plant. The questionnaires targeted a total of 120 employees and were distributed to 60 employees from both plants, with a total response rate of 30%. Primary data was utilized to contrast the profit generated from a production line that implements JIT as opposed to a production line that does not operates using JIT technique.

Equally considered is the secondary data obtained from the financial records from Company X’s production plants. This was performed in order to ascertain the rate of returns from sales, rework, as well as profit from the different lines of production (Wyk & Naidoo, 2016).

When it came to inventory saving at Company X, it was noted that Company X need to secure supplies of goods in small lot sizes contrary to their normal large lot production sizes. Small sizes production was enabled by reducing set up time. It has been found that the result of smaller batch sizes in JIT production leads to quality being improved, inventory being reduced, costs associated with manufacturing considerably dropping, a market that responds better, and lastly service that becomes faster in terms of the delivery of products.

What happened at Company X was that with the assignment of little groups of data, employees at the lowest level could start taking a shot at various periods of the plan while the last structure was being created. Steady downward delegation of guidelines at Company X diminished vulnerability among workers and expanded the rate of issue identification. With respect to benefit examination between the JIT and non-JIT plants, the JIT fabricating plant demonstrated an expansion in benefit. The majority of the waste variables added to the expansion net benefit on account of Company X. The execution of JIT likewise expanded the accessibility of employments at the organization. The likelihood of occupation dissemination in JIT manufacturing made chances to enhance work improvement experienced by representatives and open doors for employment expansion.

5. Recommendations, Conclusion and the Way Forward

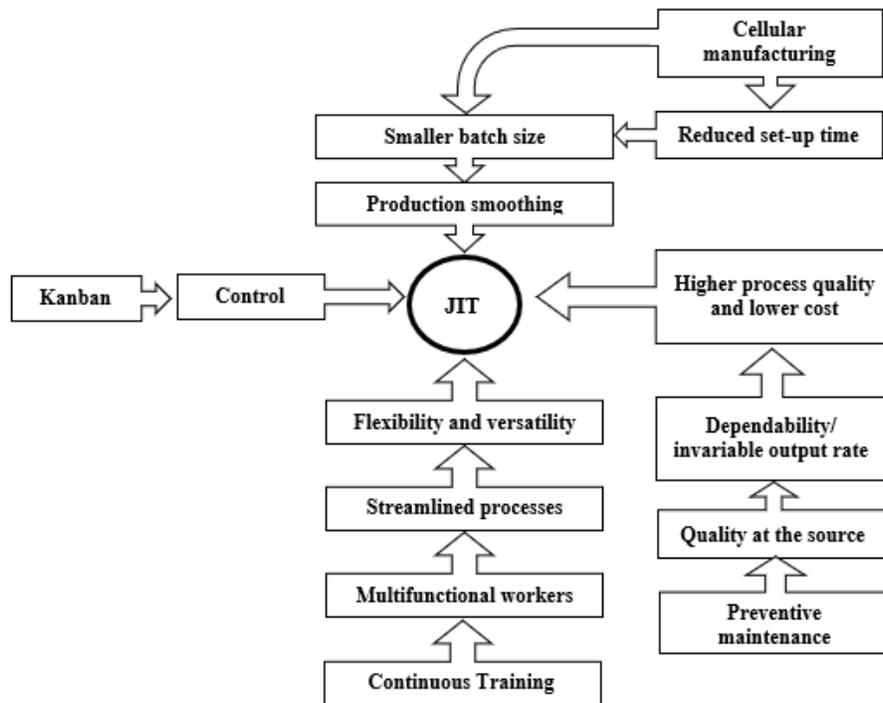


Figure 2. Inter-relationship of JIT System Elements (Madanhire and Mbohwa, 2016)

Given the major improvements at Company X and Hewlett-Packard, it is clear to see that JIT manufacturing is beneficial and can work across cultural spheres. It is recommended that South African SME's look into implementing JIT as it will be advantageous to the firms. Based on the results obtained the analysis of the case study on Company X, it has been demonstrated that JIT manufacturing application has a relationship that is proportional in a direct fashion to the firm's productivity and eventually the country's productivity. Mention can be made of JIT system elements inter relationship that is vital for a successful implementation of JIT system as depicted in Figure 2.

The objectives of this research paper were to (1) Identify the impact that JIT has had on South African SME's (positive or negative) and (2) Investigate if JIT is an applicable philosophy for South African SME's. After all the research has been conducted, it has been reached that companies in the Republic of South Africa are testing the application of Just-In-Time production and are eventually displaying enormous improvements, both in monetary terms and in the loyalty displayed by their customers including the morale of their workforce. JIT production has provided an influence that is positive on small businesses productivity in South Africa. It is a simple and applicable philosophy to follow, with many benefits to reap.

Further research should be conducted within the South African SME's sector comprising of manufacturing companies by including larger samples in various locations to investigate the impact JIT manufacturing has on the company's cultures as well as on productivity in relation to the country's economy.

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Biographies

Sambil C. Mukwakungu is an award-winning academic who has been lecturing Operations Management to first year students, Food Production, and Quality Management at the University of Johannesburg since 2009. His passion for teaching and learning has allowed him to make a difference in at least one student's life every year. He is a young researcher who is still establishing himself in knowledge creation with keen interest in Service Operations Management, Lean Operations, Continuous Improvement, as well as business innovation and innovation in Higher Education. He was awarded Best Track Paper Awards at the 2016 IEOM Conference in Rabat, Morocco, also at the 2018 2nd European Conference in Paris, France, and he is together with his team from the IEOM UJ Student Chapter a recipient of the 2018 IEOM Outstanding Student Chapter Gold Award for exceptional chapter activities and contributions to the field of industrial engineering and operations management.

Matimba Davis Mabasa is a BTech student in Management Services at the University of Johannesburg, has completed short learning programme in Basics in Project Management, Basics in Total Quality Management, Strategic Management and programme in Sales and Marketing with the University of South Africa. A participant of Development Evaluation Training Programme in Africa (DEPTA) hosted by Wits School of Governance – Clear Anglophone Africa. Have two published papers for at IEOM and GBATA 20th Anniversary Annual International Conference 2018, and have two more papers accepted for publication at the IEOM International Conference 2018, Pretoria, South Africa. Whose future prospects is to further do MBA, Master's in Project Management and Operations Management.

Sihle Mankazana is currently pursuing her Baccalaureus Technologiae in Operations Management, in the Quality and Operations Management Department at the University of Johannesburg. She was awarded her National Diploma with Cum Laude in Operations Management (2017) from the University of Johannesburg. She has been part of the UJenius Club that recognizes the top achieving 1% of the University of Johannesburg in 2014, 2015 and 2016. She was awarded the Dean's Honors Roll - 2017 for outstanding academic excellence in 2016 by the Faculty of Engineering and the Built Environment. She is also a tutor at the University of Johannesburg with great passion for teaching and learning, and an interest in research. She has two published papers at the GBATA 20th Anniversary Annual International Conference 2018, Bangkok, Thailand, and four more papers accepted for publication at the IEOM International Conference 2018, Pretoria, South Africa.

Xolani Mzileni is currently student in B Tech Quality Management in the University of Johannesburg. he has recently completed his National Diploma in Management Services in 2017. he is also currently enrolled in Basic Mandarin with UJ Confucius Institution. He is also the founder and vice-president for Quality, Operations, & Management Services (QOMS) forum. Mr. Mzileni have successfully completed the GEPS Program which was a coalition between University of Johannesburg (RSA) and University of Pittsburgh (USA) which focused on reaching societal aspects that could be resolved using engineering solutions. For academic performance, he has been UJ first year 2015 top achiever, 2016 & 2017 Ujenius which recognizes top 1% student, also received Faculty of Engineering top achievers and being of the Dean's list. He has been selected as a member for Golden Key International Honours Society which recognizes. with the passion to teach and making change, He is currently a tutor for Cost and Estimating Accounting in the University of Johannesburg. in addition to leadership and community engagement, he the founder and president for a teaching program called Extra Care in his community to assist student with their Matric studies. Lastly, he is active member in the Faculty of Engineering and Built Environment assistance team