



T.C.

TOKAT GAZIOSMANPAŞA UNIVERSITY

GRADUATE EDUCATION INSTITUTE

**THE EFFECT OF JUST IN TIME PRODUCTION SYSTEM IN
ACHIEVING PROFIT MAXIMIZATION IN INDUSTRIAL
COMPANIES**

Prepared by

MOHAMMED EZZAT MOHAMMED

Department of Business Administration

Branch of Accounting and Finance

Master Thesis

Supervisor

Asst. Prof. Dr. Atila KARKACIER

TOKAT - 2022



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SCIENTIFIC ETHICS PAGE

According to the thesis writing guide of Tokat Gaziosmanpaşa University Institute of Social Sciences, My Master's thesis named “The Effect of Just in Time Production System in Achieving Profit Maximization in Industrial Companies” that I have prepared under the consultancy of “Asst. Prof. Dr. Atila KARKACIER” is based on scientific ethical values and rules. I hereby declare that it is an appropriate, original work, and I will accept any legal sanctions if it is determined otherwise.

... / ... / 2022

MOHAMMED EZZAT MOHAMMED

DEDICATION

To the first teacher, to the light of all people, our

Prophet “Muhammad” (peace be upon him)

To My Mother and father for their Understanding

And for their overwhelming, support, morally and

Financially...



ACKNOWLEDGEMENTS

We praise and thank God who gave us the gift of knowledge and reason and gave us the determination and will to complete this work.

Special thanks to my dear wife who had the duty of father and mother during my studies.

As well as all thanks to the honorable supervisor. Asst. Prof. Dr. Atila KARKACIER for your valuable advice and guidance that benefited me and was with me at every stage of the thesis and supported me with all his scientific capabilities. You remain the perfect teacher. The least I would like to say to you is a word of thanks.

We also extend our sincere thanks to: the professors and employees of the College of Business Administration and everyone who helped us, even with a kind word, in accomplishing this work.

THE EFFECT OF JUST IN TIME PRODUCTION SYSTEM IN ACHIEVING PROFIT MAXIMIZATION IN INDUSTRIAL COMPANIES

MOHAMMED, Ezzat Mohammed¹

Abstract

The current research was conducted with the aim of investigating the impact of Just-in-Time Production system application on maximizing profits in companies in Sulaymaniyah. Questionnaire technique was used as the data collection method in the study. The statistical population of the present study was senior managers and experts of industrial companies in Sulaymaniyah with 20 industrial units, that according to the target community of the research, are 100 persons. Krejcie Morgan table was used to determine the sample size, which 80 people were determined. In order to select the samples, 5 questionnaires were distributed to 16 companies by simple random sampling. The tool for collecting data was a questionnaire with a 5-point Likert scale, the validity and reliability of which were confirmed. Finally, 62 completed questionnaires were returned. A Regression test by SPSS software was applied for analyzing the data. Based on the results, it was found that all four components of the JIT system, namely, JIT Purchasing, JIT Operation, JIT Customer, and Kanban, are used to a high extent by companies. Findings revealed that the JIT system has a significant impact on corporate profitability. It was further found that the JIT system predicts 66.4% of changes in financial performance, 19.5% of changes in cost reduction, and 30.2% of changes in waste reduction. According the results of this research, managers and experts can improve the company's profitability by using the JIT system.

Keywords: Industrial Companies, Just-in-Time Production System, Profit Maximization, Cost Accounting, Production

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SANAYİ ŞİRKETLERİNDE KAR MAKSİMİZASYONU SAĞLAMADA TAM ZAMANINDA ÜRETİM SİSTEMİNİN ETKİSİ

MOHAMMED, Ezzat Mohammed²

Özet

Mevcut araştırma, Tam Zamanında Üretim sistemi uygulamasının Süleymaniye'deki şirketlerin kar maksimizasyonu üzerindeki etkisini araştırmak amacıyla yapılmıştır. Araştırmada veri toplama yöntemi olarak anket tekniğine başvurulmuştur. Bu araştırmanın evrenini, araştırmanın hedef kitlesine göre 100 kişi olan 20 sanayi birimine sahip Süleymaniye'deki sanayi şirketlerinin üst düzey yöneticileri ve uzmanları oluşturmuştur. 80 kişinin belirlendiği örneklem büyüklüğünü belirlemek için Krejcie Morgan tablosu kullanılmıştır. Örneklemelerin seçilebilmesi için basit tesadüfi örnekleme yoluyla 16 firmaya 5 anket dağıtılmıştır. Veri toplama aracı, geçerliliği ve güvenilirliği doğrulanmış 5'li Likert ölçeğine sahip bir ankettir. Son olarak, tamamlanmış 62 anket geri dönmüştür. Verilerin analizi için SPSS programı ile Regresyon testi uygulanmıştır. Sonuçlara dayalı olarak, JIT sisteminin dört bileşeninin, yani JIT Satın Alma, JIT Operasyonu, JIT Müşterisi ve Kanban'ın şirketler tarafından yüksek oranda kullanıldığı tespit edilmiştir. Bulgular, JIT sisteminin kurumsal karlılık üzerinde önemli bir etkisi olduğunu ortaya koydu. Ayrıca, JIT sisteminin finansal performanstaki değişikliklerin %66,4'ünü, maliyet azaltmadaki değişikliklerin %19,5'ini ve atık azaltmadaki değişikliklerin %30,2'sini öngördüğü bulunmuştur. Bu araştırmanın sonuçlarına göre yöneticiler ve uzmanlar JIT sistemini kullanarak şirketin karlılığını artırabilirler.

Anahtar Kelimeler: Sanayi Şirketleri, Tam Zamanında Üretim Sistemi, Kâr Maksimizasyonu, Maliyet Muhasebesi, Üretim.

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CONTENTS

Page

SCIENTIFIC ETHICS PAGE	i
DEDICATION.....	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT.....	iv
ÖZET	v
CONTENTS.....	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
ABBREVIATIONS	xi
INTRODUCTION.....	1
SECTION 1: JUST IN TIME PRODUCTION SYSTEM.....	4
1.1. JUST IN TIME PRODUCTION SYSTEM	4
1.2. JIT OBJECTIVES	5
1.3. ADVANTAGES AND DISADVANTAGES OF JIT PRODUCTION SYSTEM ...	6
1.4.JIT PRODUCTION SYSTEM DIMENSIONS.....	7
1.4.1. JIT Purchasing	8
1.4.2. JIT Operation.....	8
1.4.3. JIT Customer	9
1.4.4. Kanban.....	10
1.5. FINANCIAL PERFORMANCE	12
1.6. WASTE REDUCTION	14
1.7. COST REDUCTION.....	14
SECTION 2: PROFIT MAXIMIZATION	16
2.1. PROFITS	16
2.2. PROFIT REPORTING OBJECTIVES	17
2.3. PROFITABILITY	18
2.4. CRITERIA FOR MEASURING PROFITABILITY	20
2.4.1. Return On Assets (ROA).....	20

2.4.2. Return On Equity (ROE)	21
2.4.3. Gross profit	22
2.4.4. Net Profit Margin	22
2.5. PROFIT MAXIMIZATION	22
2.6. PROFIT MAXIMIZATION LIMITATION	24
SECTION 3: PREVIOUS STUDIES	26
3.1. PREVIOUS STUDIES	26
3.2. RELATIONSHIPS BETWEEN VARIABLES	34
3.3. THE DISTINGUISHING FEATURE OF THE PRESENT STUDY	35
SECTION 4: EMPIRICAL ANALYSIS OF THE EFFECT OF JUST IN TIME PRODUCTION SYSTEM IN ACHIEVING PROFIT MAXIMIZATION IN INDUSTRIAL COMPANIES.....	37
4.1. RESEARCH DESIGN.....	37
4.1.1. Research Method According To Objective:	37
4.1.2. Research Method According To Data Collection Method	38
4.2. STATISTICAL COMMUNITY	38
4.3. SAMPLING METHOD.....	38
4.4. DATA COLLECTION	38
4.5. MEASURING RESEARCH VARIABLES	39
4.6. RELIABILITY AND VALIDITY OF THE TOOL	40
4.6.1. Validity	40
4.6.2. Reliability	41
4.7. DATA ANALYSIS METHOD	41
4.8. DATA ANALYSIS	42
4.8.1. Demographic Analysis	42
4.8.1.1. Assessing The Status Of Respondents By Gender	42
4.8.1.2. Assessing The Status Of The Respondents According To The Division	42
4.8.1.3. Assessing The Status Of Respondents According To Age	43
4.8.1.4. Assessing The status Of Respondents In Terms Of Education	43
4.8.1.5. Assessing The Status Of Respondents Based On Work Experience.....	44
4.8.2. Descriptive Analysis of Variables	44

4.8.2.1. Descriptive Analysis of JIT Purchasing	44
4.8.2.2. Descriptive Analysis of JIT Operation	46
4.8.2.3. Descriptive Analysis of JIT Customers	47
4.8.2.4. Descriptive Analysis of Kanban	48
4.8.2.5. Descriptive Analysis Of Financial Performance	48
4.8.2.6. Descriptive Analysis of Cost Reduction.....	49
4.8.2.7. Descriptive Analysis of Waste Reduction	50
4.8.3. Normality with Sample Kolmogorov-Smirnov Test	51
4.8.4. Relationships Between Variables:	52
4.8.5. Hypothesis Analysis	53
4.8.5.1. Multicollinearity	53
4.8.5.2. Regressions Analysis	54
RESULT AND SUGGESTIONS.....	58
SOURCES	62
APPENDICES.....	73

LIST OF TABLES

	Page
Tablo 4. 1: Cronbach's Alpha of the Research Questionnaire	41
Tablo 4. 2: Gender of Respondents.....	42
Tablo 4. 3: Respondents Division	42
Tablo 4. 4: Respondents` Age.....	43
Tablo 4. 5: Education of Respondents	43
Tablo 4. 6: Experience of Respondents	44
Tablo 4. 7: Descriptive Statistics of JIT Purchasing.....	45
Tablo 4. 8: Descriptive Statistics of JIT Operation.....	46
Tablo 4. 9: Descriptive Statistics of JIT Customers.....	47
Tablo 4. 10: Descriptive Statistics of Kanban.....	48
Tablo 4. 11: Descriptive Statistics of Financial Performance.....	49
Tablo 4. 12: Descriptive Statistics of Cost Reduction	50
Tablo 4. 13: Descriptive Statistics of Waste Reduction.....	50
Tablo 4. 14: One-Sample Kolmogorov-Smirnov Test.....	51
Tablo 4. 15: Correlations Between Variables	52
Tablo 4. 16: Multicollinearity Between Variables	53
Tablo 4. 17: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Maximize Profits	54
Tablo 4. 18: Coefficientsa of Just-In-Time System and Maximize Profits	54
Tablo 4. 19: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Financial Performance	55
Tablo 4. 20: Coefficientsa of Just-In-Time System and Financial Performance	55
Tablo 4. 21: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Cost Reduction	55
Tablo 4. 22: Coefficientsa of Just-In-Time System and Cost Reduction.....	56
Tablo 4. 23: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Waste Reduction	56
Tablo 4. 24: Coefficientsa of Just-In-Time System and Waste Reduction	57

LIST OF FIGURES

	Page
Figure 2. 1: Profit Maximization	23



ABBREVIATIONS

JIT	Just in Time
ROA	Return on Assets
GSCP	Green supply chain practices
TQM	Total Quality Management
OP	Operational Performance
BP	Business Performance
PLS-SEM	Partial Least Squares Structural Equation Model
MRP	Material Requirement Planning
DRP	Distribution Resource Planning
VMI	Vendor-Managed Inventory
AST	Adaptive Structuration Theory
QIZ	Qualified Industrial Zone
JPMF	Jordanian Pharmaceutical Manufacturing Firms
SMEs	Small and Medium Enterprise
CEO	Customer Experience Officer

INTRODUCTION

Just in time (JIT) production system is a method of inventory management in which planning is done in such a way that raw materials, goods and labor are available when needed. JIT production system is a Japanese philosophical and management system that considers production with the right materials with the right quantity and quality in the right time and at the right place. JIT production system is among the most advanced planning systems, which is at the top of the pyramid of new control systems and production planning. On the other hand profitability is the main goal of all businesses. Today, in terms of increasing competition, economic constraints and the development and complexity of markets, the optimal use of available resources and timely recognition and response to customer demands in different market segments has become inevitable and has forced organizations to eliminate Traditional ways of working to achieve profitability.

In this regard, the philosophy of the JIT production system has become increasingly popular and has been implemented by industrial companies over the past decades. JIT production system seeks to realize the benefits of eliminating waste and reducing costs. This method creates the conditions for the company to be able to meet customer demand quickly and effectively. It is also a process system that aims to reduce costs by continuously improving conditions to complete and simplify methods and procedures to create added value. Therefore, with the correct implementation of JIT production system techniques, the industrial sector can be approached to profitability goals. Given the advantages of a JIT production system and its acceptance among companies and factories, it is important to examine the effect of this system on the industrial companies profitability. However, despite the increasing literature in this domain, there is much confusion about the consequences and results of JIT production system.

JIT implementation is largely successful with the positive coordination of senior management at all levels. These notions are sometimes different from the conventional beliefs of managers, so for certain types of management, its implementation might pose a challenge, as human nature is resistant to be changed. Several scholars have implemented JIT in large, medium, and small organizations and it was seen that companies were not

familiar with the JIT production system due to insufficient knowledge of the concept of JIT, lack of proper JIT training, and lack of senior management involvement.

Industrial Companies are the backbone of Iraq and have a significant function in the country's economy. However, economic conditions and increasing competition have compelled several manufacturing companies to close, with inventory costs including ordering costs, inventory costs, warehousing costs, and especially shipping/maintenance costs harming returns, capital, cost reduction, and product quality. In inventory management, over-investment increases costs of production and thus decreases the manufacturing company's profits. Generally, the investments in inventory must be limited by companies to decrease their costs of production and thus enhance profits. Evidence shows that most inventories face the problem of declining inventory quality (raw materials). Managers of industrial units have realized that maintaining inventory comes at a significant cost. Therefore, companies could benefit from the establishment of a JIT system, but some managers resist the JIT system for reasons such as the inability of JIT to meet sudden and unexpected orders and to absorb fluctuations in raw material prices. Hence, there is a general ambiguity about the results of using JIT in Iraqi industrial companies. Industrial companies fear the limitations that may be imposed by the JIT system, and they still have some misconceptions about its applications. Given the limited evidence in developing countries acknowledging the positive effects of implementing JIT, including Iraq, the establishment of this system in industrial companies and development of awareness for its advantages and opportunities, along with obstacles in its implementation, requires further studies in this area.

In this study, it is aimed to measure the effect of JIT production system on the profit maximization of industrial companies in Iraq. In this regard, this research provides valuable results on the effects of using the JIT production system on increasing the profitability of companies and improving the performance of industry, managers, and researchers. This research will have practical and theoretical implications.

This study is important in that it explains what hinders the implementation of the JIT production system, outlines the opportunities and benefits of implementing the JIT

production system, provides an alternative way to solve the cost minimization and profit maximization problems, and helps reduce the waste of resources.

Based on what has been said, this research explored the effect of using the JIT production system on the profitability of industrial companies in Iraq. This research is presented in 3 chapters. In the first chapter, the definitions of JIT production system are stated. The second chapter is devoted to the literature on the background of the research. In the third chapter, the research methodology related to this research will be stated, and the data obtained from the questionnaires are analyzed and finally the research conclusions and suggestions for future researches are presented.



SECTION 1: JUST IN TIME PRODUCTION SYSTEM

This section investigates the theoretical foundations of research variables. In this part, the definitions and concepts of system of Just-In-Time production, profitability, financial performance, and cost and waste reduction will be explored.

1.1. JUST IN TIME PRODUCTION SYSTEM

The Just-In-Time production system (JIT) was primarily implemented in the 1960s and 1970s in Japan. Toyota Motor has been the biggest contributor to its development. This approach permits companies for saving important amounts of resources and decrease waste through storing the inventory required for producing and selling products. As a result, this approach decreases the costs of insurance and storage, in addition to the costs of excess inventory refining or disposing (Silver et al, 2017: 2).

Different researchers have offered different definitions of JIT. Two decades after the introduction of this system, researchers have reached an overall consensus on the definition of JIT and the ways it can be measured. Many studies regard JIT as a major sources of production of lean, consisting of special methods such as production of traction (or system of Kanban), timely supply, reduction of cell production regulation time, very small size, smoothing of daily schedule, and production smoothing (Bortolotti et al, 2013: 1118). JIT is an approach of inventory management that delivers the inventory goods` precise amount in a timely and accurate manner (Mankazana & Mukwakungu, 2018: 2). JIT system covers all purchasing processes, operations, and sales to improve customer satisfaction regarding innovation, reliability, speed, quality, and cost (Darwish, 2018: 9). As a planning concept that makes showing progresses, raw materials, and last productions accessible at the right place and time, JIT can involve decrease of group technology, maintenance and prevention, cross-training, internal sizes, and adjustment time (Agyabeng-Mensah et al, 2020: 160). Overall, JIT is also a method that aims to eliminate waste disposal and continuously improve the production process (Bortolotti et al, 2013: 1118). JIT empowers the use of less inventory items including end products, work in progress, and raw materials, by proper waste disposal. Many researchers claim that the main motivation for implementing JIT is to reduce costs by eliminating activities of non-

value-added for ensuring improved operational performance (Green et al., 2019: 593). Others mention that JIT provides a significant advantage and enables companies for meeting international competitive conditions (Agyabeng-Mensah et al, 2020: 1118). This is among the significant aspects of lean management. Although the JIT notion began as a producing phenomenon, many researchers have asserted its importance in other fields including procurement and sales (Green and Inman, 2005: 3438). JIT reduces inventory to a minimum, leading to reduced waste production (Green et al., 2019: 591).

However, timely production inventory management can be dangerous. If demand rises unexpectedly, the companies may not capability of meeting the inventory that is requires for meeting such demand, damage their reputations among customers, and drive business toward other companies. Even a small delay could be challenging. When the primary input would not be available "exactly on time", it may create a bottleneck (Silver et al, 2017: 3).

1.2. JIT OBJECTIVES

Any company's manufacturing operations may benefit from the JIT approach. When done correctly, JIT may help to lessen the unpredictability that many manufacturing organizations face when economic circumstances fluctuate. By competing on quality, service, and cost, a corporation might gain a "competitive advantage." These three factors are the unique characteristics that set goods apart from one another. JIT enables businesses to decrease waste in the manufacturing process, increase quality, and satisfy customer needs in an effective and consistent way (Javadian Kootanaee et al., 2013: 15). Producing system of the Just-in-Time has four major aims: (1) Delivery of purchased materials just in time to turn them into manufactured products, (2) production or delivery of parts Made exactly in time to turn them into sub-collections, (3) production or delivery of just-in-time parts to become the final product, and finally, (4) production or delivery of goods just in time for sale (Mankazana & Mukwakungu, 2018: 2).

According to Deng et al. (2014: 304) The goals of JIT system implementation are: (1) Eliminating every activity which does not add any added value to the product (2) Optimal production quality: in JIT system, the quality of production must also be

guaranteed. (3) Emphasis on simplification of operations: In the JIT system, attempts are made to perform operations in their simplest form (Dange et al., 304).

1.3. ADVANTAGES AND DISADVANTAGES OF JIT PRODUCTION SYSTEM

JIT has a lot of potential advantages. Firstly, JIT decreases levels of inventory, resulting in lower investment of inventory. Levels of inventory have fallen to the degree that several Japanese firms that adopt the JIT approach have a substantially greater yearly working capital amount than their American equivalents. Toyota, for instance, claimed a turnover percentage of 41 to 63, compared to 5 to 8 for comparable US corporations. According to Javadian Kootanaee et al. (2013: 14) the advantages of the JIT production system are as follows:

Avoid overproduction

Minimize waiting time and shipping costs

Save resources through simplifying systems of production

Reduce the capital that is closed in stock.

Ignore the requirement for operations of inventory

Reduce defects of product

Other financial benefits of JIT include:

1. Less investment in space of factory for production and inventory.
2. Lower risk of obsolescence in inventories.
3. Decrease of rework.
4. Decrease of bureaucracy
5. Reduce costs of direct material by increasing purchasing quantity (Javadian Kootanaee et al., 2013: 14).

JIT also exposes businesses to a variety of risks, especially supply chain-related risks. In this system, when inventories are depleted, a minor supply disruption by only one supplier can stop production in the short term. Also, although the advantages of using a production system in a timely manner are many and in most cases replace any possible limitation, a few disadvantages of this system are summarized below (Taghipour et al., 2020: 44):

- Elimination of contingent reserves that in the traditional way played the role of a safety inventory for companies.
- The level of participation set in Japanese organizations that have implemented the production system on time is not compatible with the amount of participation required to satisfy workers in the West, and this creates a problem.
- Decreased individual independence is another limitation of this system, which is mostly attributed to the limitation of production cycle time or time between repetitive activities.
- Resistance to change may occur at two levels: logical resistance and emotional resistance.
- Cultural Contradictions: there are many cultural differences that may be inherently related to JIT success. These will be problems that may be difficult to overcome or solve without changing workers' attitudes and philosophies (Taghipour et al., 2020: 44; Javadian Kootanaee et al., 2013: 14).

1.4.JIT PRODUCTION SYSTEM DIMENSIONS

It is noted that the primary components of JIT include production and purchasing of JIT (Inman et al., 2011: 343). Green, et. al. (2014: 125) stated that JIT includes JIT, purchase, and JIT sales, besides an important new element, JIT information. According to Hamarneh (2019: 9), JIT includes JIT purchasing, JIT operation, and JIT customer. Darwish (2018: 9) also considered three dimensions of purchasing of JIT, operating of JIT, and selling of JIT for JIT. Abdallah and Matsui (2007: 4) considered JIT dimensions including setup time decrease, JIT connection with customers, delivery of JIT by suppliers, Kanban, layout of JIT, and schedule of JIT. In the present work, according to previous

research, the dimensions of the JIT system including JIT Purchasing, JIT Operation, JIT customers, and Kanban were considered. The following is a description of each component.

1.4.1. JIT Purchasing

Generally, there is not any agreement on the JIT buying definition, however, the major idea among the researchers is that the right supplier's order from with the right time, the right price, and the right amount, which is based on customer needs, is considered as a JIT purchase. (Darwish, 2018: 11). Roy and Gwyn (1999: 181) pointed out that JIT Purchasing refers to the regular procurement process of the ideal domestic suppliers that their productions are featured by timely delivery and high quality. Purchasing of JIT is an interaction among three elements: design, marketing, and quality (De Toni and Nassimbeni, 2000: 633). Applying JIT sales as stated by Dong et al. (2001: 473) directly and directly helps buyers in reducing procurement costs for suppliers. Purchasing a JIT reduces the cost breaking, quality enhancement, stock cost, and overall cost of the ordering system through optimizing quality process, delivery number, order quantity, and delivery time (Yang and Pan, 2004: 856).

ISA and Tay (2008: 68) acknowledged that the purchase of JIT means that a small number of reliable suppliers are purchased and shipped only before the need for operation. According to Monden (2011: 8), JIT purchasing ensures the number of raw materials needed for production.

1.4.2. JIT Operation

For JIT Operation there is not a common definition in the literature. JIT operation as Sugimori et al (1977: 555) stated produces the essential items at the required period and keeps just the minimum amount of inventory for the process, which reduces the production time of the product. An important characteristic of the operating system of JIT is minimizing errors of supply and ensuring regular supply by local suppliers (Hill and Vollmann, 1986: 383). In addition, it is acknowledged that the aim of JIT Operation is achieving seven zeros (zero defect, zero surplus, zero settings, zero failure, zero displacements, zero increase, and zero time) (Hopp & Spearman, 2000: 9). According to Matsui (2007: 154), JIT Operation is the operation of generating the requiring parts in the

right time and based on the quantities that are needed. ISA and Tay (2008: 69) stated that in JIT Operation, production is done only if orders are received from the customer and based on the actual quantity.

JIT Operation, according to Milovanovic et al (2011: 1730), is the applying a strategy of inventory that causes enhanced corporate revenues. JIT Operation is described by Kulkarni et al. (2014: 3) as a process system for refining and implementing a production system. Global companies are embracing JIT Operation to boost competitiveness, according to Jadhov et al. (2015: 334). JIT Operation, according to Khan and Gwee (2011: 112), improves time of delivery, flow of process, and materials across the production stream, as well as reducing waste associated with time of delivery, space, and inventory. JIT Operations, based on Green et al. (2004: 3438), may bring value to the whole process of selling and delivering goods of an organization to the ultimate customer with little expense and waste. According to Hamarneh, (2019: 11) JIT Operation refers to enhancing the total effectiveness of operations through eliminating every non-value-added activity that cause simplification and facilitation of the services production process.

1.4.3. JIT Customer

Definition of JIT Customer based on Germain et al (1994: 475) is a "time-based approach based on traction strategy that minimizes the overall process." JIT Customer increases the value of vendor in the opinion of customers. It is mentioned that JIT Customer includes the ability of the sales organization to provide quality products at times and in quantities that customers demand (Green et al, 2005: 3439). Germain et al (1994: 475) mentioned that JIT Customer affects performance. Chapman and Carter, (1990: 37) noted that JIT Customer improves the service of customer through decreasing inventory and other kinds of waste since it specifies conditions which lead to rework and waste. In addition, it is claimed that JIT Customer is a strategy of time-based, a program that entails significant modifications take place in the form that in-house and out-of-company trades work, and the system creates the conditions for the production of high-quality market goods with relatively low inventory (Claycomb et al, 1999: 617).

Hopp and Spearman (2000: 10) noted that applying JIT Customer methods such as good association with famous suppliers, decreasing time, decreasing batch size, workload of uniform, increases the capability of meeting expectations of customer that results in increased sales. Customer of JIT, based on Amasaka (2007: 69), means designing and improving productions for meeting customer requirements by the use of set objectives and recent scientific techniques and helps to quickly specify their wants and desires. Green et al. (2005: 3439) acknowledged that JIT Customer is applied for matching the company with customers who can add value to the entire procedure of selling and delivering the productions organization to the last consumer with least cost and waste. According to Hamarneh (2019: 12) JIT Customer, customer compliance with the services provided and ease of access is zero with complaints.

1.4.4. Kanban

Kanban in Japanese means “card”, and the term contains information orders for the production or transfer of goods to the previous station or supplier (Markham et al., 1998: 719). With the help of Kanban, the allowable amount of production at each workstation and the amount of permitted movement of semi-manufactured goods between workstations or components of the supply chain are determined and communicated (Jothishankar and Wang, 1992: 451; Junior & Filho, 2010: 16). This system was first designed and implemented in Toyota. Kanban enables the timely transfer of information and inventory items across supply chains and the ability to communicate at different levels of the chain (Zipkin, 1991: 41). For this reason, the use of this system is increasing in other countries and industries (Markham et al., 1998: 719). In the automotive industry, more attention has been paid to the traction system and Kanban. This attention is due to the high cost of transportation, the need for more space, and the greater variety of parts and products (Satoglu and Ucan, 2015: 2). Kanban system reduces the level of semi-manufactured inventories in the supply chain by ordering on time and in appropriate quantities in addition to reducing surplus production. This allows planners to use the appropriate transportation equipment to reduce redundant transportation and achieve the goal of a lean manufacturing approach (Abdul Rahman et al., 2013: 176).

In general, two types of kanban are used in production (Chaharsooghi and Sajedinejad, 2010: 145); Production channel, which communicates the type and amount of production to workstations or components of the supply chain, and transmission channel (transport), which acts as a license to move a certain amount of a particular product between different sectors. Carriers determine the time it takes for parts to move from one station on the manufacturing line to another or from one supply chain component to another (Markham et al., 1998: 720). In addition to specifying the piece and the quantity, the “carrier kanban” specifies where the piece comes from and where it goes. How kanban is used in production is usually a function of two methods: single-channel and double-channel. In the single-channel method, which is usually of the transfer type, the parts are produced at the same station as the number of parts that are licensed for transmission, and the transferred parts are replaced. In a two-channel system, the amount of goods that is licensed at each station is not equal to the number of goods transferred from that station.

The Kanban system is effective when properly designed and guarantees lean manufacturing goals (Khojasteh and Sato, 2015: 4365). This system, like other systems, must be designed according to the limitations and conditions in each industry to have the necessary efficiency (Junior & Filho, 2010: 16). Khojasteh and Sato (2015: 4365) performed some simulation studies, which showed the importance of designing Kanban control systems in production systems with different characteristics.

Toyota introduced these simple principles to its factories. Different teams made cards (or Kanban) to indicate that they had the extra capacity and were ready to receive more material. The Kanban method is sometimes called a pull system because all its parts are received from orders. This system allows manufacturers to extract the value expected by the customer from the production process. The traction system is opposite to the compression system. In a traction system, supply and production occur when end customers request it, and this reduces inventory under construction. While for the manufacturers in the compression system, the production is based on demand forecasting. For this reason, in this system, the level of inventory during construction increases (Junior & Filho, 2010: 17).

1.5. FINANCIAL PERFORMANCE

Performance is one of the most controversial concepts and has never been agreed upon by researchers and theorists. This index has been used with different definitions in different fields such as airline, education, management, and computer sciences. Financial performance is defined as “profitability”, which is the ability of capital to earn a profit (Needles, 2010: 2). A full examination of a company's total status in areas including overall profitability, income, costs, equity, liabilities, and assets is known as financial performance. This method is measured through various business formulas that allow companies to calculate the exact details of a company's potential effectiveness (Hulten, 2009: 12). Financial performance is used to determine the welfare and position of relevant companies in other metrics. It is analyzed to determine potential investment opportunities and to determine whether the company is profitable or not (Wang and Sarkis, 2017: 1608). It is also an objective measure of how well an organization has used its assets to generate revenue. A company's financial performance is a significant measurement for evaluating its performance, and the degree of achievement of its predetermined goals (Needles, 2010: 2).

Understanding financial performance is essential for any organization because most of the important decisions of the organization depend on finance. Thus, its proper analysis assists in the company's decision-making process (Wang and Sarkis, 2017: 1608). In their meta-analysis and literature review research of the most relevant experimental research on the influence of JIT techniques on performance, Mackelprang and Nair (2010: 283) found that JIT enhances performance, and by reducing delivery time, cycle time, inventory turnover, production costs, and enhancing flexibility, and fast delivery in volume, lead to increased financial performance. Based on Bortolotti et al (2013: 1117) JIT system through financial production, adherence to a daily schedule, reducing start-up time, inventory level (finished goods, finished goods, and raw materials), cycle time, flow arrangement can reduce financial costs, and promoting financial performance. The following are the most important indicators of measuring financial performance.

Return on Assets (ROA)

One of the financial ratios produced by dividing net profit + interest expenditure by total assets is return on assets (ROA). Return on assets, as the name implies, helps an organization determine the profitability of its assets (Wang and Sarkis, 2017: 15). ROA is calculated from the following formula:

$$ROA = \frac{\text{Net Income}}{\text{Average Total Assets}}$$

Gross profit

Because gross profit is equal to sales income minus cost of products sold, it only removes a portion of the expenses that may be found directly in the manufacture or acquisition of items. General expenditures (overhead) including G&A, S&M, and R&D, in addition to unusual items, taxes, and interest, are all included in gross profit (Needles, 2010: 11).

Gross profit = net sales - cost of goods sold

Net Profit Margin

Net Profit Margin is the unit of income minus the taxes, interest, depreciation, costs, and cost of goods sold in an accounting time. Margin of Net Profit is calculated from the following formula (Needles, 2010: 12):

Net profit Margin = Pre-tax profit - tax

Sales growth

The capacity of a corporation for selling in a certain time is measured by sales growth. Sales growth is an important measurement that drives the developing and implementing corporate strategy and is applied by the board of directors and executives in making decisions (Hulten, 2009: 15).

Market share

Market share is the percentage of total income or sales in the markets which makes up a company's business. It can be calculated from the following formula (Needles, 2010: 15):

$$\text{Total Market Unit Sales (\#)} = 100 * \text{Unit sales (\#)} / \text{Unit market share (\%)}$$

1.6. WASTE REDUCTION

Waste indicates items that are related to production but do not contribute value to the products (Chauhan et al, 2015: 422). Reduction of waste entails supporting the creation of readily recyclable items, including switching from packaging of multi-material to single-material packaging. Product redesign, modifications in material usage, and limits on certain product categories are all strategies for reducing waste. Activities of waste reduction are significant for stopping or slowing down per capita waste generation (Skinner, 2004: 1093). Reducing waste is likely to have important consequences for the company. Worker productivity might enhance due to reduction of waste, while the quality of the product may decrease. Costs are also reduced by reducing waste. Waste reduction activities are very extensive and their comprehensive evaluation is very difficult (Cheremisinoff, 1995: 1).

There are several aspects to reducing waste, which are all necessary to be considered. Reduction of toxic substances one of these aspects, through which the concept of the waste changes through decreasing the applying toxic substances in consumer productions. Reduction of waste volume is another case, which refers to the reduction of the amount of waste produced using fewer materials (Skinner, 2004: 1093). A company can reduce waste by using the JIT system by replacing and redesigning raw materials or products and processes. Give (Bortolotti et al, 2013: 1119).

1.7. COST REDUCTION

De Toni and Nassimbeni (2000: 633) defined “cost” as all the costs associated with routine preparation from the entry of materials into the final product. Gillen and Lall (2004: 44) stated that a company should be able to decrease its costs of production. It is noted that JIT leads to a reduction in total order/installation, breakdown, and maintenance costs (Yang

and Pan, 2004: 855). Kannan and Tan (2005: 155) acknowledged that cost-cutting is driven by effective supply chain management.

JIT has the impact of reducing the number of cost factors per product in cost management systems. To manage manufacturing costs, systems of standard cost keep several cost factors of the product, including direct labor and direct materials. JIT, on the other hand, identifies cost incentives related to production expenses, allowing production costs to be decreased via better design and procedure. In the JIT system, the concentration shifts from elements of reporting cost to eliminating and preventing costs. In addition, JIT reduces the costs associated with calculating, maintaining, and controlling inventory. In short, the cost is the amount that must be spent on a customer to buy a product or service. To boost their profitability, all businesses attempt to reduce expenses as much as feasible. (Hamarneh, 2019: 9).

SECTION 2: PROFIT MAXIMIZATION

This section contains the theoretical foundations of profit maximization. In this part, the definitions and concepts of profit, profitability and profit maximization are reviewed.

2.1. PROFITS

Profit is one of the best indicators for measuring the activities of an economic unit. Scientists and researchers have described its different approaches in the framework of scientific findings, measured the strengths and weaknesses of perceptions, and with effort, increased its accuracy and capabilities (Alarussi & Alhaderi, 2018). It is sometimes argued that a company's profits, as accountants calculate, cannot determine the value of that company. As we know, by changing the method of calculating inventory, depreciation and recording income, it is easy to change the company's profit. Thus, managers can use accounting profits to mislead the market (Fama & French, 2006).

Profit is the financial benefit derived from a business activity that describes the revenue generated more than the costs and taxes associated with the activity in question (Courbois and Temple, 1975: 100). Profit is calculated as total income minus total expenses. Profit is a profitability indicator (the primary interest of the owner) in the process of earning revenue in the markets (Craig and Harris, 1973: 14). Profit is a key source for well-being of economic since it entails both revenue and the ability to expand output (Genesca and Grifell, 1992: 556).

Today, analysts and investors use profit as a criterion for valuation, stock forecasting, bankruptcy, stock price reaction, etc. Profit is the difference between the current price of items of expenditure minus revenue from current sales. The term profitability refers to the ability of companies to earn revenue and profit. Net profit is the only measure of profitability (Alarussi & Alhaderi, 2018). Investors and lenders are very interested in evaluating the current and future profitability of the company, and companies have to make a sufficient profit to provide the appropriate return for investors and lenders in order to attract the required capital. Profit is a guide for investment and decision-making. It is often assumed that investors seek to maximize their return on investment given an acceptable degree of risk (Burja, 2011).

Profit as a forecasting tool helps people predict future profits and economic events. In fact, it has been proven that the amount of profits calculated based on historical prices and current values can be used to predict profit (Fama & French, 2006). The company's profit includes operating results or ordinary profit as well as non-operating results or profit due to unexpected events. The sum of these two profits is equal to net profit. Normal profit is assumed to be continuous, but non-operating profit and loss are due to contingencies that the sum of these two profits is equal to net profit. Normal profit is assumed to be continuous, but net profit and loss prevail. In other words, net profit behavior is unusual and cannot be useful for investors in terms of decision-making, so it is better to use this criterion for accurate forecasting (Hofstrand, 2009).

Profit is considered as a measure of efficiency. A standard benefit is the management oversight of the company's resources and the efficiency of management in carrying out the company's affairs. According to the report of the Financial Accounting Standards Board, financial statements can be used as a basis for judging the ability of management to make the optimal or effective use of company resources and management performance in order to achieve the initial goals of the company (Burja, 2011).

2.2. PROFIT REPORTING OBJECTIVES

The primary purpose of profit reporting is to provide useful information to those who are most interested in financial reporting. But more specific goals are needed to better understand earnings reporting (Hofstrand, 2009). One of the main goals that is the most important goal from the point of view of all users of financial statements distinguishing between investment and profit (resources and flows) is part of the descriptive accounting process. According to Burja (2011), the specific objectives of the earnings report include the followings:

1. Using profit as a measure of management efficiency.
2. Use historical dividend amounts to predict the future of the for-profit unit and the future distribution of dividends.

3. Using profit as a measure of achievement as well as a sign of future management decisions.

Other purposes not mentioned above include the use of profits as a basis for tax assessment, the evaluation of the pricing of products by priced units, and the evaluation of resource allocation by economists.

2.3. PROFITABILITY

Profitability is the main goal of all business investments. Without profitability, a business will not last long. Therefore, measuring current and past profitability and predicting future profitability is very important. Profitability is measured by income and expenses. Income comes from business activities. For example, if agricultural and livestock products are produced and sold, revenue is generated. However, money that comes into business from activities such as borrowing money does not generate income. It is simply a cash transaction between the business and the lender to generate cash to start the business or buy the asset (Hofstrand, 2009).

The end result of all plans, activities, financial decisions, production and management performance is reflected in the company's profitability. Profitability is the ability of a company or institution to generate sufficient revenue so that, after paying current expenses, an additional amount called profit remains for the company. Investors and lenders are keen to evaluate a company's current and future profitability. Companies have to make enough profit to provide the right return for investors and lenders to raise the capital they need. If companies do not earn enough profit, they will not be able to raise the capital needed to implement all kinds of projects through shareholders or creditors. The survival of a company in the long run depends on its ability to earn revenue to meet all obligations and provide adequate returns for major shareholders.

The capacity of a corporation to produce a profit is referred to as profitability. It is the result of all the company's financial plans and decisions. Profit-to-sell and equity return variables are often used to measure profitability. The best way to measure profitability by evaluating company performance is to calculate the rate of return on equity and the rate of return on assets. Return on assets determines the relationship between the volume of the

company's assets and profits. If a company increases its investments (in terms of total assets, of course) but fails to increase its after-tax profit proportionately, the rate of return on assets decreases (Hulten, 2009: 11). In other words, when the level of profit before interest and taxes is low, from the point of view of earnings per share, financing through equity is more desirable than financing from debt. On the other hand, when the level of profit before interest and taxes is high, from the point of view of earnings per share, debt financing is more pleasant than financing through ordinary shares (Jorgenson et al, 2014: 1).

Profitability is defined as the capacity of a company, business, or corporation to report productivity, profits, and economic benefits on an annual basis. In other words, profitability is the ability to derive economic benefits from a particular job to generate profit, not just to continue the business. Thus, profitability represents the relationship between economic investment and effort (measured in hours worked) and firm income. The second meaning of profitability refers to the profit that individuals receive from the profit in their savings accounts, which can be fixed income or variable income (Gul et al., 2011). Profitability, also, can be defined as accounting profit or economic profit (Hofstrand, 2009).

Accounting profit (net income)

Traditionally, profits have been calculated using "accounting profit". To understand accounting profit, we refer to our income tax return, which provides a list of taxable income and deductible expenses (Soyemi et al., 2013). These are the items that are used to calculate accounting profit. However, the tax return may not give the company an accurate picture of profitability due to rapid depreciation and other factors. To calculate an accurate picture of profitability, you may want to use a more accurate measure of depreciation. Accounting profit provides managers with an average view of business viability. Although one year of loss may not permanently hurt your business, consecutive years of loss (or insufficient net income to cover expenses) may jeopardize business viability (Hofstrand, 2009).

Economic benefits

In addition to deducting business expenses, opportunity expenses are also deducted when calculating "economic benefits". Opportunity costs are related to money (net worth),

labor, and company management ability (Soyemi et al., 2013). An opportunity cost is the return on investment that is lost by not investing money elsewhere and wages by not working elsewhere. These are inferred from normal business expenses in the calculation of economic benefits. Economic profitability provides managers with a long-term vision of the business (Hofstrand, 2009).

2.4. CRITERIA FOR MEASURING PROFITABILITY

The main emphasis of advanced financial reporting is on the conditions for measuring earnings as an indicator of the performance of a for-profit unit. Efficient operations in the business unit affect the current and future process of dividend payment to shareholders. Therefore, all property rights holders, especially ordinary shareholders, are interested in the desired efficiency of management. Since the company's special profit affects the amount of dividend, most shareholders follow the company's profit trend. One of the interpretations that works is the relative ability of management to obtain maximum returns using limited resources, the acquisition of fixed returns using minimum resources, and the optimal combination of resources that will result in maximum returns for business owners (Soyemi et al., 2013).

Profitability ratios are used to measure profitability. Profitability ratios are used to evaluate the executive operations of companies. Profitability ratios measure a company's success in generating net profit and return relative to revenue and sales, or relative to investment. They measure the overall performance of a company and the efficiency of management in obtaining appropriate profits. These ratios are of two types. The first category measures profitability in terms of sales and revenue. The second category measures profitability in relation to investments and assets (Gul et al, 2011).

In this article, Return on Assets (ROA Ratio of Equity) (ROE), the most commonly used gross profit net profit margin will be described.

2.4.1. Return On Assets (ROA)

The company's assets play a key role in earning profit. The more efficiently the assets are used, the more profitable the bank will be. Assets, regardless of whether they are

provided from the borrowers' funds or investments of the original owners, perform their duties properly. Return on assets measures how the bank's assets are used to generate revenue and sales by management and is the best ratio for management evaluation, as it evaluates the net income generated from the use of the bank's total assets. Hence, it is less prone to deviation than the return on capital ratio (Gul et al., 2011). This ratio relates the operating profit ratio to the total resources managed by the bank. Shareholders and managers compare the return on bank assets with the return on resource utilization in other areas. The higher this return, the better the bank's efficiency in utilizing assets and resources (Khrawish et al., 2011, p.52).

Different methods of calculating ROA

The standard and general return on investment based on return on investment (ROI) is calculated as the net after-tax profit (EAT) divided by the total investment.

ROI = EAT / Investment

What investment should be made in the deductible? It can be equity, debt, and all funds provided, total assets, or only tangible assets. No matter how the investment is defined, different ROIs are calculated. The first and most common definition of an investment is the total assets used to generate profitability. So when we say 'from ROI to ROA', we mean the return on assets, or more precisely, the return on total assets.

ROA = EAT / TA

This rate describes how the company's assets have been used efficiently to generate profits.

2.4.2. Return On Equity (ROE)

It is a measure of financial performance that is calculated by dividing net profit by equity. ROE is considered the net return on assets because equity equals the assets of the company minus its debt. ROE is a measure of a company's profitability and its efficiency in generating profit.

Calculate ROE

ROE is expressed as a percentage and can be calculated for each company if the net profit and equity are both positive numbers. Net profit is calculated before dividends are paid to ordinary shareholders and after dividends to distinguished shareholders and dividends to lenders.

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Average Shareholders Equity}}$$

Net income is the sum of income, net expenses, and taxes that a company incurs for a given period. The average equity is calculated by adding equity at the beginning of the period. The start and end of the period must correspond to the period during which the net income was earned.

2.4.3. Gross profit

Because gross profit is equal to sales income minus cost of products sold, it only removes a portion of the expenses that may be found directly in the manufacture or acquisition of items. General expenditures (overhead) including G&A, S&M, and R&D, in addition to unusual items, taxes, and interest, are all included in gross profit (Needles, 2010: 11).

Gross profit = net sales - cost of goods sold

2.4.4. Net Profit Margin

Net Profit Margin is the unit of income minus the taxes, interest, depreciation, costs, and cost of goods sold in an accounting time. Margin of Net Profit is calculated from the following formula (Needles, 2010: 12):

Net profit Margin = Pre-tax profit – tax

2.5. PROFIT MAXIMIZATION

In economics, profit maximization is the short-term or long-term process by which a company may determine price, input, and output levels that lead to the highest profit. One

assumption in classical economics is that companies seek to maximize profits (Pettinger, 2019)

$$\text{Profit} = \text{Total Revenue (TR)} - \text{Total Cost (TC)}.$$

Thus, profit maximization occurs in the largest gap between total revenue and total cost. A company can maximize profits if it produces output where final revenue (MR) = final cost (MC).

To understand this principle, see Figure (2.1).

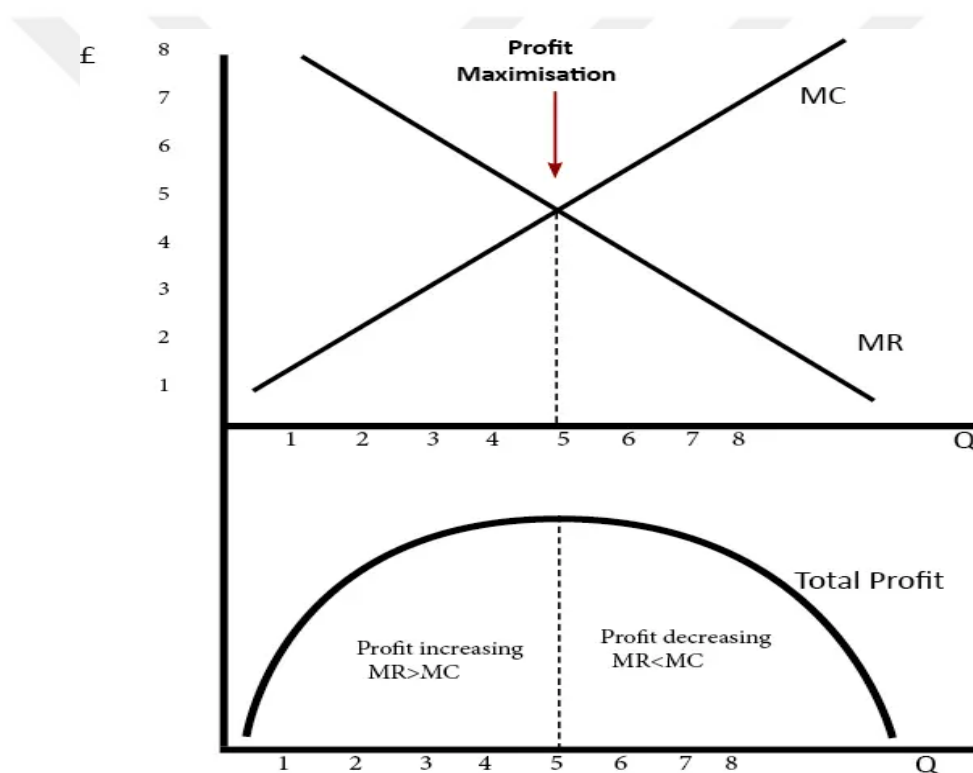


Figure 2. 1: Profit Maximization

Source: (Pettinger, 2019)

If the company produces fewer than five outputs, the MR is larger than the MC. Therefore, for this additional output, the company earns more revenue than it pays, and the total profit increases.

At output 4, the MR is only larger than the MC. Therefore, there is only a slight increase in profits, but profits continue to increase.

However, after output 5, the final output cost is greater than the final revenue. This means that the company will see a decrease in its profit level because the cost of these additional units is greater than revenue (Pettinger, 2019).

The simple model of maximizing the company's profits provides very useful guidelines for the company to make decisions regarding efficient resource management. Therefore, any business decision by a company increases its profit if the following conditions are met (Jafar et al., 2010):

1. Increases total revenue more than it increases costs.
2. Increases revenue without changing costs.
3. Reduces costs more than it reducing revenue.
4. Reduces costs, and income remains stable.

2.6. PROFIT MAXIMIZATION LIMITATION

Conventional economic theory assumes that maximizing profits is the sole goal of organizations. In the real world, however, different goals are achieved by organizations. Other important goals of organizations are maximizing sales, maximizing growth rate, maximizing managerial utility function, and maintaining market share. (Jafar et al., 2010). In the real world, it is not easy to know the exact revenue and cost of the last item sold. For example, it is difficult for companies to know the price elasticity of demand for their product, which determines the MR. The increase in profitability also depends on the reaction of other companies. If they raise prices and other companies follow, demand may not be elastic. However, if they are the only company that raises prices, demand will be elastic (Landsg, 2002).

However, companies can make the best estimates. Many companies may be forced to try to maximize profits through trial and error. For example, if they see a price increase leading to a lower percentage drop in demand, they will try to raise prices as much as they can before demand pulls back.

It is difficult to separate the effects of price changes on demand. Demand may change due to many factors other than price (Lipsey, 1975). Companies may have other goals and considerations. For example, raising prices to maximize profits in the short term can encourage more companies to enter the market. Therefore, companies may decide to make less than the maximum profit and pursue a higher market share (Pettinger, 2019).

In addition, profit maximization theory assumes that organizations are fully aware of the business environment, demand, and cost conditions. However, according to modern economists, organizations do not have complete knowledge of the business environment and their pricing and output decisions are based on probability. Arguing against profit maximization does not mean that profit theory is irrelevant or less important to the business organization. Economists consider profit maximization to be one of the most important business goals of organizations. Hence, they have proposed certain hypotheses about the importance of profit maximization (Jafar et al., 2010):

1. Profit is essential for the survival of the organization.
2. Profit helps to achieve other goals.
3. Maximizing profits has more predictive power.
4. Profit acts as a measure of organizational efficiency.

SECTION 3: PREVIOUS STUDIES

In this section existing studies on Just-In-Time and profit maximization will be reviewed. Studies are in the period of 1995-2020. Then Relationships between variables and research hypotheses development were presented.

3.1. PREVIOUS STUDIES

Agyabeng-Mensah et al (2020) carried out a research entitled "Exploring the mediating influences of total quality management and just in time between green supply chain practices and performance". The primary objective of this research is to investigate the effect of Total Quality Management (TQM), Just in Time System, and practices of Green supply chain (GSCP) on business performance (BP) and operational performance improvement (OP). This research explores the direct impact of TQM, JIT, and GSCP on BP and OP. For collecting data from managers of supply chain and managers of production in 140 manufacturing companies in Ghana, the research uses a quantitative research method using a questionnaire. For analyzing the survey data, this work utilizes the partial least squares structural equation model (PLS-SEM). The findings of the analysis demonstrates that JIT, TQM, and GSCPs positively affect the BP and OP. The results show that GSCP combines with TQM and JIT for significantly improving BP and OP.

NGUGI (2020) conducted a study entitled "Effects of inventory management systems on performance of manufacturing companies in Eldoret Town". The implications of management systems of inventory on the manufacturing firms' performance in Eldoret Town, Kenya are investigated in this research. The study's particular goals were to look at the performance of manufacturing company as a result of impacts Material Requirement Planning (MRP) on. In addition, it aims at examining the impact of the Just-in-Time (JIT) system on manufacturing organizations' performance, inventory of vendor-managed (VMI) system, and Distribution Resource Planning (DRP) system. Theory of Adaptive Structuration (AST), theory of production and inventory, and theory of pure were guiding this research. The study was conducted using a correlational research approach. 24 senior managers, 60 mid-level managers (total quality management, transportation, marketing and sales, materials handling, ICT, finance, supply chain, manufacturing, and stores), and 1,040

manufacturing workers are among the target population. Totally, 1124 enterprises in the city of Dort responded to the survey. This research employed a basic random sampling procedure for selecting 337 participants, and research instruments of this study were non-structural and structural questionnaires. With the applying descriptive and inferential statistics, quantitative analysis was utilized for analyzing and interpreting the data. The findings demonstrate the impact of management systems of inventory on improving inventory efficiency and effectiveness in manufacturing firms. To boost corporate performance, manufacturing organizations must increase the effectiveness and efficacy of inventory management systems, according to this research.

Hamarneh (2019) Conducted a study entitled "The Impact of Total Just In Time on Services Quality of Private Hospitals". The goal of this research is to see how Total JIT affects the quality of private healthcare services in Jordan. Ten hospitals that operate in this sector are included in this research. A questionnaire was used to gather data from 120 managers. The regression test findings demonstrate that the Total Just in Time sub-variables have high scores. The greatest score goes to the JIT client, next the JIT operation, and lastly the JIT provider. The characteristics of service quality have also received good marks, with the visible component scoring the greatest, followed by reliability, accountability, empathy, and dependability. Moreover, the dimensions of service quality and the JIT factor have a significant association. There are also strong links between measures of service quality and JIT sub-variables. The JIT client had the most influence, following by the variable of JIT Operation, and finally the JIT provider. JIT should be used in all service businesses, according to this research, since it impacts service quality.

Phogat, S., & Gupta (2019) conducted a study entitled "Expected maintenance waste reduction benefits after implementation of Just in Time (JIT) philosophy in maintenance". This article examines the benefits of implementing a time management philosophy (JIT). A structured questionnaire was created for this aim and submitted to 421 Indian enterprises. The findings reveal that the level of waste was reduced once the JIT mindset was used in maintenance. Maintenance waste will be considerably decreased when maintenance professionals use parts of the JIT philosophy in maintenance, according to the results of organizational study.

Ganiyu et al (2019) carried out a research entitled "An assessment of just in time system on the manufacturing firms' financial performance in Nigeria". The impact of JIT on the financial performance of manufacturing companies in Nigeria is investigated in this research. The goal of this study is to see how employing JIT might help manufacturing businesses in Nigeria save money and increase their return on investment. A questionnaire was used to obtain preliminary data. A multiple regression approach was used to conduct the research, and the results revealed that the influence of JIT is responsible for 16.3% and 39.4% of the changes in return on investment and cost reduction, respectively. This demonstrates that JIT has helped manufacturing enterprises in Nigeria improve their financial performance, and producers gain substantially from its adaptability. As a result, this research suggests that manufacturing companies use JIT to increase efficiency, reduce production costs, and reduce waste across the supply chain to a minimum.

Darwish (2018) conducted a study entitled "The Effect of Total Just in Time on Competitive Advantage on International Fast Food Restaurants in Jordan". The major goal of this research is to see how Total JIT affects the competitiveness of multinational fast-food businesses in Jordan. All five businesses involved in this industry were included in this research. A questionnaire was used to gather data from 186 managers. To evaluate the hypothesis, a test of regression was used. The findings demonstrate that the Total subcomponents of Just in Time have a good implementation score, with JIT operation coming in first, following by JIT selling, and lastly JIT buying. The aspects of competitive advantage have also received good marks, with quality coming out on top, followed by speed, dependability, cost, and innovation, in that order. Furthermore, there is a significant link between dimensions of competitive advantage and JIT variables. The findings reveal that, in Jordan, all sub-variables of JIT have an impact on multinational fast-food businesses' competitive advantage. The greatest impact was related to JIT sales and they were the variable of JIT operations and then JIT purchases.

Mankazana, S., & Mukwakungu, S. C, (2018) conducted a study entitled "The Impact of Just-in-Time (JIT) in Inventory Management System and the Supplier Overall Performance of South African's Bed Mattress Manufacturing Companies". The primary goal of this research is to look at the influence of just-in-time (JIT) on the company as a

whole and management systems of inventory in South African, through evaluating two firms that produce the same product (bed mattress), but with different management systems of inventory and suppliers. Company (X) has not adopted the Just-in-Time (JIT) method, but Company (Y) has done so. This research will give insight into the advantages and limitations of this method, as well as how it may be utilized to enhance a company's performance. A research approach of mixed-methods is employed in this study, and descriptive statistics were applied for summarizing the results. According to the findings of the research, failing to adopt the JIT system is the reason of poorer performance levels when comparing with the performance of a firm that has. The JIT methodology outlines strategies and standards for improving a company's management system of inventory and overall performance.

Al Haraisa, Y. E. (2017) conducted a study entitled " Just-In-Time System and Its Impact on Operational Excellence: An Empirical Study on Jordanian Industrial Companies ". The major goal of this research is to determine the influence of the just-in-time (JIT) system on operational excellence in the (14) manufacturing enterprises that operate in Al-Karak Governorate in the qualified industrial zone (QIZ) of Al-Hussein bin Abdullah II. To accomplish this goal, the sample unit and analysis (respondents) comprised (168) managers and heads of divisions from the departments of logistic and production, who were chosen specifically for their work in the system area of just-in-time in the target organizations. As a result, the research created a questionnaire with (25) questions in order to collect the needed data from the research population. Multiple regression analysis was also employed to examine the hypotheses in this research. Lastly, the present study's findings revealed that the just-in-time approach in Jordanian industrial firms has a favorable influence on operational excellence.

Zaid, et al, (2016) conducted a study entitled "An empirical examination of the total just-in-time impact on operational performance: insights from a developing country". The primary goal of this research is to look at the influence of supply chain management and total just-in-time (T-JIT) activities (buying, manufacturing, and selling) on operational performance from the standpoint of organizational capabilities. The research data was gathered from 166 industrial enterprises in Jordan in order to attain this goal. The research

hypotheses were tested using a structural equation model, which were constructed to empirically evaluate the influence of JIT production on operational performance and the effect of internal JIT (production) on external JIT (buying and selling) by mediators (JIT selling and JIT purchasing). The findings reveal that production of JIT directly impacts both JIT selling and JIT buying. In addition, the findings reveal that JIT manufacturing has an indirect impact on operational performance via JIT selling, where JIT selling has a direct impact on operational performance.

Dange, et al, (2016) conducted a study entitled "A Systematic Review on Just in Time (JIT)". The primary goal of this research is to look at the function of resources of a company. This paper presents a review of the literature on a small manufacturing company that switched from a producer-consumer connection divided with a buffer to a simultaneity restriction. As a result of these investigations, it has been shown that value mapping is an excellent technique for identifying waste. By concentrating on time reduction, waste removal, and simplicity, Just in Time (JIT) production achieves significant productivity and cost improvements through making the ideal application of human resources. It assists businesses in achieving their long-term goals of long-term viability and profitable expansion. Finally, the findings of this research reveal that removing the buffer system enhanced the requirement of manufacturing system for mixing flexibility, indicating that the JIT system is effective, and that running the JIT system may provide numerous benefits to the case firm.

Khairuddin, M., et al, (2015) conducted a study entitled "Just-in-Time Manufacturing practices and Strategic Performance: An Empirical Study Applied on Jordanian Pharmaceutical Industries". The goal of the study was determining the extent to which Just-in-Time (JIT) manufacturing practices are used (quality of supplier, adherence of daily schedule, commitment of preventive maintenance, layout of equipment, reduction of setup time, and delivery of just-in-time), as well as investigating their effect on Pharmaceutical Manufacturing Firms' strategic performance (JPMF) in Jordan. The research designed a questionnaire that was delivered to a simple random sample of 140 supervisors and managers engaged in the production process at the JPMF in order to accomplish these goals. The influence of JIT procedures on JPMF's strategic performance

was also disclosed in the research. Lastly, the research found that JIT techniques such as delivery of just-in-time, reduction of setup time, layout of equipment, and adherence of daily schedule had an influence on JPMF strategic performance, however quality of supplier and commitment of preventive maintenance have no impact.

Chen and Tan (2014) conducted a study entitled "The perceived impact of JIT implementation on operations Performance". The goal of this article is to look at the influence of implementing a JIT system on operational performance and to figure out how JIT components (both integrated and individual) relate to performance measures. A questionnaire was created to gather data from 224 enterprises in China for this purpose. The findings suggest that using a set of JIT features may increase the performance of manufacturing operations regardless of the industry or sales volume of the organization. Different JIT aspects, on the other hand, were shown to have varying degrees of influence. Some fundamental JIT aspects, including JIT buying, multi-skilled staff, and 5S, might have a bigger impact than others.

Aradhye, A. S., & Kallurkar, S. P. (2014) conducted a study entitled "A Case Study of Just-In-Time System in Service Industry". The primary goal of this research is to utilize a case study for demonstrating several challenges related to JIT implementation in the service sector. The case study takes place during the pilgrimage season. During this time, pilgrims who in the physical line had darshan waited an average of 8 hours, but those who used the Just In Time option waited an average of 30 minutes. 'Just In Time' signifies that the waiting time is shortened. Furthermore, since they knew the precise time of darshan, the pilgrims had previously bought their return travel tickets before darshan. Due to apprehension about the length of the wait, it is not for pilgrims who waited in line for darshan. It was also discovered that contribution collecting during this time was higher than during the previous pilgrimage season. In addition, this case study demonstrates the advantages of using JIT to reduce waiting times. The findings of this study show that the JIT approach is effective, and that using it provides the case industry with several benefits.

Bortolotti et al (2013) carried out a research entitled "Assessing the impact of just-in-time on operational performance at varying degrees of repetitiveness". The purpose of this article is to look at the influence of JIT on responsiveness and performance, as well as

the moderating impacts of demand change and product customization. The study topics were investigated using an international survey of questionnaire-based. A model of structural equation was used to examine data from 244 companies. According to the findings, product customisation has no discernible effect on JIT's performance. Demand variability, on the other hand, moderates the negative link between responsiveness and JIT but not the positive association between performance and JIT.

Madanhire, I., et al, (2013) conducted a study entitled "Application of Just In Time (JIT) Manufacturing Concept in Aluminum Foundry Industry in Zimbabwe". The purpose of this research is to look at the use of the Just in Time (JIT) principle in the aluminum foundry business. The research was according to data from Aluminum Foundry Co's real production activities. It examined the present system of manufacturing and its benefits in light of recent economic and market situations. A study was conducted to see how JIT may be applied in a system of manufacturing. This was accomplished by examining how the production system handles management of inventory, management of supply chain, and management of demand, all of which are strategic objectives in a system of JIT. The majority of the data utilized in this study came from historical sources, including management data of manufacturing, production reports of monthly and daily manufacturing, and reports of yearly from companies. The research discovered that the core aspects of JIT may be implemented into a production system without causing large system modifications. The difference between the business's internal production procedures and the JIT requirements was not as great as one would imagine for a Zimbabwean company.

Mazanai, M. (2012) conducted a study entitled "Impact of just-in-time (JIT) inventory system on efficiency, quality and flexibility among manufacturing sector, small and medium enterprise (SMEs) in South Africa". The primary goal of this research was to determine the effect of implementing a management system of Just-On-Time (JIT) inventory in SMEs in the manufacturing industry. The study's purpose is to accomplish this. To this end, a manufacturing SMEs sample in the non-metals, metals, furniture and wood, food, and other industries received self-administered questionnaires. Lastly, the survey discovered that most of the manufacturing SMEs are not using management

concepts of JIT inventory. Moreover, it was shown that SMEs in the manufacturing industry have obstacles in implementing JIT concepts. Among the hurdles include a lack of dependable supply networks, a lack of cash, and a lack of understanding of rapid financial rewards, to name a few. In addition, statistically important positive connections were shown between the use of JIT inventory management techniques and flexibility, quality, and cost efficiency. As a result, implementing JIT inventory management techniques to manufacturing SMEs may provide considerable advantages regarding the more flexibility, reduced operating costs, and enhanced product quality.

Mackelprang and Nair (2010) conducted a study entitled "Relationship between just-in-time manufacturing practices and performance: a Meta analytic investigation". The association between performance outcomes and JIT production techniques is investigated in this research using meta-analysis. The findings of this meta-analysis suggest a beneficial association between overall performance and production processes of JIT, according to in-depth literature study from 1992 to 2008. The data, nevertheless, reveal that not all JIT approaches are linked to a wide range of performance outcomes. This research stresses the significance of moderators in the link between performance and JIT functions by highlighting functions of JIT that have the highest influence on outcomes of individual performance.

Kros, et al, (2006) conducted a research entitled "Impact of just-in-time inventory systems on OEM suppliers". The primary goal of this research is to examine the influence of various equipment manufacturers' (OEMs) adoption of just-in-time (JIT) manufacturing methods on their suppliers' inventory profiles. The research will look at five financial indicators of management performance of inventory from 1994 to 2004. The study looks at three different industries in which OEMs have embraced and implemented JIT techniques. Automobiles, electronics, and aviation are among these businesses. Generally, suppliers of OEM in the aircraft industries, electronics, and automotive have presented mixed outcomes when it comes to the effect JIT adoption has had on performance indicators of inventory, according to the report.

Reid, (1995) conducted a study entitled "Just-in-time Inventory Control and the Economic Integration of Japanese-owned Manufacturing Plants with the County, State and

National Economies of the United States". The primary goal of this research is to provide light on the continuing discussion about the geographical consequences of manufacturing systems of just-in-time (JIT). The dispute has centered on the degree to which JIT inventory management favors the geographical clustering of network members of JIT. The study's goal is to attain this goal. This hypothesis is examined for host economies characterized in three geographic scales: national, state, and county, using survey data obtained from 239 Japanese-owned manufacturing facilities in the United States. The notion is supported at the county level, while not at the levels of national or state. The findings of this research suggest that JIT inventory management supports the creation of backward and local resource input links, supporting the hypothesis that JIT increases geographical clusters in JIT network members.

3.2. RELATIONSHIPS BETWEEN VARIABLES

According to the empirical studies, JIT and performance have a good association (Ngugi, 2020; Ganiyu et al, 2019; Mankazana & Mukwakungu, 2018; Zaid, et al, 2016; Khaireddin et al, 2015; Chen and Tan, 2014; Bortolotti et al, 2013; Mackelprang and Nair, 2010). Chen (2015: 1015) in his research in China suggests a developing country JIT improves performance of finance. Based on Agyabeng-Mensah et al. (2020: 156), JIT increases responsiveness to a company's competitive advantage and decreases time of delivery. By cost savings, this improves operational and financial performance. That being said, Flynn's (1995: 1325) findings failed to establish a positive association among company performance and JIT. Ganiyu et al (2019: 111) revealed that JIT has helped manufacturing businesses in Nigeria improve their financial performance, and manufacturers gain substantially from its compatibility. Therefore, it can be expected that JIT implementation can lead to increased financial performance.

H1: Just-In-Time system application has an important impact on financial performance.

It is stated that the system of JIT is associated with ensuring a maximum strategy of demand for buying raw materials, reducing total product costs, and reducing the risk associated with further supply (El-Dabee, et.al, 2013: 42). Ganiyu et al (2019: 111) also recommend that for achieving greater efficiency, manufacturing companies must use JIT

in reducing the costs of production. Mazanai (2012: 5786) noted that efficient inventory management systems lead to a significant reduction in operating costs. The JIT system's fundamental idea is centered on inventory and inventory production that causes savings of cost (Monden 2011: 3). It is claimed that the major procedure of the JIT system is to reduce product costs by eliminating defects and rework. Therefore, it can be expected that JIT implementation can lead to cost reduction (Ramezani & Razmeh, 2014: 11).

H2: Just-In-Time system application has a significant impact on cost reduction.

The JIT system can be described as an approach aimed at generating the right item at the right period and in the right location. every activity's waste increases the cost of production, including unnecessary material handling, accumulation of excess inventory, or the use of improper production methods that create products that need to be reworked. Successful implementation of JIT leads to waste elimination. (Chauhan et al, 2015: 417). According to Phogat & Gupta (2019: 25), the amount of waste was minimized when the JIT philosophy was used in maintenance. Ganiyu et al (2019: 111) also received JIT helps to eliminate waste to a minimum. Therefore, it could be expected that the JIT implementation can result in reducing waste.

H3: Just-In-Time system application has a significant impact on waste reduction.

3.3. THE DISTINGUISHING FEATURE OF THE PRESENT STUDY

Based on a review of the research background, it was found that the present study differs from previous research in several ways. This research first explores the effects of JIT implementation on three aspects of financial performance, waste reduction, and cost reduction, while previous research has considered only one of these dimensions. In addition, most of the previous research have examined the impact of JIT on performance (Ngugi, 2020; Ganiyu et al, 2019; Mankazana & Mukwakungu, 2018; Zaid, et al, 2016; Khaireddin et al, 2015; Chen and Tan, 2014; Bortolotti et al. al, 2013; Mackelprang and Nair, 2010), while other aspects were studied to a much lesser degree. On the contrary, most of the researchers considered the system of JIT as a one-dimensional structure and limited researches examined different elements of the JIT system. Also, in addition to the three dimensions that were studied in most researches, this research includes the

dimensions of the JIT system including JIT Purchasing, JIT Operation, JIT customers (Darwish, 2018; Hamarneh, 2019) taken components of the JIT system. Another distinguishing feature is the use of questionnaire tools to collect information. In most JIT researches, the available documents have been used to test the hypotheses. The study also focuses on manufacturing companies in Sulaymaniyah, Iraq, which has not been surveyed before. Therefore, the present study is different and innovative compared to previous research.



SECTION 4: EMPIRICAL ANALYSIS OF THE EFFECT OF JUST IN TIME PRODUCTION SYSTEM IN ACHIEVING PROFIT MAXIMIZATION IN INDUSTRIAL COMPANIES

In this section, the research methodology was discussed and the research design , Statistical population and sampling, tools and methods of analysis were introduced. Then the findings were analyzed with SPSS software.

4.1. RESEARCH DESIGN

Research design includes an approach to research techniques and methods selected by a researcher. This scheme allows researchers to select research methods that are appropriate to the topic and adjust their studies accordingly. A research plan is a structure for determining the answers of the questions. (Creswell, 2014). In the present study, a quantitative research design was used for collecting data. Quantitative research is based on the collection of quantifiable data in order to create facts and uncover study trends. For collecting data, quantitative approaches are more systematic than qualitative ones. (Creswell, 2014). Quantitative methods have the following advantages (Hughes, 2006):

1. Accuracy: Because of reliable sensors and measurements
2. Control: Because of design and sampling
3. Capability of providing causal relationships: Because of the application of controlled tests
4. Statistical methods which gives the researcher ability of performing complex analyzes.
5. Reproducibility

4.1.1. Research Method According To Objective:

The current research is “applied research” in terms of purpose, as its outcomes could be applied directly in industrial companies.

4.1.2. Research Method According To Data Collection Method

This research is a “descriptive, survey-based research” with regards to how the data was collected. A “descriptive research” includes surveys and citations of facts about the characteristics of society. Because the survey method is done through a questionnaire to answer questions by a sample of respondents (Kothari, 2004).

4.2. STATISTICAL COMMUNITY

A statistical population is a group of events, objects or people that are evaluated in a specific context (Saunders, Lewis, and Thornhill, 2011). In this research, the statistical population includes the senior and middle managers of industrial companies of Sulaymaniyah which are 20 companies. According to the purpose of research, in each company, 5 people are the target community, which are CEO, Procurement Manager, Stock control Manager, Warehouse Manager and Production Manager. Therefore, according to 20 companies, the statistical population includes 100 people.

4.3. SAMPLING METHOD

Krejcie Morgan table is utilized for determining the sample size. Based on this table, the sample size for a community of 100 people is 80. For sampling, 16 companies were randomly selected and according to the probability of falling questionnaires, a total of 80 questionnaires were provided to each firm, totaling 5 per company. The questionnaires were given to CEO, Procurement Manager, Stock control Manager, Warehouse Manager and Production Manager of the companies.

4.4. DATA COLLECTION

A questionnaire was utilized for collecting research data. A review of the background of study shows that most of the researches in this field used questionnaire tools to collect information.

With the questionnaire tool, it is possible to survey managers more quickly (compared to interviews). Also, in the questionnaire tool, there is no need to provide confidential financial information of the company, and companies provide their

information to the researcher more easily. It also has the following benefits (Jones et al, 2013):

- More accurate answers by keeping people confidential
- The conditions are the same at the time of completion
- No need for the interviewer and no effect
- Ability to quantify a lot of data and then analyze the various correlations between them
- Large amounts of information can be collected in a relatively cost-effective way and in a short time from a large number of people
- It could be done by a small number of people or a researcher with a restricted effect on reliability and credibility
- The outcomes of the questionnaires could often be measured easily or quickly through utilizing a software package or by a researcher
- They could be used to compare and contrast with other researches and may be used to measure changes

By referring to the company, the managers were given the opportunity to respond to the questions of the questionnaire in order to conduct scientific research. Respondents were assured that the information would be used solely for the purpose of conducting scientific research.

4.5. MEASURING RESEARCH VARIABLES

The research variables are as follows:

The independent research variable includes applying the system of JIT in the company. A review of the research background shows that different researchers have used different questions to measure the implementation of the JIT system. In this study, total JIT involves three sub-variables; JIT customers, JIT operation, JIT purchasing, and Kanban with a five-point Likert scale (strongly disagree = 1 to strongly agree = 5). JIT purchasing

has 10 questions adopted from Darwish (2018) and Hamarneh (2019), JIT operation has 9 questions adopted from Darwish (2018), Hamarneh (2019) and Bortolotti et al. (2013), and JIT customers has 7 questions adopted from Darwish (2018), Hamarneh (2019) and Abdallah and Matsui (2007). Kanban as 4 questions adopted from Abdallah and Matsui (2007) and Bortolotti et al. (2013).

The dependent variable of the research is maximize profits, which is investigated in terms of financial performance, cost reduction and waste reduction. Profit maximization, in economics, refers to the long-term or short-term process through which companies generate additional output because the revenue generated exceeds the cost. Therefore, the total profit will increase (Landsg, 2002: 23).

Research-related variables include financial performance, cost reduction, and waste reduction. To measure financial performance, this study uses the Agyabeng-Mensah et al.'s scale (2020) consisting of five items with a five-point Likert scale (strongly disagree = 1 to strongly agree = 5), which has been approved by Feng et al (2018) and Agyabeng-Mensah et al (2020). To measure cost reduction, by comparing operating cost, inventory cost and product price with the last 3 years, the amount of the reduction of the company's operating cost is determined, and in this regard, 3 items with a five-point Likert scale (strongly disagree = 1 to strongly agree = 5) are used. To measure waste reduction, by comparing waste, rework and energy consumption with the last 3 years, the company's waste reduction rate is determined, and accordingly, 3 items with a five-point Likert scale (strongly disagree = 1 to strongly agree = 5) are used.

4.6. RELIABILITY AND VALIDITY OF THE TOOL

Reliability and validity are criteria utilized for testing the validity of study instruments.

4.6.1. Validity

Validity refers to the ability of the measuring instrument to measure the targeted feature rather than another property (Kothari, 2004). It will be utilized in this study to assess face validity (available from consultants, supervisors, and other professionals), and the

instrument's face validity was validated after adjustments in terms of expressiveness of the test questions and translation eloquence.

4.6.2. Reliability

The dependability of a measure presents the consistency and stability of notion being measured, and it assists in evaluating the quality (fitness) and accuracy of a measure (Kothari, 2004).

In the Cronbach's alpha approach, 20 questionnaires are distributed throughout the statistical population, and their reliability is determined using the Cronbach's alpha test and SPSS software. Table 4.1 displays the outcomes.

Tablo 4. 1: Cronbach's Alpha of the Research Questionnaire

Variables		Cronbach alpha
just in time Implementation	JIT purchasing	0.926
	JIT operation	0.704
	JIT customer	0.781
	Kanban	0.758
maximize profits Financial performance		0.712
Cost reduction		0.736
waste reduction		0.705

When the questionnaire's reliability is more than 0.70, it is considered acceptably reliable; in fact, the closer this amount is to one, the more reliable the questionnaire is.

4.7. DATA ANALYSIS METHOD

Data analysis in this research will be done in two parts: inferential and descriptive statistics. In the descriptive statistics section, using the graphs and tables of frequency distribution, the demographic information of the respondents will be provided; and in the

inferential section, Correlation, Kolmogorov-Smirnov test, linear regression tests was used with the spss software.

4.8. DATA ANALYSIS

In this phase, the obtained data is summarized and categorized using indicators of descriptive statistics in order to describe the sample's characteristics, and then the hypotheses are confirmed or rejected through inferential statistics indicators. It's worth noting that 80 questionnaires were given to 16 different industrial units. (5 questionnaires in each unit), and of these, 62 completed questionnaires were received.

4.8.1. Demographic Analysis

4.8.1.1. Assessing The Status Of Respondents By Gender

Frequency of respondents in terms of gender are provided in table 4.2.

Tablo 4. 2: Gender of Respondents

	Frequency	Percent	Cumulative Percent
Male	54	87.1	87.1
Female	8	12.9	100.0
Total	62	100.0	

According to Table 3.2, 87.1% of respondents are male and 12.9% are female respondents.

4.8.1.2. Assessing The Status Of The Respondents According To The Division

Frequency of respondents in terms of division are given in table 4.3.

Tablo 4. 3: Respondents Division

	Frequency	Percent	Cumulative Percent
Operation department	22	35.5	35.5
Quality department	13	21.0	56.5
Marketing department	10	16.1	72.6
Supply Chain department	17	27.4	100.0
Total	62	100.0	

According to Table 4.3, 35.5% were from the Operations Department, 21% from the Quality Department, 16.1% from the Marketing Department, and 27.4% from the Supply Chain Department.

4.8.1.3. Assessing The Status Of Respondents According To Age

Frequency of respondents in terms of age are given in table 4.4.

Tablo 4. 4: Respondents` Age

	Frequency	Percent	Cumulative Percent
20-25	5	8.1	8.1
26-30	21	33.9	41.9
31-35	28	45.2	87.1
35 or more	8	12.9	100.0
Total	62	100.0	

According to the table 4.4., the age of 8.1% were from 20 to 25 years, 12.9% were from 26 to 30 years old, 45.2% were from 31 from 35 years old, and 33.9% were over 35 years old.

4.8.1.4. Assessing The status Of Respondents In Terms Of Education

Frequency of respondents in terms of education are given in table 4.5.

Tablo 4. 5: Education of Respondents

	Frequency	Percent	Cumulative Percent
Matriculation or below	8	12.9	12.9
Associate degree	7	11.3	24.2
Bachelors	42	67.7	91.9
Masters or Above	5	8.1	100.0
Total	62	100.0	

According to the table 4.5., 12.9% had Matriculation or below, 11.3% Associate degree, 67.7% had a bachelor degree, and 8.1% had a master degree or higher.

4.8.1.5. Assessing The Status Of Respondents Based On Work Experience

Frequency of respondents in terms of work experience are given in table 4.6.

Tablo 4. 6: Experience of Respondents

	Frequency	Percent	Cumulative Percent
less than 5 years	11	17.7	17.7
6-10 years	16	25.8	43.5
10-20 years	31	50.0	93.5
more than 20 years	4	6.5	100.0
Total	62	100.0	

According to the table 4.6., 17.7% has less than 5 years of work experience, 25.8% had 6-10 years, 50% had 10-20 years, and 6.5% had more than 20 years.

4.8.2. Descriptive Analysis of Variables

To describe the respondents' perceptions about each variable and item, averages, standard deviations, and ranks are provided. Given that for the mean of dependent and independent variables the highest number is 5 (the range of 5 being: strongly agree, agree, relatively disagree, disagree, and strongly disagree), the range (1 / 2.33) is indicating the subjects' low score. The interval (2.3-3/66) is indicating the average score and the interval (3.67-5.5) is indicating the subjects' high score.

4.8.2.1. Descriptive Analysis of JIT Purchasing

Descriptive Analysis of JIT Purchasing are given in table 4.7.

Tablo 4. 7: Descriptive Statistics of JIT Purchasing

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	The company develops full database about suppliers.	2	5	3.87	.877	High	2
2	The company chooses the appropriate suppliers.	2	5	3.94	.787	High	1
3	The company shares forecasting with suppliers.	2	5	3.63	.891	Medium	10
4	The company places orders based on forecasting.	1	5	3.76	.987	High	5
5	The company receives materials at the right time.	1	5	3.84	.944	High	3
6	The company receives requested materials on the right quantity.	1	5	3.68	1.004	High	8
7	The company receives the materials on right quality.	2	5	3.79	.871	High	4
8	The company develops suitable space to store materials.	2	5	3.71	.982	High	7
9	The company receives orders in many lots according to demand.	2	5	3.73	.908	High	6
10	The company settles accounts to the suppliers on time.	1	5	3.65	.925	Medium	9

The average of items, based on the findings of the table 4.7., is between 3.63 and 3.94, which is at the average and high level, which shows that, according to the respondents, JIT Purchasing items are performed at a high level in the studied units. Among these, item number (2) has the highest average and item number (3) has the lowest average. The average of the total JIT Purchasing is 3.76 and in the high condition.

4.8.2.2. Descriptive Analysis of JIT Operation

Descriptive Analysis of JIT operation are given in table 4.8.

Tablo 4. 8: Descriptive Statistics of JIT Operation

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	The company usually complete daily schedule as planned	1	5	3.76	1.066	High	5
2	The company provides enough space for operations	2	5	3.52	.901	Medium	8
3	The company arranges the equipment to facilitate operation	2	5	3.76	.918	High	5
4	The company layout facilitates operations	1	5	3.66	.974	High	7
5	The company provides cross training to all employees.	2	5	3.82	.933	High	4
6	The company meets the production schedule of every day.	1	5	3.71	.912	High	6
7	The company chooses appropriate materials for customers.	1	5	4.15	.865	High	1
8	The company empowers the employee to solve problems.	2	5	3.85	.827	High	3
9	The company uses updated programs to reduce operation time.	1	5	3.90	.863	High	2

The average of items, based on the findings of the table 4.8., is between 3.52 and 4.15, which is at the middle and high level, which shows that, according to the respondents, the JIT Operation items are performed at a high level in the studied units. Among these, item number (7) has the highest average, and item number (2) has the lowest average. The average of the total JIT operation is 3.79 and in the high condition.

4.8.2.3. Descriptive Analysis of JIT Customers

Descriptive Analysis of JIT customers are given in table 4.9.

Tablo 4. 9: Descriptive Statistics of JIT Customers

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	The company develops full database about customers.	1	5	4.08	.911	High	6
2	The company's customers receive just-in-time deliveries.	1	5	4.23	.876	High	3
3	Most of customers receive frequent shipments from the company	1	5	4.21	.890	High	4
4	The company always delivers on time to customers	2	5	4.29	.857	High	1
5	The company can adapts production schedule to sudden production stoppages by customers	1	5	3.87	.949	High	7
6	The company responds to customers complaints in time	2	5	4.18	.758	High	5
7	customers are linked with the company via JIT systems.	1	5	4.26	.904	High	2

The average of items, based on the findings of the table 4.9., is between 3.87 and 4.29, which is at the upper limit, which shows that, according to the respondents, the JIT Customers items are executed at a high level in the studied units. Among these, item number (5) has the lowest average and item number (4) has the highest average. The total average of JIT Customers is 4.16 and in the high condition.

4.8.2.4. Descriptive Analysis of Kanban

Descriptive Analysis of Kanban are given in table 4.10

Tablo 4. 10: Descriptive Statistics of Kanban

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	Suppliers fill our kanban containers, rather than filling purchase orders.	1	5	3.94	.973	High	1
2	Our suppliers deliver to us in kanban containers, without the use of separate packaging	2	5	3.68	.785	High	3
3	We use a kanban pull system for production control.	1	5	3.73	.728	High	2
4	We use kanban squares, containers or signals for production control	2	5	3.61	.662	Medium	4

The average of items, based on the findings of the table 4.10, is between 3.61 and 3.94, which is at the average and high levels, which shows that, according to the respondents, Kanban items are performed at a high level in the studied units. Among these, item number (4) has the lowest average and item number (1) has the highest average. The average Kanban is 3.74 and in the high position.

4.8.2.5. Descriptive Analysis Of Financial Performance

Financial performance's Descriptive Analysis is given in table 4.11.

Table 4. 11: Descriptive Statistics of Financial Performance

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	By applying the JIT system, the company had an increase in market share.	1	5	3.92	.946	High	2
2	By applying the JIT system, the company had an increase in sales growth.	1	5	4.02	.839	High	1
3	By applying the JIT system, the company had an increase in net profit margin.	2	5	3.81	.807	High	3
4	By applying the JIT system, the company had an increase in return on assets.	1	5	3.73	.853	High	5
5	By applying the JIT system, the company had an increase in in gross profit.	2	5	3.77	.913	High	4

The average of items, based on the findings of the table 4.11., is between 3.73 and 4.02, which is at the middle and high level, which shows that, according to the respondents, the financial performance items are executed at a high level in the studied units. Among these, item number (4) has the lowest average and item number (2) has the highest average. The average of the total financial performance is 3.85 and in the high position.

4.8.2.6. Descriptive Analysis of Cost Reduction

Descriptive Analysis of Cost reduction are given in table 4.12.

Tablo 4. 12: Descriptive Statistics of Cost Reduction

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	By applying the JIT system, the company had a reduce in production costs.	2	5	3.87	.799	High	3
2	By applying the JIT system, the company had a reduce in of operational costs.	1	5	3.90	.783	High	2
3	By applying the JIT system, the company had a reduce in inventory costs.	1	5	3.95	.876	High	1

The average of items, based on the findings of the table 4.12, is between 3.87 and 3.95, which is at the medium and high range, which shows that, according to the respondents, cost reduction items are performed at a high level in the studied units. Among these, item number (1) has the lowest average and item number (3) has the highest average. The average of the total cost reduction is 3.91 and in the high position.

4.8.2.7. Descriptive Analysis of Waste Reduction

Descriptive Analysis of Waste Reduction are given in table 4.13.

Tablo 4. 13: Descriptive Statistics of Waste Reduction

No	Question	Minimum	Maximum	Mean	Std. Deviation	Importance	Ranking
1	By applying the JIT system, the company had a reduce in energy consumption.	2.00	5.00	3.89	.748	High	1
2	By applying the JIT system, the company had a reduce in reworks.	2.00	5.00	3.82	.800	High	2
3	By applying the JIT system, the company had a reduce in material wastes.	1.00	5.00	3.76	.862	High	3

The average of items, based on the findings of the table 4.13., is between 3.76 and 3.89, which are in the average and high levels, which shows that, according to the respondents, Waste reduction items are performed at a high level in the studied units.

Among these, item number (13) has the lowest average and item number (1) has the highest average. The total average of Waste reduction is 3.82 and is the in high condition.

4.8.3. Normality with Sample Kolmogorov-Smirnov Test

The distribution of data associated with variables should be normal in order to employ parametric statistical approaches, which is verified using the Kolmogorov-Smirnov test.

Assumption Zero: The variable's distribution is normal.

Opposite Assumption: There is no normal distribution for this variable.

Tablo 4. 14: One-Sample Kolmogorov-Smirnov Test

		JIT Purchasing	JIT Operation	JIT customers	Kanban	Financial performance	Cost reduction	Waste reduction
N		62	62	62	62	62	62	62
Normal Parameters ^{a,b}	Mean	37.58	34.13	29.11	14.95	19.24	11.73	11.74
	Std. Deviation	7.56	5.93	5.16	2.49	3.37	2.04	1.77
Test Statistic		.155	.113	.149	.090	.105	.109	.160
Asymp. Sig. (2-tailed)		.073	.153	.086	.179	.169	.161	.063

Based on the table 4.14., Since the significance level is greater than 0.05, the Assumption Zero is accepted, that indicates the data is normal. So all variables of the study have a normal distribution, hence at every phase of data analysis parametric tests must be employed.

4.8.4. Relationships Between Variables:

Due to the normality of data distribution, the Pearson correlation test was applied for examining the relationships among research variables. Table 4.15. shows the correlation between the research variables.

$$\begin{cases} H_0 : \rho = 0 \\ H_1 : \rho \neq 0 \end{cases}$$

Tablo 4. 15: Correlations Between Variables

		Purchasing JIT	Operation JIT	customers JIT	Kanban	Financial performan ce	Cost reduction	Waste reduction
JIT Purchasing	Pearson Correlation	1						
JIT Operation	Pearson Correlation	.698*	1					
	Sig. (2-tailed)	.000						
JIT customers	Pearson Correlation	.648*	.784**	1				
	Sig. (2-tailed)	.000	.000					
Kanban	Pearson Correlation	.600*	.560**	.657**	1			
	Sig. (2-tailed)	.000	.000	.000				
Financial performan ce	Pearson Correlation	.663*	.753**	.780**	.633**	1		
	Sig. (2-tailed)	.000	.000	.000	.000			
Cost reduction	Pearson Correlation	.356*	.396**	.464**	.297*	.513**	1	
	Sig. (2-tailed)	.005	.001	.000	.019	.000		
Waste reduction	Pearson Correlation	.536*	.445**	.451**	.461**	.521**	.646**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	

According to the outcomes of the table 4.15., the level of significance for all relationships is less than 0.05 that indicates the importance of the association among JIT dimensions with financial performance, cost reduction, and waste reduction. Also, Pearson

correlation coefficients are greater than 0.3 for all associations. Therefore, the association between financial performance and JIT dimensions, cost reduction, and waste reduction is significant, and it was found that there is an important association among these variables. In the association between financial performance and JIT dimensions, the Pearson correlation coefficient is between 0.633 and 0.78. In the relationship between JIT dimensions with cost reduction, the Pearson correlation coefficient is between 0.297 and 0.464. In the relationship between JIT dimensions and Waste reduction, the Pearson correlation coefficient is between 0.445 and 0.536.

4.8.5. Hypothesis Analysis

Multiple regression was utilized for testing the effect of Total JIT on financial performance, cost reduction, and waste reduction. After confirming the relationships between the variables, multiple regression tests were performed. Multicollinearity between variables must first be examined.

4.8.5.1. Multicollinearity

If the independent variables have a linear relationship, it is said that there is Multicollinearity. Table 4.16. demonstrates the findings of the Multicollinearity study.

Tablo 4. 16: Multicollinearity Between Variables

	Tolerance	VIF
1 (Constant)		
JIT Purchasing	.445	2.248
JIT Operation	.323	3.097
JIT customers	.314	3.186
Kanban	.515	1.940

According to Maddala (1992) a VIF value that is more than 10 indicates a serious multicollinearity problem that prevent the application of regression analyses, a value between 5 - 10 indicates a problem of moderate, where a value lower than 5 indicates low multicollinearity problem. All achieved values are between 1.94 - 3.18 that shows that there is not a significant multicollinearity among dimensions of the independent variables i.e. very low correlation among the independent variables.

4.8.5.2. Regressions Analysis

Main Hypothesis: Just-in-Time system application has a significance impact on maximize profits in companies of Sulaymaniyah.

Tablo 4. 17: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Maximize Profits

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.763 ^a	.583	.576	3.94067	83.782	.000 ^b

The correlation between the maximizing profits and Just-In-Time system is 0.763 in the table above, indicating a significant relationship. We also infer that the relationship between the aforementioned two variables is a linear relationship, since the computed significance level is less than 5%. The regression coefficients of this model are demonstrated in the table below.

Tablo 4. 18: Coefficientsa of Just-In-Time System and Maximize Profits

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.809	3.197		4.320	.000
	JIT System	.250	.027	.763	9.153	.000

a. Dependent Variable: maximize profits

We infer from the aforesaid test that "Just-In-Time system implementation has a significant influence on maximizing profits" since the significance threshold is less than 5% ($t = 9.153$, $\text{sig.} = 0.000$, $p < 0.05$). Furthermore, the standard beta coefficient of .763 indicates a significant link between one variable and the others. In addition, the regression equation is as follows:

Maximizing profit = 13.809 + 0.250 (Just-In-Time system).

H1: Just-In-Time system application has a significance effect on financial performance.

Tablo 4. 19: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Financial Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.815a	.664	.658	1.96835	118.445	.000b

The correlation between the Just-In-Time system and financial performance is 0.815 in the table above, indicating a significant relationship.

Tablo 4. 20: Coefficientsa of Just-In-Time System and Financial Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.078	1.597		1.301	.198
	JIT System	.148	.014	.815	10.883	.000

a. Dependent Variable financial performance

We infer from the aforesaid test that "Just-In-Time system implementation has a significant influence on Financial performance" since the significance threshold is less than 5% ($t = 10.883$, $\text{sig.} = 0.000$, $p(0.05)$). In addition, the regression equation is as follows:

Financial performance = $2.078 + .148$ (Just-In-Time system).

H2: Just-In-Time system application has a significant effect on cost reduction.

Tablo 4. 21: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Cost Reduction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.441 ^a	.195	.181	1.84745	14.519	.000 ^b

In the table 4.21., the correlation between Just-In-Time systems and cost reduction is 0.441, which shows a moderate correlation. We also infer that the relationship between the aforementioned two variables is a linear relationship, since the computed significance level is less than 5%. This model's regression coefficients are shown in the table below.

Tablo 4. 22: Coefficientsa of Just-In-Time System and Cost Reduction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.086	1.499		4.061	.000
	JIT System	.049	.013	.441	3.810	.000

a. Dependent Variable: cost reduction

In the table 4.22., because the level of significance obtained is less than 5% ($t = 4.061$, $\text{sig.} = 0.000$, $p < 0.05$), it can be concluded from the above test that “Just-In-Time system application has a significant effect on cost reduction.” In addition, the Beta standard coefficient, which is equal to 0.441, shows the average relationship of this variable, and the regression equation is expressed as follows:

$$\text{Cost reduction} = 6.068 + 0.049 (\text{Just-In-Time system})$$

H3: Just-In-Time system application has a significant effect on waste reduction.

Tablo 4. 23: Results of Linear Regressions Analysis (ANOVAa) of Just-In-Time System and Waste Reduction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.549 ^a	.302	.290	1.49433	25.924	.000 ^b

In the table 4.23., the correlation between the Just-In-Time system and waste reduction variables is 0.549, which shows a moderate correlation. We also infer that there is a linear relationship between the aforementioned two variables since the computed significance level is less than 5%. This model's regression coefficients are shown in the table below.

Tablo 4. 24: Coefficientsa of Just-In-Time System and Waste Reduction

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	5.646	1.212		4.657	.000
JIT System	.053	.010	.549	5.092	.000

a. Dependent Variable: waste reduction

In the table 4.24, because the significance level is less than 5% ($t = 5.092$, $\text{sig.} = 0.000$, $p < 0.05$), we conclude from the above test that “the Just-In-Time system application has a significant effect on waste reduction.” Also, the beta standard coefficient, which is equal to 0.549, shows the average relationship of this variable, and the regression equation is expressed as follows:

$$\text{Waste reduction} = 5.646 + 0.053 (\text{Just-In-Time system})$$

RESULT AND SUGGESTIONS

This study aimed to investigate the impact of Just-in-Time system application on maximizing profits in companies in Sulaymaniyah. Based on the research findings, the implementation of JIT system dimensions is high among Sulaymaniyah industrial companies. Specifically, the total JIT Purchasing average was found to be 3.76 and in the high position. This shows that Sulaymaniyah industrial companies are aware of the importance of this dimension after JIT and have adopted it in their purchasing activities. In this regard, Hamarneh (2019) also has a high average of receiving JIT Purchasing in private hospitals in Jordan. In another study, Darwish (2018) rated this amount as strong in international fast food restaurants in Jordan. It was further found that the total average of JIT operation among Sulaymaniyah industrial companies is equal to 3.79, and in a high position. In fact, companies implement the JIT system in their day-to-day plans and processes and facilitate them. Zaid et al. (2016), Hamarneh (2019) and Darwish (2018) achieved similar results. It was also found that the total average of JIT Customers is equal to 4.16, and is in a high position. This result shows that companies' ability to provide quality products in quantities and at times demanded by customers is high. Research by Abdallah and Matsui (2007), Zaid, et al, (2016), Hamarneh (2019) and Darwish (2018) achieved similar results. Finally, it was found that the total Kanban average is 3.74, and in the high position. This dimension shows the ability to timely transfer information and inventory items along supply chains and the ability to communicate at different levels of the chain, which has been strong in the companies under study. In this regard, Abdallah and Matsui (2007) and Bortolotti et al. (2013) achieved similar results.

It was further found that the average total financial performance is 3.85, and in a high position. This shows that the companies surveyed with the implementation of the JIT system have faced an increase in net profit, return on investment, profit margin, sales growth, and market share. Orobia et al. (2020) and Ganiyu et al. (2019) achieved similar results. The average total cost reduction is 3.91, and in the high position. Ganiyu et al (2019) and Phogat & Gupta (2019) achieved similar results. Finally, the average total waste reduction is 3.82, and in the high position. Ganiyu et al. (2019) and Phogat and Gupta (2019) achieved similar results.

Based on the research findings, it was determined that $\text{Beta} = 0.763$, $t = 9.153$, $\text{sig.} = 0.000$, $p < 0.05$. Therefore, we conclude that "Just-In-Time system application has a significant effect on maximizing profits." In fact, JIT has been found to enable companies to save important amounts of waste and decrease waste through storing the inventory required for producing and selling products. It also decreases insurance and storage costs, as well as the cost of refining or disposing of excess inventory (Silver et al., 2017); and generally increase the company's profitability. These results have been confirmed in the research of Hamarneh (2019), Bortolotti et al. (2013) and Ganiyu et al. (2019).

Based on the research findings, it was determined that $\text{Beta} = 0.815$, $t = 10.883$, $\text{sig.} = 0.000$, $p < 0.05$. Therefore, we conclude that "Just-In-Time system application has a significant effect on financial performance." Chen (2015) improves financial performance in his research in China, Driftland JIT. According to Agyabeng-Mensah et al. (2020) JIT decreases delivery time and increases responsiveness to a company's competitive advantage. This improves operational and financial performance through cost savings. Ganiyu et al (2019) achieved similar results.

Based on the research findings, it was determined that $\text{Beta} = 0.441$, $t = 4.061$, $\text{sig.} = 0.000$, $p < 0.05$. Thus, it can be concluded from the above test that "Just-In-Time system application has a significant effect on cost reduction." In this regard, Green et al. (2019) claim that the main motivation for implementing JIT is to reduce costs by eliminating non-value-added activities to ensure improved operational activities. Yang and Pan (2004) noted that JIT reduces the total cost of ordering/ installation, breakdown, and maintenance, which is in line with the results of the present study. According to Hamarneh (2019), JIT in cost management systems reduces the number of cost elements for a product. Mazanai (2012) noted that efficient inventory management systems lead to a significant reduction in operating costs. El-Dabee et al. (2013), Ganiyu et al. (2019) and Ramezani and Razmeh (2014) achieved similar results.

Based on the research findings, it was determined that $\text{Beta} = 0.549$, $t = 5.092$, $\text{sig.} = 0.000$, $p < 0.05$. Therefore, we conclude that "Just-In-Time system application has a significant effect on waste reduction." In fact, JIT encourages the use of less inventory, such as raw materials, work in progress, and end products through the disposal of waste.

As Green et al. (2019) acknowledged, JIT reduces inventory to a minimum, leading to less waste generation. According to Bortolotti et al. (2013), JIT is a method that aims to eliminate waste disposal and continuously improve the production process. Ganiyu et al (2019) and Phogat & Gupta (2019) achieved similar results.

According to the findings achieved from the present study, it was found that there is a strong relationship between the use of the JIT system and the profitability of companies. The use of JIT helps to supply the products needed by customers, as well as the regular purchase process from the best local suppliers, who have high quality products and delivery at the right time and quantity, and finally, JIT supplies the necessary parts, produces on time and keeps only the least amount of inventory for the process, which helps reduce inventory costs and wastage, thus positively impacting financial performance. Hence, industrial companies using such an inventory system experience higher financial performance, lower operating costs, production and maintenance, and reduced waste and rework. It should be noted that the JIT system had the greatest impact on financial performance, followed by waste reduction, and finally, cost reduction. This result shows that the most important result of the JIT system is the improvement of financial performance, which is the main goal of companies. Since the JIT system produces on a custom basis, it has the least amount of waste, and finally, the reduction of costs was less effective than the other dimensions of the JIT system, which shows that other factors also play a role in reducing the company's costs and should be considered by the managers of companies. In general, based on the findings, the JIT system can be considered as an optimal inventory management system for industrial companies. Therefore, managers and experts of industrial companies must provide the human and financial potential to use JIT.

According to the results of the analysis of the research data and based on the verified hypotheses, companies can create a supplier database, select quality and timely suppliers and place orders according to demand. However, companies should use updated programs to reduce uptime. In addition, management should provide training programs to ensure proper use of the JIT system by employees. Companies should focus on building a JIT system that is adaptable to the local environment and business conditions. Finally, they should recruit qualified personnel who can manage the JIT elements.

The limited time to conduct the research and the short sampling period led to cross-sectional research, which made it difficult to draw conclusions about causation. Failure to examine control variables such as industry type, size, and age of participation in the research due to excessive subject matter. These are the limitations of the research.

For future researchers, the present study can be done in larger statistical communities and separately for different industries. Using a qualitative method and tools for interviewing managers, researchers can identify obstacles to the implementation of the JIT system in companies. Also they can investigate the moderating role of environmental uncertainties, the intensity of competition, and drastic changes in the market in the relationship between the JIT system and the company's profitability.

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APPENDICES



**T.C.
TOKAT GAZIOSMANPAŞA UNIVERSITY INSTITUTE OF GRADUATE
STUDIES**

Dear Respondent

I am Mohammed Ezzat Mohammed, a master's student in Tokat Gaziosmanpaşa University, and the purpose of this survey is to obtain empirical data and information for my thesis study entitled “**The Effect of Just in Time Production System in Achieving Profit Maximization in Industrial Companies.**” I will be delighted if you participate in the survey by responding to its questions, in which the responses are reflecting on your information, as it would have a positive effect on finalizing the study at a significance level. Please respond as sensibly as possible to the following statements by marking (✓) in an appropriate place. However, all responses will keep confidential and used only for scientific study, and information about the participants will not be identified.

Thank you for your cooperation.

Researcher

Mohammed Ezzat MOHAMMED

Please, answer the following questions as thorough as possible.

1. What is your gender?

- a. Male ☐
- b. Female ☐

2. Your age?

- a. Less than 30 years ☐
- b. 30-40 years ☐
- c. 41-50 years ☐
- d. 51 and above ☐

3. What is your level of education?

- a. High school ☐
- b. Associate degree ☐
- c. Bachelors ☐
- d. Masters or above ☐

4. What is your work experience?

- a. less than 5 years ☐
- b. 6-10 years ☐
- c. 10-20 years ☐
- d. more than 20 years ☐

5. Division:

- Operation ☐ Quality ☐ Marketing ☐ Supply Chain ☐

Please answer the following statements based on your knowledge and experience.

<i>Question</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
Part 1: JIT Purchasing					
The company develops full database about suppliers.					
The company selects the right suppliers.					
The company shares forecasting with suppliers.					
The company places orders based on forecasting.					
The company receives materials at the right time.					
The company receives requested materials on the right quantity.					
The company receives the materials on right quality.					
The company develops suitable space to store materials.					
The company receives orders in many lots according to demand.					

The company settles accounts to the suppliers on time.					
Part 2: JIT Operation					
The company usually complete daily schedule as planned					
The company provides enough space for operations					
The company arranges the equipment to facilitate operation					
The company layout facilitates operations					
The company provides cross training to all employees.					
The company meets the production schedule of every day.					
The company chooses appropriate materials for customers.					
The company empowers the employee to solve problems.					
The company uses updated programs to reduce operation time.					
Part 3:JIT Customers					
The company develops full database about customers.					
The company's customers receive just-in-time deliveries.					
Most of customers receive frequent shipments from the company					
<i>Question</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
The company always delivers on time to customers					
The company can adapts production schedule to sudden production stoppages by customers					
The company responds to customers complaints in time					
Customers are linked with the company via JIT systems.					
Part 4: Kanban					
Suppliers fill our kanban containers, rather than filling purchase orders.					

Our suppliers deliver to us in kanban containers, without the use of separate packaging					
We use a kanban pull system for production control.					
We use kanban squares, containers or signals for production control					
Part 5: Financial Performance					
By applying the JIT system, the company had an increase in market share.					
By applying the JIT system, the company had an increase in sales growth.					
By applying the JIT system, the company had an increase in net profit margin.					
By applying the JIT system, the company had an increase in return on assets.					
By applying the JIT system, the company had an increase in gross profit.					
Part 6: Cost Reduction					
By applying the JIT system, the company had a reduce in production costs.					
By applying the JIT system, the company had a reduce in of operational costs.					
By applying the JIT system, the company had a reduce in inventory costs.					
Part 6: Waste Reduction					
By applying the JIT system, the company had a reduce in energy consumption.					
By applying the JIT system, the company had a reduce in reworks.					
By applying the JIT system, the company had a reduce in material wastes.					