

THE DEGREE OF JIT IN MINERAL OIL AND ASPHALT INDUSTRIES IN LIBYA

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ABSTRACT

The focus of this research is to show the degree of the Just-in-time system implementation in mineral oil and asphalt manufacturing industries in Libya and to evaluate the availability of its elements, which are management support, human, inventory management, total quality management and their relationship with the cost and competitiveness. Also, to know the challenges those are faced in this system implementation. A 650 questionnaire was developed for the workers in the mineral oil and asphalt manufacturing industries in Libya and tested using the collected data that was gained from the sample. The interview was made with 16 managers and responsible people in the area to discuss the possibility level of the JIT implementation and the problems that may prevent the implementation. T- Test and F- test used through a simple linear regression and multiple regressions to identify the best model for the research variables. The findings strongly supported the hypotheses that the four main elements are available. The simple linear regression showed that all elements have a significant relationship with costs and only three have a relationship with a competitive position. The findings of this research showed that the lack of the awareness about the importance of JIT in the target factories is the limitation of this research. Also, the finding showed that the overseas suppliers, the lack of management support are the most challenges that prevent JIT implementation. Finally, the recommendations were made according to the findings, which were the importance of introducing the JIT and its advantages to the oil industries in Libya and trying to overcome the obstacles that may prevent its implementation. This research emphasizes that the success of this system depends on both humans and technology, therefore, four elements are suggested as the most important elements to succeed with the JIT implementation in the long term strategy implementation.

ABSTRAK

Fokus penyelidikan ini ialah untuk menunjukkan kepentingan sistem “Just-In-Time” (JIT) dan meneroka kewujudan elemen-elemen JIT iaitu sokongan pengurusan, manusia, tahap inventori terturun, pengurusan kualiti menyeluruh, dan kehubungannya terhadap kos dan persaingan. Ia juga bertujuan untuk mengenal pasti kekangan sebelum sistem ini dilaksanakan. 650 soal selidik telah dibangunkan dan diuji dengan menggunakan data yang telah dikutip daripada sampel kajian yang terdiri daripada pekerja-pekerja dalam industri pembuatan minyak galian dan asfalt di Libya. Temu bual telah dibuat dengan 16 orang pengurus dan individu yang bertanggungjawab dalam bidang berkaitan untuk membincangkan tahap kemungkinan pelaksanaan JIT dan masalah-masalah yang boleh timbul sebelum pelaksanaan. Ujian-t dan ujian F telah dilaksanakan melalui regresi lurus mudah dan regresi berganda untuk mengenal pasti model yang terbaik bagi pemboleh ubah kajian. Dapatan kajian menyokong kuat hipotesis bahawa keempat-empat elemen utama wujud. Hasil daripada regresi lurus mudah menunjukkan bahawa semua elemen mempunyai kesan yang signifikan terhadap kos manakala tiga daripadanya mempunyai hubungan dengan persaingan. Bagaimanapun hasil statistik regresi berganda menunjukkan bahawa manusia dan elemen pengurusan kualiti menyeluruh memberi kesan terhadap kos pengeluaran manakala pengurangan elemen inventori memberi kesan terhadap kedudukan persaingan berbanding elemen-elemen yang lain. Dapatan kajian ini menunjukkan bahawa kekurangan pembekal tempatan adalah kekangan paling besar dalam kajian ini disamping kekangan daripada pembekal luar negeri, kos yang tinggi dan kekurangan sokongan pengurusan. Sebagai rumusan cadangan dibuat berdasarkan dapatan kajian iaitu kepentingan memperkenalkan JIT dan kelebihan kepada industri minyak di Libya serta keperluan untuk mengatasi semua kekangan yang menghalang pelaksanaan JIT.

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LIST OF ABBREVIATIONS

JIT	Just in Time
ZORC	Zawiya Oil Refining Company
MOAM	Mineral Oil and Asphalt Manufacturing
NOC	National Oil Corporation
EOMC	Elbirigha Oil Marketing Company
TQM	Total Quality Management
MENA	Middle East and North Africa Countries
OGJ	Oil and Gas Journal
Bbl/d	Barrels per Day
OPEC	Organization of Petroleum Exporting Countries
WIP	Work in Process
IT	Information Technology
BFA	Benghazi factory for producing asphalt
ZFA	Zawiya factory for producing asphalt
ZFMO	Zawiya factory for producing mineral oil
PIIE	Peterson Institute for International Economies
OAPEC	Organization of Arab Petroleum Exporting Countries
ZORCDB	Directory book
SOC	Sirte Oil Company
VIF	Variation Inflation Factor
TOL	Tolerance

CHAPTER 1

1.1 Introduction

Change is sometimes undesirable, but it is necessary for industries to adapt to changes in order to achieve their respective goals, and find innovative ways to cut production cost, reduce waste, and increase value (Asiabi, 2012).

The purpose of this introductory chapter is to offer a general background about the research and its motivations, aim, objectives, associated questions, and a statement of the problems that Libya's industries are facing.

This research seeks to explore the significance of Just in time (JIT) system in the development of the current oil industry sector in Libya, focusing on mineral oil and asphalt manufacturing (MOAM), and supports recent efforts to improve the industry sector. Its attempts to be introduced (JIT) as a modern manufacturing system in some kinds of oil industry sector in Libya, which is one of the largest petroleum countries in the world, and its strategic location in the southern Mediterranean coastline, has made it into one of the biggest exporting countries for more than five decades in Africa. Furthermore to understand the significance of this subject, this research provides a trying of reducing costs, and improving the competitiveness of mineral oil and asphalt manufacturing products in Libya through the "JIT".

The research is of importance since, as is the case in many developing countries that have introduced an ambitious industry development program, the industry development in Libya has occurred on the assumption that more effectiveness in the development of economic growth will follow. However, there is no empirical evidence that provides details relating to the particular fundamentals in developing oil industry sector in Libya, and provides an important introduction to this area to explore the significance of JIT for the mineral oil and asphalt manufacturing industries. Therefore, there is a point of view that doubts the likely positive impact of this system upon this sector growth in Libya.

This research has given more focus to extend the empirical work in this area of the Libyan industry, and can be described as a significant exploratory research that includes crucial issues, which can be barriers to understand or a temptation requirement to judge some practices as better than others, for adoption of the effective approaches to the development of the oil industry sector, by the implementation of successful development programs, through the modern systems adoption focusing in JIT.

The result of this research will be useful in reaching decisions to develop these industries. The research also adds to the existing body of literature regarding the development in one of developing countries, and will add to the literature on the industry's development related to the role of the MOAM industry development, thus, initiating an exciting topic for future research.

1.2 Background and Research Motivation

The motivation to conduct this research can be divided into two main subsections; first the need and viability, and second, addressing the justifications for the research.

1.2.1 The Need and Viability

The Libyan industries suffer from numerous negative aspects resulting from the political situation, and financial crises. As known; different sanctions were imposed on Libya by the US and UN. The US banned imports of the Libyan crude oil in 1981 and extended it later to include direct trade, commercial contracts, and travel activities (Libya Profile, 2007).

The Libyan economy has suffered from these sanctions, especially those imposed by the UN; it banned Libya from importing refinery and industrial equipment, which have additionally influenced the health, education, oil sector, and other aspects of the Libyan people's lives (Libya Energy Data, 2007). The UN embargo began in 1992 and eased in 1999 and completely ended in 2003, while the US embargo ended in 2004 (IMF, 2005).

The question arises here as to why the mineral oil and asphalt manufacturing has been selected in this research, and why implementing JIT will be more helpful than the other modern systems.

According to Ghanem (2009), there is no doubt that, the manufacture of mineral oil and asphalt will become an important source in Libya in terms of excellence locally and externally at the level of cost and competitiveness. This industry must contribute to the Libyan economy by the exploitation of the local material sources available in producing the mineral oil and asphalt. However, the mineral oil products cover the entire western region, which is only about 70% of the local consumption because; the plants and manufacturing lines are very old, which leads to a production with high cost. The rest needs imports from abroad, taking into account the cost and quality of these imported products, this means that this industry need to acquire high production efficiency compared to its competitors.

On the other hand, the asphalt products cover 100% of the local consumption; however, there is a way to increase the production to be exported abroad because of the availability of the raw material in the local environment (Zawiya oil refining company directory book, 2010).

Hokoma (2006) studied the JIT in the oil industry sector in Libya, and this study showed that whenever the company is more efficient, least amount of inputs is required to produce outputs, so it results in less production cost. However, the most important problem for oil and other light products industries in Libya is using a huge amount of the material, and a big number of workers to produce fewer outputs. Also, this study showed that more studies are needed to investigate the possibility of the benefit of the modern systems that will help in upgrading the industry sector in Libya, such as JIT, and its advantage.

Finally, from own experience of working in this sector for more than nine years in the Zawiya Oil Refining Company (ZORC), the researcher noted that the workers and the warehouses of raw materials are the most burden on the cost. The workers need more focus for it, and it is considered to be very expensive to fill the requirements of the different temperatures to keep the materials from being damaged, which leads to an increase of the products' costs and lower the chance of achieving a high competitive position.

Consequently, reducing cost for both inventory, and workers are the main reasons to apply JIT, to eliminate the warehouses, and acquire a needed workers' level.

1.2.2 Justification for the Research

Even so, as the political history of Libya is somewhat dissimilar from other developing countries, Middle East, North Africa, and Asia, there are certain influences that are peculiar to Libya, and which consequently require an early evaluation of the performance of its financial resources, because, it has been observed that by reforming their economies, these countries have achieved significant levels of economic growth.

Thus, the case for development in Libya is made on the assumption that the industry growth contributes directly to the economic growth (Kaplan, 2007; Masoud, 2009).

Given what has been mentioned in the introduction about Libya's unique position as a country, this research can be considered as a step towards the empirical building of research methods, which will provide a significant contribution to the knowledge and understanding of Libya's obstacles that prevented it from following up the development. Therefore, based on the above discussion, the researcher came to the following points:

- i. Libya has similar characteristics to other developing countries that have improved their own industries very recently. However, the industry in Libya still in primitive stages, which leads to the increase of the production cost, such as MOAM products in the local Libyan environment (Masoud, 2009).
- ii. The need of increasing the capacity and improving the products' competitiveness by applying the new industrial methods, such as JIT system. Oil revenues comprise over 95 *percent* of Libya's hard currency earnings (75 *per cent* of government receipts and 30 *percent* of the gross domestic product) and, thus, the economy was severely damaged by the dramatic decline in oil prices during 1998, as well as by reducing oil exports and production, in part as a result of UN and US sanctions (Sami, 2012).
- iii. The development in Libya is still in the early stages, but it is moving quickly as a result of the removal of the UN and US sanctions and, there are signs of rapid development in non-oil sectors (Masoud, 2009). However, currently, there are only very few studies in the oil field. Therefore, a complete analysis on the MOAM industrial sector in the Libyan environment is lacking, the majority of them focus on the assurance of the presence of a traditional cost system in the other sectors in Libya.

1.3 Statement of Problem

Libya needs a comprehensive upgrade to its entire industry and refining systems with the particular aim of increasing the output of oil and other light products, because the US and UN sanctions are a nuisance to both the government and population, which delay investments in the oil industry and contribute to a rise in inflation due to the increased cost of imports materials, and products (Othman, 2005).

As mentioned in the previous discussion, during the 1990s and first few years of the 21st century, the economic growth in Libya was slowed and the Libyan government started to experience recessionary trends because the country was struggling with financial crises of the mid-1980s that resulted from international sanctions. These trends saw the collapse of oil prices and gulf war in 1990/ 1991. Following that, Libya was forced to re-examine its industrial policies and redirect its development strategies, when the traditional remedies were becoming ineffective (Alfajori, 2003; St Johan, 2008).

The volumes of crude oil production at most of the oil companies that were operating in Libya decreased in 2009 compared with that of 2008. The decreases included a decrease of 21.6% in Harouge Oil Co., 20.5% at Wintershall Libya, 11.3% in Mellitah Oil Co., 8.4% of Akakus Oil Operations, 7.3% in Arabian Gulf Oil Co., 6.0% of Sirte Oil, 5.7% in Zuweitina Oil Co., and 4.6% at Waha Oil Co. Crude oil production at Mabruk Oil Co (Central Bank of Libya, 2010, p. 34).

The problem to be addressed by this research is the mineral oil and asphalt products situation, which are produced by the Zawiya Oil Refining Company. According to OBEC, the Zawiya Oil Refining Company (ZORC) is in need of upgrading because most of its products are of low quality. As a result of the UN sanction and the US embargo, these industries started to suffer from many problems. The main problem with these industries is that they still operate using antiquated methods.

These traditional methods of arranging a manufacturing facility by departmental specialty, each department houses specialized equipment or technology. When factories are laid out in this manner, production in large batch sizes, complicated and long-time processing is inevitable, and this leads to an increase in the final production cost compared to the competitor products, also, lowers the chance to compete in local markets (Libya Energy Data, 2007).

Since these methods have become antiquated and ineffective, this calls for the creation of new methods to replace the complicated processes to produce products and simplify the process operations, in order to discover the problems in the early stages which in turn will reduce the waste and improve the quality to meet the challenges of the costly production and to bring it to the extent that it can strengthen the competitiveness and achieves goals (Biltayib, 2006).

Masoud (2009) wrote that the PIIE argued that the effect of the UN resolutions exporting appeared to be minimal; it banned the pumps sale in Libya and other equipment used to load crude oil and its products for shipments abroad, an obstacle they deem not difficult to overcome.

The challenges that face the MOAM in Libya are these kinds of industries require a comprehensive development of its manufacturing system to lower processing type and time, which in turn reduce products cost, and also to improve the competitiveness through better use of the available material in the local environment. All that will be achieved through the essential steps toward change and implementation of the new industrial system. Therefore, it has become imperative for the management in the industrial companies in Libya that are looking for an appropriate concept to reduce cost of production and to improve the competitive position to adopt new industrial methods, such as JIT.

The JIT philosophy maintains that a manufacturing floor be laid out by product rather than by function. All equipment should be dedicated to a product or family of products and organized logically in the order, in which the various processes are performed on that family of products.

Two characteristics must be fulfilled before a group of machines can be deemed the optimal JIT work cell, the first is whether the product is flowing one at a time from machine to machine, and, secondly, whether the cell has the flexibility to produce at different rates with varying crew sizes (Pheng & Shang, 2011). This system will eliminate the waste in the whole manufacturing environment, from raw material through shipping, and, improve the manufacturing systems by reducing process (Kootanaee et al., 2013).

Based on the previous discussion, the implementation process of this system is essential for an efficient operation that plays a prominent role with outcomes that may develop the Libyan industrial companies. The challenge to achieve a sustainable development of the Libyan oil industry is to develop the manufacturing systems to improve the management of the most productive public enterprises. To achieve that objective, a high level of development is required, which demand a strong and healthy industry sector capable of attracting more foreign industries and upgrading of domestic.

1.4 The Research Aim

The main aim of this research is to persuade and encourage the decision makers in the Libyan management to take steps toward implementing the JIT system in the MOAM industries, through investigating the availability of the necessary elements of JIT to undertake successful implementation.

In addition to identifying the importance of these elements in reducing the cost and improving the competitiveness, because of a lack of knowledge about JIT and its benefits.

To achieve this, the following research objectives and questions were formulated in Figure 1.1

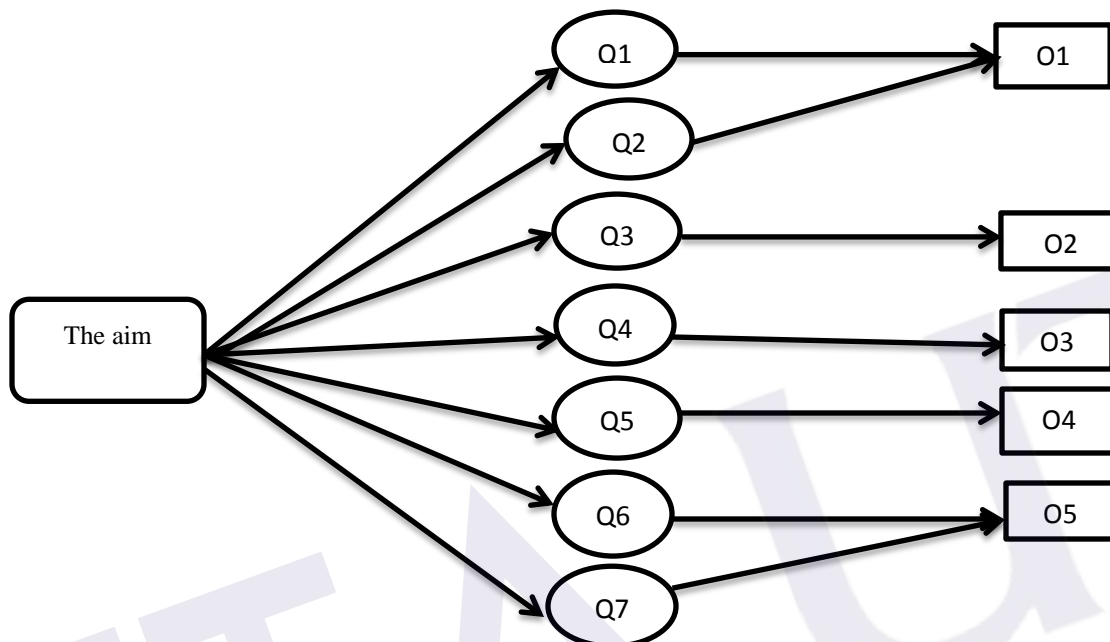


Figure 1.1 Questions Related to the Objectives

1.5 The Research Questions

- i. Do the MOAM factories in Libya apply JIT?
- ii. Do the MOAM production systems have the necessary elements that are essential for JIT application?
- iii. Is there a relationship between the necessary elements of JIT and cost reduction?
- iv. Is there a relationship between the necessary elements of JIT and the competitiveness?

- v. What are the problems that are faced in the JIT application in the MOAM factories in Libya?
- vi. Is there a difference in the respondents' answers about the relationship between JIT's elements and the cost reduction, due to the demographic characters?
- vii. Is there a difference in the respondents' answers about the relationship between JIT's elements and the competitiveness, due to the demographic characters?

1.5 The Research Objectives

1. To evaluate the extent of the "Just in Time (JIT)" system in the MOAM factories in Libya, and assess the availability of JIT's necessary elements that need to apply the JIT system in the MOAM factories in Libya, in which this research will suggest their concepts, which are, management support, human, inventory management, and TQM, to develop to up to date with the needs of factories.
2. To measure the benefits of the necessary elements of JIT in the MOAM factories. This involves the examining relationship between these elements and the cost reduction variables from the research respondents' perspectives.
3. To examine the relationship between JIT's elements and the competitiveness variable in the MOAM factories from the research respondents' perspectives.
4. To determine the challenges those hinder the JIT application in the target factories, and the possible solution to overcome these obstacles from the research respondents' perspectives.

5. To infer if there is a difference in the answers about the relationship between JIT's elements and cost reduction, also, the relationship between JIT's elements and competitiveness from the respondents' perspectives due to the demographic characters, age, education, experience, and occupation.

1.7 The Research Hypotheses

After reviewing the previous studies that focus on the elements of JIT, the hypotheses are formulated as follows:

- H1.** There is a statistically significant relationship between necessary elements of JIT and the cost reduction.
- H2.** There is a statistically significant relationship between the necessary elements of JIT and the competitiveness.
- H3.** There is a statistically significant difference from the respondents' perspectives about the relationship between JIT's elements and cost reduction related to the demographic variables.
- H4.** There is a statistically significant difference from the respondents' perspectives about the relationship between JIT's elements and the competitiveness due to the demographic variables.

1.8 Significance of Research

The importance of the research relies on these points:

- i. This research focuses on the necessary elements of JIT and their relationship with the production to decrease the final production cost in the MOAM factories in Libya. This will support these industries and increase their ability to compete in the local and global market.
- ii. This research is to shed the light on the obstacles that prevent from benefitting from JIT, and study the factors that lead to these obstacles, because of the impact of this system on the Libyan economy, through the use of local resources.
- iii. This research will be the first step that provides a detailed of the JIT necessary elements and the factors that affect production cost, in general, that affect the application of the JIT system in the mineral oil sector in Libya.
- iv. This research is to ascertain the ability of the oil companies in Libya to apply JIT and use it to reduce production cost and improve its competitive position.
- v. This research will provide an example to invite the oil industrial companies in Libya to apply and accommodate the JIT system, once they can provide the essential requirements for its application.
- vi. This research is rare in Libya because to the best of the researcher's knowledge, it is one of the few studies, if not the first, that aims to study the application of the JIT system in the MOAM factories in Libya. Most of the studies in this field are directed to study the cost systems. Therefore, the present research is very rare in Libya to the research and educational system.
- vii. This research will be the basis of further studies in this area in the near future, and encouraging the researcher in Libya to care and consider this area as an important to improve the economy of Libya in general.

1.9 The Research Structure and Organization

To achieve the research objectives, the theoretical part of the JIT system must be studied and the factors affecting its success. Then, the proposal of a model for its application in the mentioned factories in Libya must be prepared by evaluating the target factories in Libya through the methodology that will be adapted in this research. Therefore, this research will be divided into two major parts, as follow:

1.9.1 Theoretical Part:

The theoretical part: this part focuses on understanding the concepts and ideas of JIT and factors that control its application to design a detailed plan for the field work, and then provide the main steps to achieve the goals of the present proposal. The intensive literature review and study of this system will help and guide to achieve the goal of this part, which consists of the following chapters:

Chapter 1: this chapter consists of the introductory chapter, the main problem of this research and the objectives, questions, hypotheses, significance of this research.

Chapter 2: this chapter presents theoretical part, some information about the Libyan history and location, some information about the Libyan MOAM industries and the concept of JIT, its elements, objectives, and advantages.

Chapter 3: this chapter presents the conceptual model of the JIT system in which this research will provide its concept, the main elements controlling the JIT application and previous studies related to the research topic.

Chapter 4: this chapter explains the methodology that will be used to collect information and the sample of the research.

1.9.2 The Field Part

This part will start once the research model has been designed and the application of JIT in the MOAM factories in Libya is studied based on the previous theoretical investigations in this area. The design model of this research will have to extract the critical factors that affect, facilitate and allow the application of the JIT in Libya. Carrying out field trips to the elected factories in Libya based on the theoretical model, to collect information and discuss the main elements with qualified experts in this area, to extract the internal factors that might limit and prevent the application and success of the JIT in Libya. This part includes the following chapters:

Chapter 5: this chapter focuses on the field part, which is a statistical analysis to answer the research questions and test hypotheses, in order to achieve the research objectives.

Chapter 6: this chapter presents the research, discussion, the key finding, contribution to knowledge, research recommendation, research limitations, and overall conclusions.

1.10 The Scope of Research

Libya is still in the early stage of its financial reform; however, there is a sign of rapid development in the industry sector (Masoud, 2009). As mentioned previously, there is a lack of published material in this area; the existing literature is rather limited. Therefore, this research provides a contribution to the subject of the Libyan MOAM industry's growth by analyzing the necessary data, to evaluate the availability of the necessary elements to apply and success of JIT, that are represented in the target factories.

Because of the difficulties to include all main elements in this research and what is needed for collecting data and analysis, the research focus on integrating all the necessary element in four main elements that are considered the most important from the researcher perspective.

The focus on the MOAM industries in Libya is of interest for several key reasons. Firstly, the MOAM will provide a new and better insight to start developing into the oil sector, in general.

Secondly, the Libyan government has been willing to develop the oil industry and its recent policies of engaging workers and managers alike striving for a reform. Thirdly, it's a big failure that an oil country imports the mineral oil products from abroad, and cannot benefit from its crude well, such as asphalt, add it to the financial sources of the Libyan income. Even though the war started in Libya in 2011 which resulted to some unstable situation in this sector, this research will cover the period of 2010 to 2015, including Zawiya factory for producing mineral oil (ZFMO), Benghazi factory for producing asphalt (BFA) and Zawiya factory for producing asphalt (ZFA), in addition to, the National Oil Corporation (NOC).

Ultimately, it is hoped that this research identifies and suggests more about the Libyan industry development and the role of these products' performance in the nation's economic growth.

1.11 Summary and Link

This chapter has presented in details the introduction of the research. The issues discussed include background and research motivation, justification for the research, a statement of the problem, the research questions, research objectives, hypotheses, and the research scope. The following chapter will demonstrate the relevant literature to provide a background and understanding into the dynamic of the current research.

CHAPTER 2

Literature Review

2.1 Introduction

This chapter is divided into three sections. The first section explains the research issue, the challenges, the historical background in Libya, the financial resources, the MOAM industries. The second section provides the information about the “Just in Time” system, definition, elements, objectives, advantages and disadvantages. The third section presents some previous studies about JIT and its necessary elements.

2.2 The Research Issue and Challenges

As a result of the speed of development in the industry field, and the use of electronic commerce and production technology, companies need to create a system that leads to production with high quality and lowest possible cost (Al-kassasbeh, 2011).

Development programs have become the new phenomenon during the past two decades. Places like the Middle East and North Africa countries; in particular Libya, Egypt, Tunisia, Jordan and Saudi Arabia, all began similar developed programs aimed at achieving the stabilization of their economies, specifically, they found themselves incapable of attracting foreign economies and to protect their economies in the global markets (Creane et al., 2004).

Several empirical examples are utilized to support this argument, for instance; the Nigeria experience, as a developing country, which is supported by a study of Adeyemi (2010). Jordan also has developed positively over the last few years, it could be argued that a healthy relationship exists between Jordan's economic development and the advancement of its industry sector; this hypothesis is supported by Alyagoub (2009). Since Libya and Jordan are neighbors, they possess several historical, cultural, and climatic similarities; both altered their economic ideology from socialism to capitalism. Although they were affected by this at different times, a sharp focus on the relevant development in Jordan will provide much valuable information and some beneficial lessons for Libya to assimilate in its own economic and financial progress (Masoud, 2009).

These facts are interesting for the proposed research which represents an applied research of a type that has not appeared elsewhere, and the model offered may therefore not only be appropriate to the oil industry sector, but also in other sectors in similar circumstances.

Since it has been mentioned that other emerging economies, whose features are very similar to those of Libya prove the positive outcomes of developing industries, as a result, there is a rationale for exploring their approaches and learning from their experiences in revealing the gap to explore the reason of the growth delay in the industry sector in Libya, it compared the growth model of the emerging economies, as observed in MENA, Eastern Europe, Asia, and Latin America, which are similar in many aspects to the Libyan economy because, the delay growth in industry sector will deter the transformation of the country (Biltayib, 2006).

Therefore, as a trial of the upgrades in the oil industry sector in Libya, Hokoma (2006) carried out a study on JIT in the Libyan environment, and the findings showed that, even though the industry in Libya is still unaware of the benefits of JIT, which has received more attention than any other new manufacturing concept in the last century, the application of JIT in the local environment can provide a number of advantages. For instance, lower the processing time, increasing the production capacity to be exported abroad, and develop effective quality programs to serve the JIT in the local environment, which in turn, will help in rebuilding the restructuring and reorganizing of the industrial sector in Libyan, and increase its ability to compete in global markets over the long term by reducing cost of production and improve quality.

Primarily, in the view of the current official tendencies for restructuring the Libyan economy within the country provided opportunities for the introduction of managerial and technical skills that would allow the use of knowledge, ability and vitality value in a more efficient way, for an improvement in the Libyan industry, there is a need to be more a focus on boosting the development in the oil sector and its products, because this sector is the main financial source. Given what has been declared, one of the most important subjects on the agenda for government policy is the economic reform and Libya's reintegration into the international community (Kellerhals, 2008; Kessler, 2008).

Based on that, it can be argued that by implementing its development program, Libya's wealth will grow strongly amongst the country's small population due to the improvement of oil products and the increasing of prices (Hokoma, 2010).

It's worth to note that the inventory management has led to finding the idea of (JIT) in order to reach the best performance and achieve the aspiration of the various economic through the inventory management, which aims to reduce cost and maximize profit. The industrial companies had been building a competitive advantage to its price and its ability to apply quality, which leads to find the idea of "Just in Time" system (JIT), which in turn leads to changes in the competitiveness concept. It reduces production costs, maintains high quality, reduces defective production and increases the productive capacity (Agrawal, 2010; Robinson, Pearce & Mital, 2008; Sadikoglu, 2008).

The “Just-in-Time” system is a production and management system that was used first time by the Toyota Company in Japan, and has achieved a great success. This has made American and Canadian companies applied it in their system. These companies focused on studying the Japanese society and the extent of the ability and suitability for the application of this system, because of the social cohesion and collaborative work characterized by the Japanese society to manage the consumers’ demand (Abdaliah & Matsui, 2007).

JIT was able to help companies and factories to improve and increase challenges through an approach that focused on people, plants and systems, it would be successful if plants and processes were arranged for a maximum output and efficiency, in addition to; the quality and production programs that were scheduled to meet demands exactly (Adeyemi, 2010).

It is an approach that combines conflicting objectives of low cost, high quality, manufacturing flexibility and delivery dependability, JIT eliminates waste, streamlines operation and promotes a fast changeover and a closer supplier’s relation, a closer control between inventory levels and production-delivery needs. The cost saving for JIT is a result of the inventory reduction and associated holding; it focuses on the process not the product. The philosophy behind JIT is to continually seek ways to make the processes more efficient (Jozefowska, 2008; Kaneko& Nojir, 2008).

However, the problem in MOAM industries is with the use of the traditional methods that lead to a long time processing such as: each department houses specialized equipment or technology. Given that the current industrial climate can be changed, it is now an ideal time to implement these modern systems, and bring in new ideas to improve all the sectors throughout Libya. The researcher hopes that, the research results will be helpful in reaching decisions to develop the industry system through adopting JIT in order to increase the growth in the oil industry sector, in general, and within the MOAM, particularly in Libya.

2.3 An Introduction to Libya

The historical background in Libya can be discussed from two angles, which are geographically, and financial resources.

2.3.1 First Geography

Libya is located in the heart of North Africa near the Mediterranean Sea, surrounded by Egypt, Tunisia, Algeria, Sudan, Chad and Niger. The area of Libya is about 1,759,540 sq km (679,358 sq ml) and there is a coastline of some 2,000 km. It is the fourth largest country in Africa, the seventeenth largest in the world and is seven times the size of the UK. The climate is moderate in spring and autumn; summer tends to be very hot while winter is cold.

The country is subject to a diverse climate with the Mediterranean Sea in the north and the desert climate of the south. Likewise, Libya comprises of the desert 45 per cent with 25 per cent sand dunes, the rest being arable land 19 per cent, permanent crops 17 per cent, pasture 20 per cent, and forest 4 per cent (Libya location, 2007; BBC News, 2007).

In fact, Libya is rich in natural resources oil and natural gas and other areas of iron ore, Sebeka salts and pastures. Agriculture and fishing are the key industry sectors outside the oil and gas sectors (OAPEC, 2010).

Libya's geographical location has aided the growth of trade networks with the exchange of goods and products between Europe and Central Africa via Libyan local areas, such as coastal towns and oases. The geographical location of Libya renders it as a strategic link between eastern and western nations (Libya Energy Data, 2007).

The population increased during the last decade from 3,225.1 thousand in 1980 to 4,524.4 thousand in 1990, 5,426.8 thousand in 2000, and reached an estimated 6,089 million in 2007. The annual population growth rate during the period 1975-2005 was about 2.9, due to improved standards of living, and is expected to be 1.9 per cent during the period 2005-2015 (Libya country, 2007).



Figure 2.1 Libya Map (Source, Libya Location Maps, 2007)

2.3.2 Second Financial Resources

As for the distribution of the Libyan financial sources among non- oil sectors are that the industrial sector occupies first place, the agricultural sector is at the second place, the tourism sector ranks in the third place. However, the oil source considers the main financial source in Libya (Igbikiowubo, 2008).

Prior to the war, Libya had been producing an estimated 1.65 million barrels per day. Libya production's capacity had increased over the previous decade, from 1.4 million bbl/ d in 2000 to 1.8 million bbl/ d in 2010, but still remained well below peak levels of over 3 million bbl/ d achieved in the 1960s. Though Libya produced below nameplate capacity, the output exceeded the country's OPEC target of 1.47 million bbl/ d (Libya Oil 2011).

According to Biltayib (2006); Libya Oil Almanac (2001); OGI (2013) Libya has five domestic refineries as shown below.

- i. Ras Lanuf: this export- oriented refinery on the Gulf of Sirte.
- ii. Zawiya: Libya's second- largest refinery, with a capacity of 120 thousand bbl/d, is also the only significant one near the capital of Tripoli. It is operated by the Zawiya Oil Refining Company, which is the only company that owned the MOAM factories in Libya.
- iii. Tobruk: Near Libya's eastern border, Tobruk is reported to run on crude oil from Sarir, one of the first fields to restart after the conflict. Most sources report Tobruk's capacity as 20 thousand bbl. /d.
- iv. Sarir: Like Tobruk, Sarir is operated by an affiliate of AGOCO and is reported to be processed crude pumped from the field of the same name. It is a topping facility with a capacity of only 10 thousand bbl/ d.
- v. Marasa El Breaga: the oldest refinery in Libya. Marsa El Brega refinery has a crude processing capacity of 8 thousand bbl /d. It is operated by Sirte Oil Company (SOC).

Major export terminals in Libya include Es Sider, Marsa el Brega, Tobruk, Ras Lanuf, Zawiya, and Zuetina.

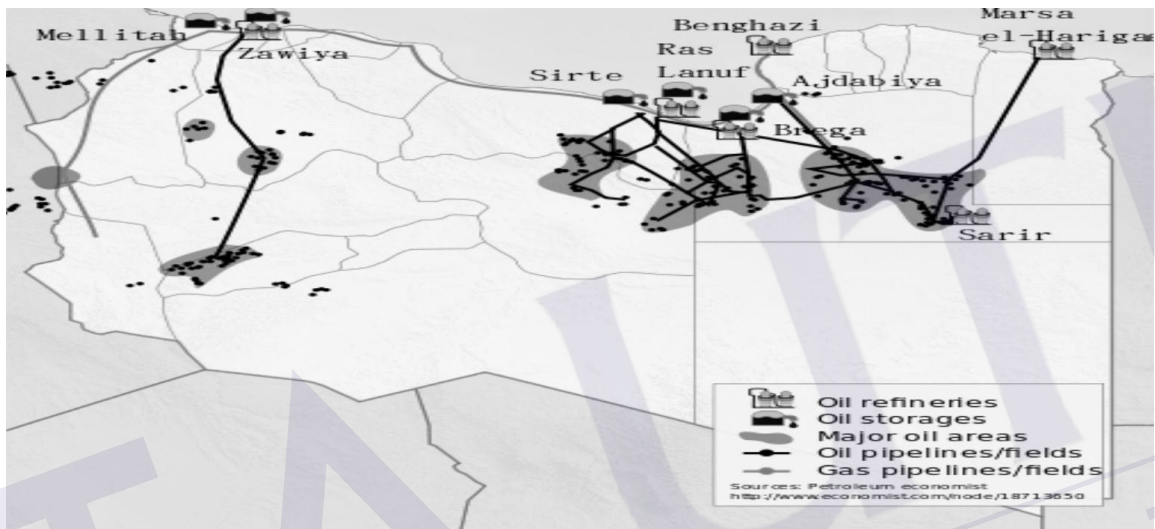


Figure 2.2 Major Oil and Gas Fields and Infrastructure in Libya
Libya location Maps (2007)

2.3.3 Mineral Oil and Asphalt Manufacturing Industries in Libya (MOAM)

This research seeks to make an original contribution to gain knowledge on the academic and practical levels, as one of the first attempts at empirically investigating the availability of the main elements that are necessary to apply “Just in Time” (JIT) in MOAM factories in Libya. These products are produced in three factories in the Zawiya and Binghazi towns in Libya. Because these factories are owned by the Zawiya Oil Refining Company only (ZORC), the researcher thinks that it is necessary to provide the background of this company.

It was established in 1974 by the NOC, and operates in refining oil, asphalt manufacturing, export and supply crude oil and petroleum, in addition to producing different kinds of mineral oil. It is located 50 km west of the capital Tripoli. This company is the second biggest refinery company in Libya with a crude processing capacity of 60,000 barrels per day. The capacity expanded to 108,000 bpd by 1977 and as of May 2011, the refinery had the capacity of 120,000 bpd.

It's the only company that produces mineral oil and asphalt products in Libya. The company's location was chosen to cover the western region markets needed from mineral oil, which represented 70% of total domestic consumption and 100% of asphalt, in line with the policy of industrial distribution centers. In addition, to take advantage of sea water and its proximity to the export ports, because of the importance that they have in producing and contributing to the oil production in Libya, especially in the west region (ZORCDB, 2010).

The company provides all facilities needed for production, such as electricity and desalination of sea water, generate steam, laboratories, quality control units, and maintenance workshops involving various disciplines, port and stores.

It has a big number in the workforce with 3000 workers and contains about 26 departments, such as the financial management, account management, management of planning and follow-up, internal audit management, technical management, engineering and project management, warehouses management, managing and developing port management, management of training, ZFA management, BFA management, ZFMO management, management of naval operation, management of safety, enterprises trade union, services management, purchasing management, management of tenders development, management of administrative affairs, management to prevent loss, security management, organization management, and others. Some of these managements include two departments while some include six (ZORCDB, 2010).

To understand this research well, the researcher will give an idea about the target factories: first; the ZFMO, this factory established in the year 1971-1972 by the America company Shell.

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