THE DEGREE OF HUMAN FACTOR IN SUCCESS OF JUST IN TIME SYSTEM IN MOAM INDUSTRY IN LIBYA

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ABSTRACT

Just- in- time system is one of the new and modern systems in the manufacturing and management world. It has received more attention than other systems in the last decade in developed countries, however, developing countries are still unaware of its importance in increasing their ability to compete in the global market by improving their product quality and decreasing cost. The JIT system focuses on the concept of human resource development more than it in traditional manufacturing ways. The workers are the most important factor to the success of Just- in- time system. The focus of this study is to show the degree of the JIT System and human element in the mineral oil and asphalt manufacturing industries in Libya (MOAM). A 650 questionnaire was developed for the workers in the MOAM factories in Libya and tested using the collected data that was gained from the sample. T-Test and F-test through a simple linear regression was used to identify the study model. Finally, this research emphasizes the importance of human factors in reducing products cost.

Keywords: JIT: Just In Time, TQM: total quality management, WIP: work in process, MOAM: Mineral oil and asphalt manufacturing.

INTRODUCTION

This research seeks to explore the significance of human factor 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 introduce JIT as a modern manufacturing system in some kinds of oil industrial sector in Libya, which is one of the largest petroleum countries in the world, and its strategic location on 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 study tries to find out the degree of the JIT system and human factor as one of the most elements of the JIT elements

because in the traditional manufacturing systems it is usual for workers to have limited skills, they cannot do number of processes such as it is necessary to have worked to operate machine, another one for maintenance, and another one for inspection quality. However, in JIT they must have good training to have a diversity of skills and talents, they must be multi-skilled which give them flexibility in doing many jobs, also doing other workers' jobs when needed beside their main work. In addition, to train them to do some maintenance and small repairs.

Also, this study seeks to and prove the impact of the well-trained workers on reducing costs of the mineral oil and asphalt manufacturing products in Libya in order to persuade the decision makers in the Libyan management to take steps toward implementing the JIT system in the MOAM industries.

STATEMENT PROBLEM

The lack of high-level workers is one of the challenges that face the implementation of such modern system in Libya such as JIT. The problem to be addressed by this study is that the MOAM industry still operates using traditional manufacturing methods of arranging a manufacturing facility by departmental specialty, each department houses specialized equipment or technology. These methods depend completely on human sources in the manufacturing process, which leads to an increase in the cost of the products. The challenges faced by the MOAM in Libya are that these kinds of industries require a comprehensive development of its manufacturing system to improve the workers' ability to be multi-skilled through better training programs and education.

OBJECTIVES OF STUDY

A. To evaluate the extent of the "Just in Time (JIT) system in the MOAM factories in Libya.
B. Evaluate the degree of the human factor in MOAM factories.
C. Prove the positive impact of human factors on cost reduction to encourage the Libyan management to take steps toward implementing the JIT system in the MOAM industries.
D. Know if there is the difference in respondents' answers about the impact of the human factor in reducing production cost due to the experience.

THE STUDY QUESTIONS

A. Do the MOAM factories in Libya apply JIT?
B. Are there enough qualified personnel in place with the right technical information and are experienced enough to facilitate the application of the JIT system to maximize the advantages of this system in minimizing the final cost?
C. Is there a positive impact of the human factor in reducing production cost?
D. Is there a difference in respondents' answers about the impact of the human factor in reducing production cost due to experience?

THE STUDY HYPOTHESES

A. Human has a positive impact in reducing the production cost.
B. There is a statistically significant difference from the respondents' perspectives about the impact of the human factor on reducing the production cost due to the experience.

THE STUDY SCOPE

Because of the lack of published materials in this area and the existing literature is rather limited, this research provides a contribution to the subject of the Libyan MOAM industry's growth by analyzing the necessary data, to evaluate the degree of the human sources to apply and success of JIT, that are represented in the target factories, which are Zawiya factory for producing mineral oil (ZFMO), and Benghazi factory for producing asphalt (BFA), in addition to the National Oil Corporation (NOC) in Libya.

LITERATURE REVIEW

Alony and Jones (2008) reviewed studies of human-related and organizational factors in the context of lean manufacturing and identified gaps in research in this area. They made it clear that JIT adoption will need to implement an organizational and cultural change during the process, which will have measurable and immeasurable effects on the staff, this effect needs to be taken into consideration. Alony and Jones (2008) wrote in their study that just in time production system in developing countries such as JIT in Nigeria cannot exist without relying on overseas suppliers; this system will generate new ideas and ultimately new products. Finally, education and training are required to encourage worker's participation and improvement (Adeyemi, 2010).

Jose (2008) focused on alliances between large corporations and between large corporations and joint ventures, sustainable competitive advantage. This paper laid out a conceptual framework for studying the relationship between the strategic human resource management practices of small and medium-sized business and their performance as corporate partners, as industry and competitive conditions change. This paper contributes several new insights to academic literature. Kumar (2010) wrote that "It could be a great JIT opportunity for Indian industries due to its relative low Investment need, and capability of the small business environment. It allows the workers to become a participant in decision- making by putting the trust and responsibility in their hands, Indian industries believe that the JIT system would be helpful to face the global competition". The author considered the human source as being the most important factor in this study.

Al-Yaquob (2009) wrote that the human factor considers the most important factor that has a strong ability to make this system implementation successful, as she summarized the Just in time requirements as follows:
   a) Adopt the idea, all people belong or relate to the company must be fully aware of the importance of this system, and support it.

b) Focus on training and educational programs to educate all facilities, and workers to ensure their positive interactions.

c) Forming working groups to plan what will be implemented such as technology teamwork, and management teamwork.

d) Superior management supports this system implementation and monitors the progress of what has been planned.

e) Full understanding and how to deal with the related problems, and obstacles during the process.

f) Respect, support and encourage the workers because changes may lead to multiple problems in adapting a new situation, especially if it is associated with technological developments.

g) Education and continuous development.

h) Continuous Research, and collect information from other companies that applied this system, in order to take advantage of previous experience.

i) Direct relation to workers to increase their loyalty and convention, with an emphasis on informing them everything in solving problems.

j) Finally, the importance of worker's satisfaction.

Based on the above points, the human factor considers the most challenges that this system face, which requires more attention to benefit from this system in decreasing products cost (Al-Yaquob, 2009).

THE DEVELOPMENT OF THE THEORETICAL CONCEPTUAL MODEL

The expectation confirmation theory is a cognitive theory that attempts to describe post-purchase or post- adoption, satisfaction as a purpose of anticipation. This theory was written by Oliver in 1980 and has been used in many studies (Mittal & Gera, 2012).

Based on the idea of this theory, this study took the concept of the relationship between the human and cost reduction, as shown in figure 1.
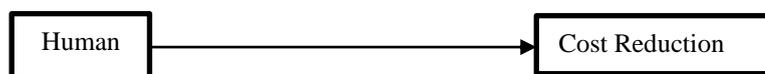

Figure 1: The Impact of the human on Cost reduction

METHODOLOGY

This study was conducted using different kinds of methodologies. The research design combines two types of data collection methods, questionnaires, and semi-structured interviews, as well as reflection from own experience and involvement in the accounting area in the Libyan oil industry. The first phase of data collection method is done through a questionnaire. The quantitative approach of gathering information serves as the main tool of data collection in this study. The objective of the questionnaire is to obtain the data to answer the research questions and test the hypotheses related to the impact of the human as a main element of JIT on the cost reduction.

According to Aaker et al. (2001), the questionnaire questions are designed to achieve the research objectives and to enable a validation of the answers obtained. The questionnaire consists of three sections. The first section deals with the demographic characteristic of the study sample, age, education, experience, and job title.

The second section consists of many questions to judge the current system, focusing on the file on human as the main element of JIT and its availability in the target factories to achieve the first objective and to answer the first question of this study, which is the availability of the human element in the MOAM factories. This part consists of some questions about the education level, the level of training programs, team working, participation, encouragement of development, rewards, cooperative environment, multi- skill worker, multi- shifted work and, the number of workers.

The third part includes many questions to explore the impact of the human on the cost reduction, from the respondents' perspectives such as error correction, inventory reduction, reduction of unnecessary activities, defects and damage reduction. This part is developed to achieve the second objective and to answer the second question from the study questions, and to verify whether to accept or reject the first hypothesis, which is about the impact of the human factor in reducing the cost.

Finally, over the course of the nine years that the researcher worked in the Zawya Oil Refining Company in Libya, the researcher developed many relationships and personal contacts that would prove beneficial in gathering a lot of information about the study topic.

THE STUDY POPULATION AND SAMPLE

The study populations consist of entire workers in the selected factories in the western and eastern areas in Libya, which are owned by ZORC, focused on the MOAM factories, and some managers from the NOC. The reason that the researcher chose this company was that it is the only company that owned the MOAM factories in Libya. The number of workers in the factories is about 803 workers, 530 of them in ZFMO and ZFA distributed among manufacturing workers, mixed and facilities, packing, quality control, maintenance, warehouses, and others. About the BFA, the number of the workers in this factory is 273 workers. Because there were constraints for any business research project, such as limited money and time, there are difficulties of including all workers in the target factories. Therefore, 650 copies of the questionnaire were distributed, only 247 copies were returned. The total response rate was 38%, which is agreed by Krejecie and Morgan (1970) table.
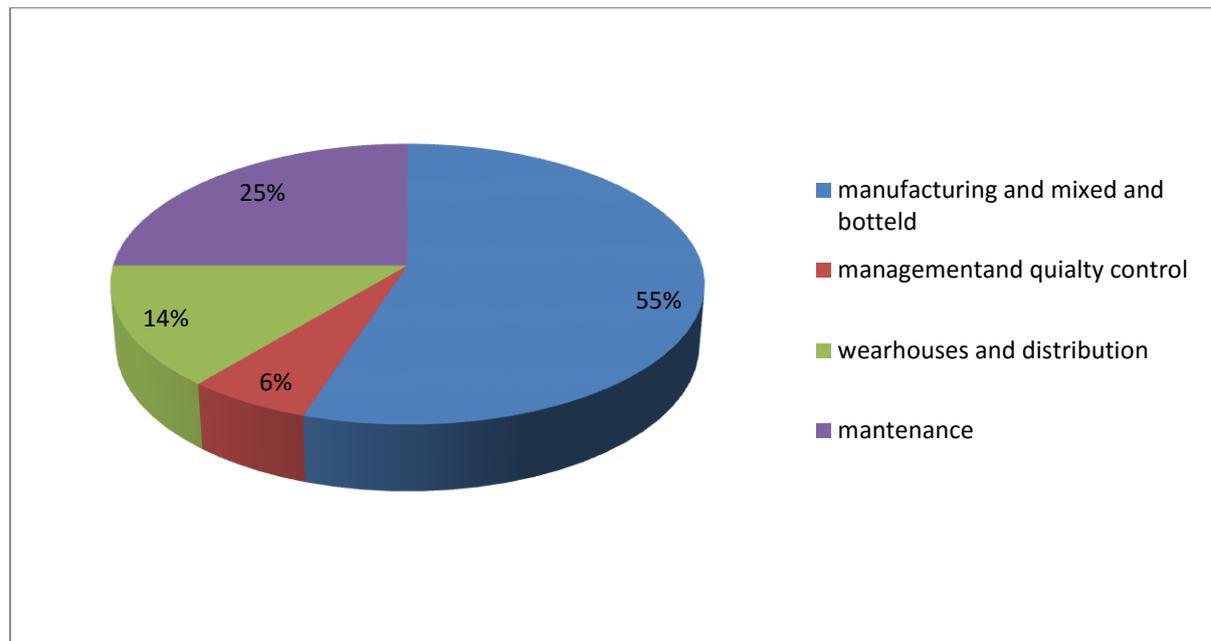
Figure 2: The Workers in the MOAM Factories in Zawiya and Benghazi

For the interview sample, the researcher, aimed to make 20 semi-structured interviews, managers and heads of departments accumulating to 45, a total of 16 were achieved, while 4 were not achieved because 2 of them are abroad for a long time, and the other 2 were very busy.

DATA ANALYSIS

For the statistical processing, one sample–T–Test, simple linear regression has been used in order to test each item of the questionnaire and know the significance of the answers of the respondents. The researcher used the regression analysis to achieve the study objectives by examining the impact of the independent variables on the dependent variables. Thus, explaining whether the model is successful in presenting what might contribute to the independent variable in better responding.

VALIDITY OF THE STUDY

The internal consistency was concluded through using Pearson correlation between each item from the area of the questionnaire and the total score of the field. The results of the internal validity of the study tool are as follows:

Table 1: Pearson Correlations between H and Total Score

Items	N	C	P
The education level is important	247	0.650	0.000
The workers in the factories have limited skills	247	0.503	0.000
The team work groups are ignored	247	0.652	0.000
The factory management ignores encouraging worker development	247	0.689	0.000
The work program in the factory is multi- shifted program	247	0.550	0.000
The workers satisfactory are ignored	247	0.668	0.000
The personnel training to the workers is ignored	247	0.781	0.000
The incentive rewards program is ignored	247	0.518	0.000
The number of workers exceeds the factory needs	247	0.673	0.000

Table 1 shown that the Pearson correlations between the items of the first part, human, and the total score range between 0.503 to 0.781. Therefore, all the items have correlations ≥ 0. 5 and considered valid to what is intended to measure.

Table 2: Pearson Correlation between CR and Total Score

Items	N	C	P
The human increases the level of the error correction	247	0.598	0.000
The human helps in reaching a zero inventory level,	247	0.615	0.000
The human helps in eliminating unnecessary activities	247	0.561	0.000
The human reduces the defects and damage ration	247	0.503	0.000
The human helps in applying a good coordinate between the processing production department	247	0.613	0.000
The human helps in determining the value of sales	247	0.552	0.000

The above table shows that the correlation set out in the table are statically significant, all items ≥ 0. 5. As a result, this part is considered valid to what is intended to measure.

RELIABILITY OF THE STUDY

The researcher followed the statistical measurements to determine the reliability of the research tool through Cronbach's alpha coefficient, shown as follows:

Table 3: The Value of Internal Consistency of the Research Variables

No	Research variables	Items	Alpha
X 1	Human	9	0.728
X 2	Cost reduction	6	0.719
Total		15	0.723

STATISTICAL ANALYSIS

THE DEGREE OF JIT IN THE MOAM IN LIBYA

In order to achieve the first objective and answer the first question, the interview was conducted to examine the availability of JIT in the mentioned factories. Managers interviewed in the MOAM were asked about the availability of JIT in these kinds of industries, and the possibility of applying this system in case of unavailability. Table 4 summarized the answers of the interviewees to the first question about the degree of JIT in the MOAM factories in Libya.

Table 3: The Response Rate

Code	Statement	N= 16	
	Do MOAM adopt JIT?		
		Frequencies	Percent
1-1	Do no adopt and possible	7	43 %
1-2	Do not adopt and impossible	4	25 %
1-3	There is a level of implementation	2	12.5 %
1-4	Do not adopt	3	18.75%

From the above table, one can easily note that about 86.75 % of the respondents emphasized that JIT does not exist formally in MOAM factories in Libya. However, there is a chance to apply it; this opinion is asserted by 55.5 % of the respondents.

THE DEGREE OF HUMAN FACTOR IN THE MOAM

Table 5 shows the mean, frequency distribution and T-test of the respondents' answers about the human factor, in order to know whether or not this factor is available in the MOAM factories in Libya.

Table 5: T-Test Statistics for H Variable

Items	Mean	Std	T- test	P- value

The education level is important	3.71	0.934	11.990	0.000*
The workers in the factories have limited skills	2.40	0.878	- 10.657	0.000*
The team work groups are ignored	2.39	0.838	-11.384	0.00*0
The factory management ignores encouraging worker development	3.016	1.076	2.306	0.022*
The work program in the factory is multi- shifted program	4.07	0.883	19.022	0.000*
The workers satisfactory are ignored	1.66	0.834	-25.177	0.000*
The personnel training to the workers is ignored	2.38	1.048	-9.289	0.000*
The incentive rewards program is ignored	2.31	0.828	-13.142	0.000*
The number of workers exceeds the factory needs	3.12	1.101	1.733	0.084*

As presented in the above table, the human items in decreasing rank order are as follows:

The work program is multi-scheduling program M= 4.07, Std, =833, $P < 0.05$ recorded in the first highest rank. This result refers to the workers that are multi-skilled workers because the factories follow a mixed scheduling work program, which means that, the workers have multifunctional skills because 71.3 % of the respondents disagree that the workers have limited skills M= 2.40, Std =0.878, $P < 0.05$.

This finding is in line with the view suggested by Ngo et al. (2008), who reported that the workers must be well-trained to have a diversity of skills and talents, which gives them flexibility in doing many jobs and to do other workers' jobs when needed. And the work multi-scheduling program should be considered to give the workers more time to their social life, which mirrors workers' satisfaction.

The second highest ranking to the item, the education level is important, M= 3.71, Std = 934, $P < 0.05$; about 78.5 % of respondents agreed with this item. This is supported by the opinion of Marchington and Wilkinson (2008) who suggested that learning is a beneficial approach for improving the productivity of labour which is measured by the required time to complete the task as well as reducing costs, which means that it helps workers to earn more skills.

Finally, the overall mean of the availability of the human factor is M= 2.80, Std= 0.935, $P < 0.05$. These findings showed some agreement about the availability of the human factor in the MOAM factories, which indicates that there is a level of human factor to apply JIT in MOAM factories in Libya and this encourages the implementation decision because the change will not need a long time.

THE IMPACT OF HUMAN FACTOR ON COST REDUCTION

Table 6: Descriptive Statistics for CR

Items	Mean	Std.	T -Test	P-Value
The human increases the level of the error correction	2.12	0.578	-13.003	0.000
The human helps in reaching a zero inventory level,	2.00	0.725	-9.622	0.000
The human helps in eliminating unnecessary activities	2.32	0.845	-10.869	0.000
The human reduces the defects and damage ration	2.03	0.890	-8.789	0.000
The human helps in applying a good coordinate between the processing production department	2.50	0.654	-5.239	0.000
The human helps in determining the value of sales	2.30	0.921	-9.718	0.000

The above table shows that the highest rank to the item that human helps in applying a good coordinate between the processing production department with M= 2. 50 Std =0. 654 P < 0.05. This is followed by the item, the human helps in eliminating unnecessary activities with mean M= 2.32, Std= 0.845, P < 0.05. The overall mean is M = 2.21, P < 0.05. Since, the respondents disagree that human helps in reducing the production cost because there is no relationship between them, which is illogical and reflect a lack of knowledge about the importance that human factor plays in reducing the cost.

TESTING THE STUDY'S HYPOTHESES

Testing the First Hypothesis Using Simple Linear Regression

There is a statistically significant impact of the human factor on the cost reduction.

Null Hypothesis H0
There is no statistically significant impact of the human factor on the cost reduction (H0: B1=0).

Alternative Hypothesis H1
There is a statistically significant impact of the human factor in cost reduction (H1: B1≠ 0). Where B1= Regression coefficient of the independent variable on the dependent variable in the regression equation Y= B1X+ B0.

The researcher used the simple linear regression in table 7 to verify this hypothesis as follows:

Table 7: Simple Linear Regression

Independent variable	R	R Square	F-Test	P- Value
Hum	0.608	0.369	143.477	0.000

Due to the findings of this table, R= 0.608, the F= 143.477, P < 0.05 which is significant.

This result can be interpreted as meaning that there is a positive impact for the human factor, as an independent variable on the cost reduction, as the dependent variable. Thus, the null hypothesis is rejected (H0: B1=0) and the alternative hypothesis is accepted (H1:B1 $\neq$ 0) on the basis that there is a significant impact for the human factor in the cost reduction, and that reflects the possibility of benefitting from this impact in applying JIT in the target factories. Also, the results show that the value of the $R^2 = 0.369$, which represents that, the change in an independent variable human factor explains 36.9 % of the change in the dependent variable cost reduction. This finding agrees with the study of Ngo and Foley (2008) and Tong and Wiboonwong (2011). They explained that, under the JIT system, workers significantly simplify costing. They affect the character of all costs types. For instance, the cost of overhead will be reduced due to the elimination of the unnecessary activities, such as handling the cost, machine preparation and break down time cost, occurrence errors, reduce work in process inventories and finished goods inventories or eliminating them.

Testing the Second Hypothesis

To test the differences in respondents' perspectives about the impact of human factor in the cost reduction due to experience, requires testing of the following hypotheses:

H0: there is no statistically significant difference at 0.05 levels in the respondents' perspectives about the impact of the human factor in the cost reduction due to experience (H0: M1 = M2 =M3 = M4).

H1: There is a statistically significant difference at the 0.05 levels in the respondents' perspectives about the impact of the human factor on the cost reduction due to experience (H1: at least one of them different).

Table 8**:** Result of F-Test

Variable	Mean	Std	F-Test	P-value
Less than 5 years	3.12	0.629		
5 to 15	2.82	0.523		

Variable	Mean	Std	F-Test	P-value
16 to 25	3.45	0.409		
More than 25	3.16	0.644		
Total	3.31	0.551	6.373	0.005

The above table illustrates that, the overall M= 3.31, Std = 0.551, F- test = 6.373, P < 0.05. Thus, reject the null hypothesis and accept the alternative hypothesis, on the basis that there is a statistically significant difference at the 0.05 level in the respondents' perspectives about the impact of the human factor in the cost reduction related to the experience.

CONCLUSION

This study discusses a new insight in managerial accounting in one of the developing countries, Libya, which is considered one of the biggest petroleum countries in the world. Even though JIT generates new ideas and ultimately new products, the oil industry in Libya is still unaware of its importance to reduce cost. The application of JIT system in the local environment can provide a number of advantages for example: decreasing storage cost, decreasing workforce, increasing the number of qualified experts and well-trained personnel, and developing effective programs to serve the JIT system in the local environment which, in turn, will impact all other sectors. All these advantages will, directly and indirectly, affect the restructuring and reorganizing of the industrial sector in the local environment by the modern systems and its tools. To achieve the study objectives, a field study was conducted on the MOAM factories in Libya to find out the extent of their application of the JIT system, and to determine the requirements to develop this system to increase the efficiency and effectiveness of its role in reducing costs.

As the expectation, the results of the study were completely the same, which are that the factories do not apply JIT formally; however, there is a possibility of benefit of it. In fact, the factories do have the main principle or the whole structure to apply this system because of the availability of some of the human factor, however, this factor is not completely available. The finding shows that the lack of awareness of the necessity of applying this system is the most significant problem that is currently being faced. Finally, the researcher believes that the MOAM industries in Libya are a very promising sector to apply the JIT system in a long term, however, the absence of some of the main requirements may prevent the change in the current stage due to the fact that there is no way to provide enough and right JIT requirements in the current situation.

Acknowledgement

REFERENCES

Aaker, D.A., Kumar, V. & Day, G.S. (2001). *Marketing Research.* 7th edition. New York. John Wiley & Sons.

Alony. L & Jones. M. (2008). *Lean Supply Chain JIT and Cellular Manufacturing-The Human Side.* University of Wollongong, Wollongong, Australia.

Adeyemi. S. (2010). *Just in time production system (JITPS) in developing countries the Nigerian experience.* Department of business administration, University of Ilorin, Ilorin, Nigeria.

Al-Yaquob, S.N. (2009). *The Impact of Appling JUST-IN-TIME System to Maximize Profits of Industrial Shar holding Companies in Jordan*. Middle East University for Graduate Student, retrieved from www.pdffactory.com.

Jose, O. (2008). *Strategic Human Resource Management, Small and Medium Sized Internship and Strategic Partnership Capability*. University Of Pennsylvania, USA. Wong. Y.C., Wong, K.Y. & Ali, A. (2009).

Kumar, V. (2010). JIT Quality Management, Concepts and Implications in Indian Context. *International Journal of Engineering Science and Technology*, India.

Mittal, S. & Gera, R. (2012). Relationship between serves quality dimensions and behavioural intentions: An SEM Study of Public Sector Retail Banking Customers in India. *Journal of Services Research*, 12(2), 147-171.

Marchington, M. & Wilkinson, A. (2008). *Human Resource Management at work: People Management and Development.* Harlow: Pearson Education.

Ngo, H.C.L. & Foley, S. (2008). Strategic Human Resource Management, Firm Performance and Employee Relation Climate in China. *Human Resource Management, 47(1).*

Tong, T.L. & Wiboonwong, T. (2011). *Adopting of Global Operation Strategy*: Thammasat University & College of Innovation, Thailand.