Extracting of Relationships Between Modern Management Techniques in SME Manufacturing Support and Procurement of Equipment for Oil Companies of Iran

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A B S T R A C T

The organization can fully benefit from efforts to improve quality through programs such as total quality management. Just-in-time and total quality management combine to support the successful implementation of agile manufacturing programs which, in turn, result in the organization's ability to respond rapidly and aggressively to changes in customer demand. We contend that adoption of a market orientation combined with just in time, total quality management, and agile manufacturing programs leads to organizational capabilities of relatively low cost operation, high quality product and service production, and rapid response to changes in customer needs and demand. While studies on total quality management implementation appear to focus on identifying the role of total quality management practices on organizational success, total quality management practices are still directed from within the organization. Market orientation, however, requires more external engagement and shares the same ultimate aim as total quality management implementations.

Keywords: *Market orientation, total quality management, just-in-time, agile manufacturing, operational performance, logistic performance.*

1. Introduction

Combining market orientation with agility plans, total quality management, and just in-time leads to the increase of the organization's capabilities with regard to reducing executive performance, increasing the production of high-quality products, providing services, and showing quick reactions to changes in customers' needs. This will increase competitive advantages and improve performance (operational and logistic). Operational performance refers to the organization's ability to have optimal and effective performance, and logistic performance refers to the organization's ability to gain customers' satisfaction by providing them with high-quality goods and services in a timely manner. Basically, plans related to just in-time development focus on eliminating waste in all organizational processes. Just in-time

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tries to gain competitive advantages by eliminating waste in the organization. . Just in-time involve trying to improve quality through total quality management. Generally, total quality management is combined with just in-time in order to support plans such as agile production, which leads to the increase of the various organizations' ability to show reaction to the changes made in customers' needs [23].

Nowadays, investigating and applying development plans, such as total quality management, just in-time, and agile production, is a crucially important factor to gain efficiency and productivity. However, the relationship between these elements with one another and the association between these elements and market orientation should be examined in light of customers' wants. In order to solve this problem, we should resort to systems approach because the interface between these elements is rather unexplored. Therefore, in this research project we attempt to explore the relationships between market trends, just in-time, agility, and total quality management in manufacturing support and procurement companies for Iranian oil industry. To this end, we make use of systems approach. Marketing and executive performances and the related processes should be utilized and consolidated in order to gain competitive advantages developed and stated in the section dealing with logistic performance and executive performance. The theory of systems has developed a method to investigate the internal relationships within an organization, achieved through focusing on internal interdependencies between auxiliary systems. With regard to executive systems, organizational performances have been consolidated through carrying out specific development programs, such as just in-time, total quality management, and agile production. On the other hand, market orientation require that all members of the organization concentrate on customers' changing needs and responding to them [23]. Organizational changes in line with market orientation are brought about the commitment of a steadfast senior management, which can be achieved through effective application total quality management methods [5]. Both marketing and the application of total quality management methods call for harmonizing different parts of the organization and the systematic collection of information to gain customers' satisfaction. Creating value for customers also requires close cooperation and harmony between the marketing and quality sections of the organization. Hence, cooperation between marketing and executive sections is crucially important for an organization. Consequently, this research explores the association between these two sections due to a research gap in this regard. Furthermore, most research projects have been conducted in big companies, while SMEs play a significant role in thriving of businesses and the economy at large. Moreover, unlike previous research in this regard, this study tries not to deal with solely the executive aspects of just in-time, total quality management, and agile production, but to examine how these variables are related to the marketing section. Therefore, the research gap in how these variables are linked, examining the interplay among these variables and marketing with a systematic approach is quite necessary.

This study first discusses the theoretical framework dealing with market orientation, executive performance, logistic performance, agility, total quality management, and just in-time. In the next section, the conceptual framework and then research methods and effective

components are specified. After that, statistical analyses have been carried out and a model has been proposed. Finally, results are discussed and implications are provided.

2. Literature Review

2.1. Theoretical model

In the conceptual model presented and in order to solve the data, market orientations are considered as the initial independent variable and logistic performance as the final dependent variable. The rest of the variables are intermediate dependent variables in the analysis of the process. Total these variables have been taken from [23] research.
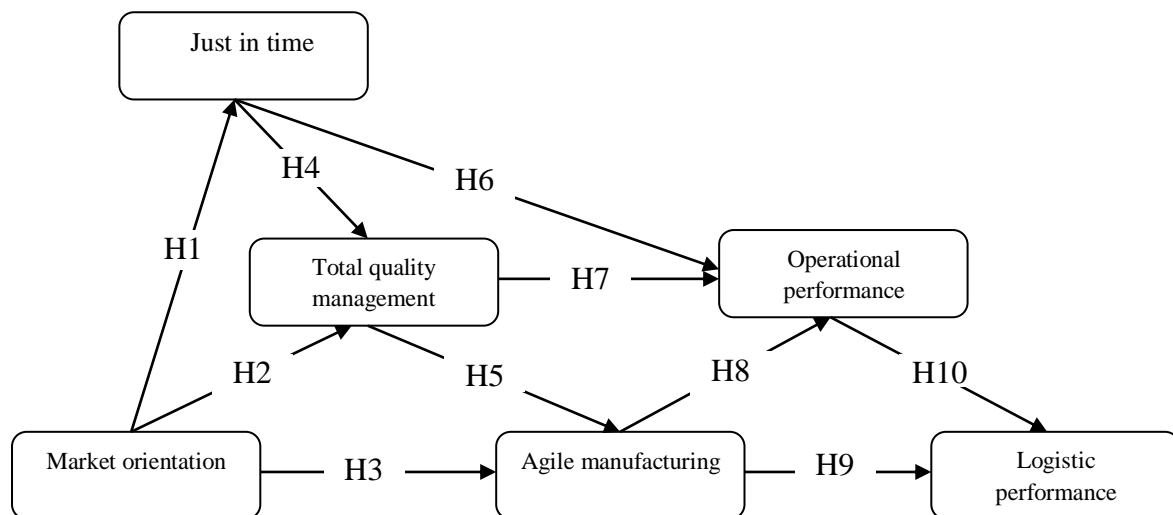

Fig 1. Zelbest et al., 2010

Market orientations are an introduction to total quality management, just in-time, and agility and they are, in turn, an introduction to operational and logistic performance. The conceptual model of this research is actually a macro model to find the relationship between to total quality management, just in-time, and agility and the effects of these programs on operational and logistic performance. Focusing on customers, designing the product, and statistical quality control are the factors considered in investigating total quality management. To examine just in-time, minimizing the inventory, production in small categories, planning for just in-time and kanban are the factors taken into account.

2.2. Concepts

2.2.1. Market orientation

Marketing is one of the aspects of organizational culture in which employees attach the highest value profitability and customer loyalty through creating superior value. Market orientation is a behavior norm spread through the organization and responds to current and

future needs of the market and customers market-oriented companies are quick in responding to such needs and this is a competitive advantage for them .They also perform efficiently in responding to challenges and opportunities. Value-centeredness in market orientation points to preparing the organization to cope with new business conditions and respond to new market needs. This kind of market orientation culture is a competitive advantage for the organization when it is unimitatable and rare [19]. Shapiro [18] is probably the first person defining various aspects of market orientation. Shapiro considered a market-oriented company as one in which important information regarding factors influencing the market customers' process of buying permeates through all the duties and functions of the company, tactical and strategic decisions are jointly made by different parts and units of the organization, and these parts and units are committed to implement these decisions [8]. There are few empirical studies dealing with the relationship among market orientation and total quality management, just in-time, and agile production. Nevertheless, several theoretical studies have investigated the association between market orientation and total quality management. Demirbag et al.[5] found that there is a positive relationship between market orientation and total quality management, while market orientations do not affect operational performance.

2.2.2. Operational performance

  Operational performance is concerned with internal investigation of an organizational. Feng et al.[6] have defined it as, "the performance related to the internal performance of an organization, such as production, the quality of production, and customer satisfaction.". Operational power is always related to efficacy [12]. Outsourcing of this information and then operational performance are a function of the level and flow of liquidity and the determined time. Operational performance is contingent on the organization's capabilities in responding to customers' needs and wants [9]. Inman et al.[11] conducted a research project titled "Agile production: The relationship between just in-time, operational performance, and the company's performance". Psomas and Fotopoulos[16] found no distinction between a company's operational performance and its logistic performance. This research deals solely with total quality management and is not as comprehensive as Inman's research.

2.2.3. Logistic performance

Logistic performance is concerned an organization's external performance (manufacturer/customer) [7]. Logistic performance is a combination of customer satisfaction, responding to customer needs [4], analysis dependence [14], the speed of analysis [20], flexibility [21], and capacity. Logistic performance is an indicator of an organization's ability to gain customer satisfaction by means of timely delivery of high-quality products and services [23]. The relationship between logistic performance and the variables examined in this study is rather unexplored.

2.2.4. Just in-time

Just in-time is a sort of growth and development plan requiring the elimination of all sorts of waste in all organizational processes. Toyota Motors pointed out that just in-time is on the basis of raw materials and manufacturing products with necessary quality in the necessary time [22]. Monden [13] held that the most important thing is to reduce execution times as much as possible. The joint relationship between customers and manufacturers leads to the formation of accurate and quick relationship with the needed market [23].

Just in-time is a concept originating from Japan and is an alternative to categorical production. The strategy of just in-time   is a reengineering of the production process. This strategy reforms the design of the products and eliminates or severely reduces operation costs. Timey production is not a distinct concept that is related to   other   concepts   such   as total quality management, constant improvement, production-based time and reengineering. However, there is not a universal agreement with regard to just in-time, and it seems that it is different across cultures and industries [17]. Just in-time is a salient plan in an organization to eliminate all wastes all through the organization [23]. This philosophy has been introduced by Toyota Motors and is based on manufacturing products and receiving raw materials in the necessary quantity and in the required time. Cua et al. [3] conducted a research project with regard to the relationships between total quality management, just in-time, productive maintenance, and production performance.

The most recent research in this regard was conducted by [11], titled "Agile production: The relationship between just in-time, operational performance, and the company's performance". However, no research as comprehensive as investigating the relationships between just in-time, total quality management, agile production, and market orientation has not been conducted.

2.3. Some definitions of agility

 There are several definitions of agility in the literature. Definition of organization's agility : "the ability to face unpredicted challenges in order to cope with new and unpredicted business threats, a considering changes as opportunities" [30].

Efficient operational changes are responding to indistinct and changing needs [15]. Systematic response to the penetration of pressures caused by the highest level of market instability and the complexity of products and simultaneous emphasis on a wide range of competitive capabilities 9[1]. As a matter of fact, agile production is a new production method providing competitive period for factories aiming to implement it. Organizations characterized by agile production manufacture high-quality and perfect products with short waiting time and with the reconfiguration capacity. These organizations coordinate and harmonize design, engineering, and production and marketing and sales. Therefore, products are made in complete accordance with customers' needs and wants [26].

2.3.1. Agile production

Agile production creates a sort of ability to survive and thrive in competitive environments characterized by constant and unpredictable changes. Acceding to this definition, agile production involves the flexibility of mechanical systems of manufacturing products and concepts such as empowering employees, close relationships between producers and suppliers, total quality, and reengineering of firms. In fact, agile production is a new production method providing competitive period for factories aiming to implement it. Organizations characterized by agile production manufacture high-quality and perfect products with short waiting time and with the reconfiguration capacity. These organizations coordinate and harmonize design, engineering, and production and marketing and sales. Therefore, products are made in complete accordance with customers' needs and wants [26]. The newest study in this domain has been carried out by [11]. This study revealed that there is a meaningful positive correlation between agile production and operational performance. Moreover, operational performance and marketing performance are positively correlated.

2.4. Total quality management

One form of operation management methods is total quality management received a great deal of attention. The definition used by the Center of Quality Management of the Institute of Science of Technology (University of Manchester) is as follows: total quality management refers to mutual cooperation of all members of an organization and related business processes in order to produce products that satisfy customers' and services that satisfy customers' needs and expectations [10]. In order to ensure that products and services have the desired quality, quality commitment of all the organization parts is essential. This attitude towards quality management is reflected all through the organization in the form of what is called total quality management. Many distinct individuals have influenced the growth of quality awareness in the United States, Japan, and other countries. The most popular people are Walter Showhart, Edward Deming, Joseph Joran, and Philip Grazli [27]. Total quality management can be defined as a philosophy of total management constantly trying to improve the organization. The theory of total quality management is developed in an evolutionary process form quality control to guaranteeing control by means of total quality management. One of the most recent studies in this field is a research project titled 'Enhancing the production performance and customer behavior through total quality management: strategy for competitive advantage. It has been conducted by [2]. Unfortunately, studies in this domain focus on operational aspects of total quality management, and there seems to be a dearth of research illuminating the relationship between total quality management and other variables such as market orientation, just in-time , and agile production.

2.5. Hypotheses

A hypothesis is a wise guess about the relationship between some variable. Hypotheses are stetted in the form declarative sentences and express expected results [29]. In this research, marketing aspect and executive aspect are stressed. The marketing aspect deals with market trends and customers' needs, and the executive aspects are concerned with development plans such as agility, total quality management, and just in-time. We argue that the above mentioned variables interact to enhance the organization's efficiency, quality, and responsiveness. A capability is considered desirable if it leads to a competitive advantage and improves operational performance and logistic performance. The combination of market orientation with just in time plans and total quality management is not sufficient for creating competitive advantage, and we need to move towards agility to enhance operational performance and logistic performance. Therefore, the following hypotheses are stated:

H1. Market orientations have a direct and positive effect on just in time.

H2. Market orientations have a direct and positive effect on total quality management.

H3. Market orientations have a direct and positive effect on agility.

H4. Just in time has a direct and positive effect on total quality management.

H5. Total quality management has a direct and positive effect on agility.

H6. Just in-time has a direct and positive effect on operational performance.

H7. Total quality management has a direct and positive effect on operational performance.

H8. Agility has a direct and positive effect on operational performance.

H9. Agility has a direct and positive effect on logistic performance.

H10. Operational performance has a direct and positive effect on logistic performance.

3. Methodology

3.1. Sampling method

The variables of this study have been taken from [23] research. The statistical population of this study is SME manufacturing support & procurement of equipment for oil companies of IRAN. Since the population of this study was in an industrial context, the sample consists of 100 experts in the field. Nevertheless, a sample of 150 participants was selected according to availability and judgment sampling. Finally, 94 questionnaires were gathered for statistical analysis, so we evaluate the relationship between variables and their influence on each other using PLS software.

3.1.1. Reliability of the questionnaire items

Since Cronbach alpha is appropriate to measure the reliability of an instrument and its internal consistency [25], after collecting 30 questionnaires that were pretested, the reliability of this instrument was measured by means of Cronbach alpha. Table 1 illustrates the

reliability of the questionnaire and the dependent and independent variables. Since the alpha coefficient for each variable is more than 0.7, the questionnaire is valid.

Table 1. Cranach alpha coefficient

Enablers	N. question	Alpha
Market orientation	10	0.843
Just in time	13	0.853
Total quality management	13	0.874
Agile production	10	0.916
Operational performance	8	0.825
Logistic performance	6	0.764

3.1.2. Validity of the questionnaire

The importance of validity lies in the fact that inappropriate and inadequate measurements can jeopardize the value of a study [28]. In this research, content validity and confirmatory factor analysis of the questionnaire have been investigated. The content validity of an instrument lies in its items. If they reflect the features and skills the researcher intends to measure, the test has content validity. The content validity of an instrument is usually determined by experts in the field. The content validity of this questionnaire has been judged and confirmed by the supervisor, advisor, and some other experts such as faculty members, PhD students, and MA students of management.

3.1.3. Confirmatory factor analysis

Joreskog invented confirmatory factor analysis. In this method, hypotheses are made based on previous issues or the theory related to the correlations between variables. Then, these correlations are fit as much as possible in the target matrix [24].

Due to the features and functions of confirmatory factor analysis, this method has been utilized to investigate construct validity of the instrument. In order to test measurement models, PLS, which is a variance-based modeling technique, has been used. In PLS models, two models were tested. Outer model, equivalent to measurement model and the inner model is similar to structural models in structural equation modeling.

3.2. Statistical analysis

The present research has an application goal and is a survey by nature. Descriptive statistics are utilized to analyze demographical information and inferential statistics are calculated to test the hypotheses. The sample of this study consists of manufacturing support and

procurement companies for Iranian oil industry. This sample has been collected by Torang Company known by Iran's Oil book. This book includes six chapters and each chapter introduces the companies' active in the domain discussed in that chapter. The tiles of the chapters are as follows: Chapter One: Exploration and Drilling, Chapter Two: Equipment, Chapter Three: Contractors, Chapter Four: Materials, Chapter Five: Services, and Chapter Six: Design and Engineering.

Due to the important role played by SMEs in the country's economy and trade, the necessity of conducting more research projects in companies active in oil industry, the high importance oil industry places on productivity in these companies, and utilizing methods that maximize production, this sample has been selected. After experts' ideas were used and the conceptual model was confirmed, the indicators related to the factors of the model were determined and the questionnaire was developed to test the research hypotheses. Then the questionnaire was administered to organizations' specialists and mangers. In order to select the members of the sample, simple random sampling was utilized. Ninety four questionnaires with seven-point Likert type items were prepared. To ensure content validity, expects' ideas were consulted.

Parametric and nonparametric statistics are calculated in this research, In order to describe the data and analyze demographic information, descriptive statistics are used, and to analyze the data and test the hypotheses and the conceptual model, confirmatory factor analysis and structural equation modeling were used. PLS and SPSS were used to analyze the data.

The data gathered from the experts and statistical samples were analyzed by means of appropriate methods and the conceptual model was tested. Finally, the results of this study are discussed, conclusions are made, and implications are provided.

4. Results

In this research, descriptive statistics were calculated to describe demographic information. It was found that 1.1 percent of the participants (1 individual) were post-diploma graduates, 96.8 percent of them (91 individuals) had bachelor degrees, and 2.1 percent (2 individuals) were MA or above graduates. Moreover, the findings of this study revealed that 9.6 (9 individuals) were senior managers or deputies, 74.5 percent of the participants (70 individuals) were managers or deputies of one section of the organization, and 16 percent (15 individuals) were a unit or staff supervisors. It was also found that 69.1 percent of the participants (65 individuals) had less than ten years' experience in their jobs, 28.7 percent (27 individuals) had 10 to 20 years of experience, and 1.1 percent one individual) had more than 20 years of experience. Furthermore, 4.3 percent (4 individuals) had very little familiarity with just in time. 23.4 percent (22 individuals) had little familiarity, 71.3 percent (67 individuals) had an average familiarity with concept, and only one person 91.1 percent) was fairly conversant about just on time. There were 3.2 percent (3 individuals) who had very little familiarity with total quality management, 20.29 (19 individuals) had little familiarity with the concept, 75.5 (71 individuals) had an average familiarity with the concept, and 1.1 percent (one individual) was fairly familiar with total quality management. There were 4.3

percent (4 individuals) who had very little familiarity with agility, 54.3 percent (51 individuals) had little familiarity with the concept, 40.4 percent (38 individuals) had an average familiarity with the concept, and 1.1 percent (one individual) was fairly familiar with agility. There were 3.2 percent (3 individuals) who had very little familiarity with agility, 31.9 percent (30 individuals) had little familiarity with the concept, 62.8 percent (59 individuals) had an average familiarity with the concept, and 2.1 percent (2 individual) was fairly familiar with agility. First, Kolmogorov-Smirnov test was run to determine the harmony between empirical information and the selected statistical distributions. To determine the desirability of the indicators, the mean of a population was used for normal variables and binomial test was run for non-normal data. As Table 2 indicates, Pearson correlation coefficient was run to examine the relationships between variables.

Table 2. Correlations

6	5	4	3	2	1	
					1	Market orientation
				1	.340**	Just in time
			1	.432**	.491**	Total quality Management
		1	.583**	.179	.539**	Agile production
	1	.496**	.307**	.133	.246*	Operational Performance
1	.262*	.106	.044	-.84	.236*	Logistic Performance

*p<.05 (two-tailed)   **p<.01 (two-tailed)

As Table 3 illustrates, the first, second, third, fourth, fifth, eight, and tenth have been confirmed with degrees of 3.11, 4.28, 3.39, 3.46, 5.81, 7.37, and 2.47 respectively.In addition, these degrees indicate that the effect of these variables on one another is rather high and the direction is positive. The T value for the sixth, seventh, and ninth hypotheses is low, hence these hypotheses are not confirmed. The negative value of these values suggests that these variables do not have meaningful effect on each other.

The qualitative indicators for the fit of the structural models suggest that the average variance extracted exceed .4 for each dimension of a model, and the combing reliability for each dimension was more than .6. The last column is related to R^2 for the model and the variables predicting it are entered into the circle by a flash. As illustrated in Table 4, marketing orientation predict .07 of the variance in just in time. Marketing orientation and just in time predict .45 of the variance in total quality management.   Finally, market trends, just in time,

total quality management, agile production, and operational performance predict 10 percent of the variance in logistic performance.

Table 3. Confirming or rejecting the research hypotheses

Result hypothesis	The standard error	T value	β	hypothesis	number
confirm	.08	2.11	.26	**Just in time** ⟵ **Market orientation**	1
confirm	.1	4.28	.42	**Total quality Management** ⟵ **Market orientation**	2
confirm	.09	2.29	.30	**Agile production** ⟵ **Market orientation**	3
confirm	.12	2.46	041	**Total quality Management** ⟵ **Just in time**	4
confirm	.09	5.81	.56	**Agile production** ⟵ **Total quality Management**	5
reject	.18	1.22	-.23	**Operational Performance** ⟵ **Just in time**	6
reject	.12	.42	-.05	**Operational Performance** ⟵ **Total quality Management**	7
confirm	.08	7.27	.62	**Operational Performance** ⟵ **Agile production**	8
reject	.25	.74	-.18	**Logistic Performance** ⟵ **Agile production**	9
confirm	.16	2.47	.27	**Logistic Performance** ⟵ **Operational Performance**	10

Table 4. The qualitative indicators of structural model

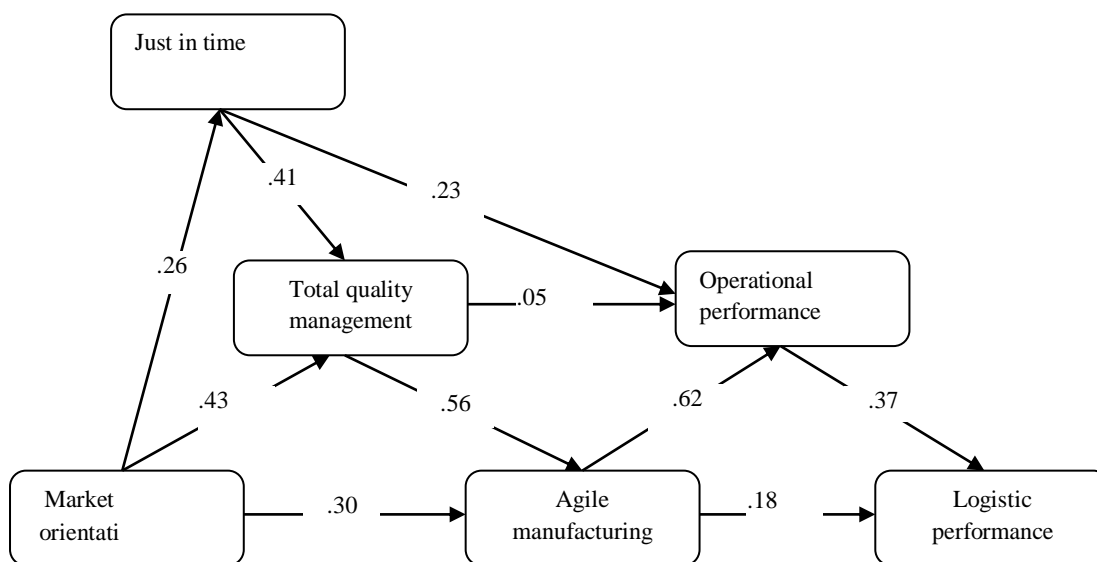| R Square	(Composite Reliability)	(AVE)	
-	.87	.44	Market orientation
.07	.83	.56	Just in time
.45	.81	.58	Total quality Management
.59	.92	.57	Agile production
.27	.85	.42	Operational Performance
.10	.82	.45	Logistic Performance

Fig 2. Path coefficients in the internal model of Smart PLS

The internal model illustrated in Figure 2, indicates the relationship between the latent variables of the research. We can examine the hypotheses of the study by means of the internal model. The numbers written on the lines of Figure 4 are β coefficients of regression of the variables, which are path coefficients. In this model, we can enter several models simultaneously and investigate the effect of each variable on the latent variable in the presence of other variables the effect of agile production on operational performance was significant (β=.62, t=7.37). In addition, the effect of total quality management on agile production was also meaningful (β=.56, t=5.81). Moreover, market trends had a significant effect on total quality management (β=.43, t=4.28), and   just in time on total quality management (β=.41, t=3.46). The results of the study also showed that just in time did not have a significant on operational performance (β= -.23, t=1.32). Furthermore, there were not significant relationships between agile production and operational performance (β=-.05, t=.62) and agile production and logistic performance (β=-.18, t=.74). The most significant impacts were the effect of agile production on operational performance, total quality management on agile production, market orientation on total quality management, market orientation on total quality management, just in-time on total quality management, market orientation on agile production, and market orientation on just in-time respectively. In order to have a better understanding of the issue, the final revised model of the research is reported in Fig 3.
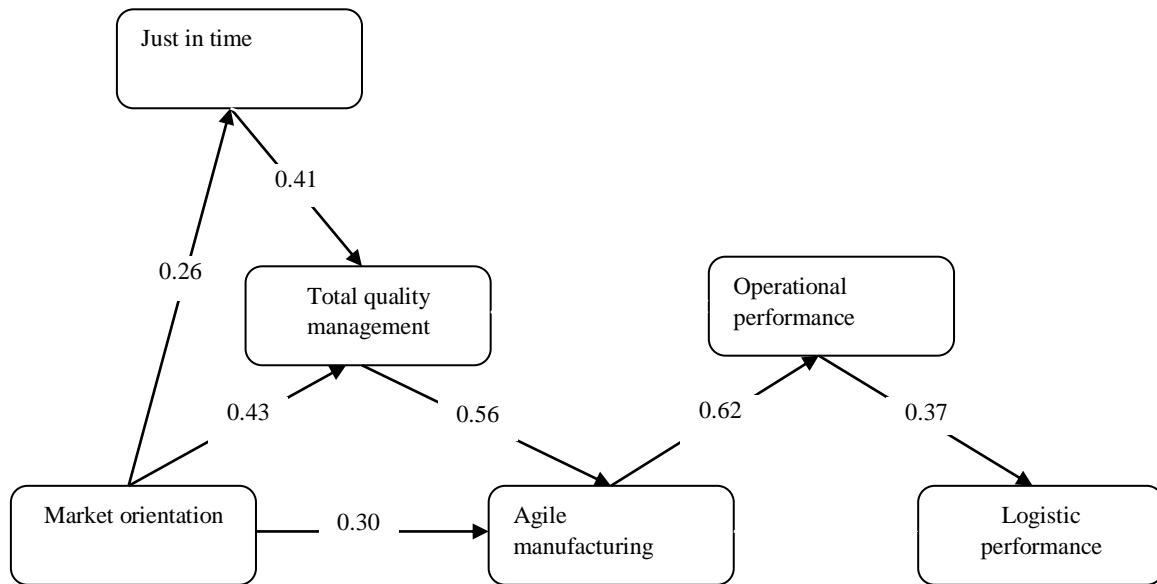
Fig 3. The revised conceptual model

5. Discussion and conclusion

The relationship between agile and operational performance (hypothesis 8) was the most significant relationship. Therefore, improving agile production can significantly enhance operational performance in an organization. In addition, the association between total quality management and agile production and the relationship between market orientation and total quality management should receive more attention. According to Table 3, the important role of total quality management, particularly in hypotheses 2, 4, and 5, cannot go unnoticed. Hence, we should attach prime importance to the establishment of this system in the organization. Due to the influence of market orientation on total quality management (hypothesis 2), we should ensure customers that the internal processes enjoy high reliability with regard to inspection, quality, observing production standards. Moreover, customers should be made certain that a particular product has much strength with regard to market appeal because factors such as inspection and customer needs have been observed in the production process. Since customers put high value on on-time or in-time delivery of purchased products, companies are recommended to pay more attention on agile production in order to be able to identify their customers' needs and present their products in advance (the third hypothesis confirms the positive relationship between market orientation and agile production). Timely receiving of raw materials and going through the production process on the basis of the production plan is essential and requires cooperation and making special policies on the part of senior management of the organization. Timely receiving of raw materials, going through the production process, and reducing the size of stores are directly associated with to customers' needs to on-time delivery, controlling the statistical process, and many other factors. Hence, in order to reach total quality management, organizations are

recommended to attach prime importance to just in-time as an infrastructure to implement total quality management (Hypothesis 4 acknowledges this). Applying quality tools, such as total quality management, can help organizations to respond more quickly to market and customers' needs and to adapt the products to customers' expectations. Consequently, we should establish the infrastructures of total quality management to have customers who are more satisfied. By means of total quality management, we can achieve agile production (hypothesis 5 is confirmed). If an organization applies agile production system, its ability to have efficient and optimal performance increases (hypothesis 8 is confirmed). When the optimal performance of a company increases, its ability to satisfy customer also increases (hypothesis 10 is confirmed). The findings of this study can be of benefit to different industries to improve efficiency. Many research projects have been conducted with regard to the empirical dimension of these variables; however, awareness of the relationship between these variables and the magnitude of these relationships is of crucial importance in implementing these systems.

6. Suggestions for Future Research

1. According to [22], the relative low costs, high quality, and quick response to customer needs are strategic to competitive advantages. Future researcher are recommended to focus on aspects such as quality costs and competitive advantages.

2. Investigating the same model in governmental organizations and comparing the results

3. Exploring the problems and challenges of enforcing total quality management, just in time, and agile production in governmental organizations in different industries

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