

# Relationship Between Operational Performance in Industrial Manufacturing Companies with Approaches of Innovation, Quality, Efficiency and Productivity

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## Abstract

The operational plan converts dream and imagination to a reality; in fact, it is an assured way to achieve organizational perspectives. The present study aims to identify the performance indicators and to investigate the relationship between the operational performances of industrial manufacturing companies in terms of innovation, quality, productivity and efficiency. A researcher-made questionnaire has been used to evaluate operational performance and its indicators. This questionnaire has been allocated to the experts of the company which produces utility gas meters. Data analysis was performed by Pearson correlation and One Sample T-Test and the Amos software. The research findings show that operational performance emphasized on efficiency, productivity, effectiveness and future benefits of the organization and plays an important role in identification of innovation, quality, productivity and efficiency indicators and promotion of goals and improvement of organizational activities.

## Keywords

Operational Performance, Innovation, Quality, Productivity, Efficiency, Utility Gas Meters

## 1. Introduction

Nowadays, companies must have competitive advantages to improve their performance and confront with competitors in order to be able to excel in complex and changing performance conditions and maintain their presence in the markets. In recent years, not only competitive sensitivity in the market has increased, but also its nature has changed [1]. The development and continuity of activity of companies require operational operation whose implementation is always limited and the task of the organizations is prediction of the operation to achieve certain goals with regard to the possibilities and limitations and general lines of the plot in order to ensure that operational performance continues to progress the goals and activities of the organization. Also, operational performance is defined as the scale for making value in today's world, and it is a heroic act in every organization that helps dreams and impressions convert to a reality. Operational performance is a way that assures individuals to outline accurately and exactly the organization perspectives; therefore, it explains a methodology that determines those strategies which a group uses to achieve goals. An operational function consists of a set of operational steps that are performed to attain predetermined goals. Operational performance causes to determine the

objectives and convert these objectives into operations and predict its implementation methods, as well as foretell and determine the steps and sequences of the necessary activities for providing strategic goals through the tools (tactics) by separation of necessary time, cost and human resources. Today, companies try to measure their performance and compare it with their competitors in order to take appropriate action to achieve a performance level that can keep them in the market [2]. Therefore, operational performance is a measure for evaluating the achievement of organizational goals. Measuring operational performance is the basis for many decisions and is one of the most important issues for creditors, investors, governments and managers. On the other side, the operational objectives of operational performance are replaced by general objectives and predict how to achieve them in a series of operations. Also, the performance of human resource management (HRM) in the organization is related to the operational level, and desirable organizational management has facilitated the transfer of operational performance, in other words, it has a strong and important role in the correct selection and conscious utilization of the desired tools and methods of operational performance. The present study aimed to identify the state of operational performance of industrial manufacturing companies in terms of innovation, quality, productivity and efficiency. Therefore, according to the importance and necessity of operational performance in organizations for achieving predetermined goals and this fact that an evaluation of the organization performance means measuring the extent to which the organizational unit has achieved its predetermined goals in its program, the results of the evaluation of their performance are not intended, but rather they are tools that are used to predict future plans, as well as, improve the strengths and resolve the weaknesses of that unit. The performance appraisal system of an organization is considered as the main mechanism for clarifying the set of tools and organizational communications in line with the implementation of strategies. In the current management theories, targeting and evaluating organizational performance play a key role which is expressed in the form of some phrases such as "whatever has been done will be measured" [3]. According to the importance of this issue, various methods for evaluating operational performance have been presented, which can be referred to as a performance evaluation method [4]. Managers use a variety of criteria such as innovation, quality, productivity and efficiency to evaluate the performance of their organizations.

In this regard, researches were performed such as Ahmadi et al. [5] who found that the innovation and organizational performance resulted from knowledge sharing lead to increase productivity and effectiveness. Keshavarzi et al. [6] showed in the article of investigating the effect of knowledge sharing on learning, innovation and organizational performance on 320 managers, engineers and experts of Mashhad water and sewage company that knowledge sharing has positive effect on learning, innovation and organizational performance; also, explicit knowledge sharing has a greater impact on financial performance and the tacit knowledge sharing has a stronger impact on operational performance. Thornhill [7] investigated the impact of innovation on the performance of 845 manufacturing companies in Canada. The results of the research showed that innovation is more prevalent in industries with high dynamics and innovation interaction with knowledge is effective in the dynamics of industry and company performance. Mansury & Love [8] found that the presence and increase of innovative services have a positive effect on the growth of organizations, but they have no effect on productivity. Carbonell and Escudero [9] concluded that the speed of

innovation has a direct relationship with organizational performance and can provide sustainable competitive advantage. Jamenez & Sanz-Valle [10] found that organizational learning elements have a positive effect on organizational innovation and organizational performance. In the Wang & Wang's [11] research, the relationship between innovation and performance in 89 high technology companies in China was examined. The results of their research showed that knowledge sharing practices have an impact on innovation, quality, efficiency, productivity and performance, and it has a more significant effect on quality and innovation.

According to the above-stated articles, this study aims to identify the indicators and to investigate the relationship between operational performances in industrial manufacturing companies with the approach of innovation, quality, efficiency and productivity.

The conceptual model of the research has been presented with regard to the research literature, the evaluation of operational and strategic performance, and the establishment of technology management. The structure of this research model is based on initial results and research in this field.

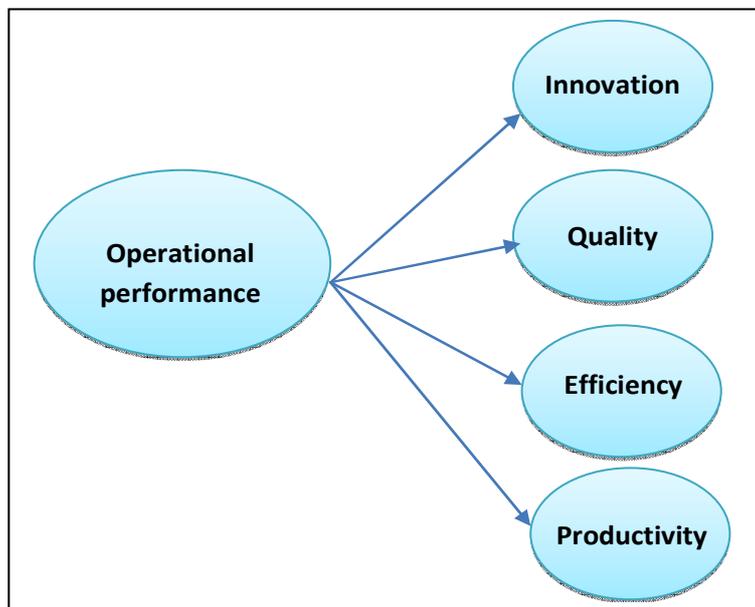


Figure1. Research conceptual model (derived from research literature)

## 2. Theoretical Foundations

A history of operational planning at the headquarters of ministry is returned to 2001. Planning is the most important and first job of a manager. Therefore, each manager should be able to plan and his/her other management tasks including human resources recruitment are in the next degree. There are two types of goals in the organization: the long-term goal and the short-term goal which realization of the long-term and short-term goals needs the strategic planning and the operational planning, respectively.

### 2.1 Definition, Concept and Types of Operational Performance

Operational (operational-tactical) performance is a function that delivers details of how strategic functions are implemented, in other words, executive functions are short-term decisions that are made for the best use of existing resources in the light of environmental changes. The operational functions, themselves, are divided into two categories: 1- One-time programs: These programs are designed for specific purposes and disappear after they are implemented. 2- Permanent programs: These programs are standard procedures for management of current status and foreseeable situations.

## *2.2 Identification of Operational Performance Indicators*

### *2.2.1 Innovation*

Innovation is the transformation of the idea into an applied program, product, new service, process or improvement of a presentation and new operation [12]. Innovation consists of three components of innovation in product and service, innovation in the process, and innovation in the organization.

#### *2.2.1.1 Innovation in Product and Service*

Innovation is the implementation of a new product and service and completely improved in business practices, organization or external relations [13].

#### *2.2.1.2 Innovation in Process*

Innovation is the concept of introducing a new process into the market through making new applications in the creation or commercialization of the product [13].

#### *2.2.1.3 Innovation in the Organization*

Innovation which is considered as the idea, behavior, approach, strategy, policy, and new programs that are accepted in the organization is referred to the organizational innovation [14].

### *2.2.2 Quality*

Quality literally means "of what kind" and it has different meanings in the absolute and relative sense; quality in the absolute sense is thing that is complete and without additional expense, and its two aspects are scarce and expensive, quality is admired by many people, but few have it [15]. Quality involves eight components including management and leadership contribution in quality improvement, customer focus, identification and training of employees in making quality, empowerment of staff and teamwork to improve quality, measurement and analysis of quality, the process management and relationship with the supplier, and continuous improvement.

#### *2.2.2.1 Contribution Management and Leadership in Quality Improvement*

Management and leadership play a role in enhancement, improvement and promotion of quality, and their support and participation cause to improve quality.

#### *2.2.2.2 Customer Focus*

It mentions that quality is important for the customer and it must be used to meet the needs of both domestic and foreign customers [15], also, it must be used to identify employees for participation and quality improvement. Intended purpose of customer is not just buyers, but also it includes all internal staff. The degree of conformity of the manufactured goods or the provided services with the customer's need indicates quality and it has a significant role in increase of the customers in view of the customers' complaint.

#### *2.2.2.3 Identification and Training of Employees in Making Quality*

Holding educational courses is essential for identifying and training employees and the promotion of organizational quality (quoted from in-person interviews with experts).

#### *2.2.2.4 Empowerment of Staff and Teamwork to Improve Quality*

Use of encouragement of group performance and teamwork presentation is very effective in order to empower employees.

#### *2.2.2.5 Measurement and Analysis of Quality*

The analyzed information is available to the departments in order to measure the quality, as well as information which is obtained from domestic and foreign customers and manufacturers, and then they are analyzed and the size of quality is measured.

#### *2.2.2.6 Process Management*

Process management can be controlled by control of the placement of charts and quality control tools.

#### *2.2.2.7 Relationship with the Supplier*

Maintaining relationships and cooperation with suppliers leads to good communication and quality improvement.

#### *2.2.2.8 Continuous Improvement*

The attention of organization personnel to the proper conduct of activities and continuous monitoring of processes lead to continuous improvement.

### *2.2.3 Productivity*

A mental attitude - an approach that seeks to continuously improve -is being called productivity. Productivity involves four components including improvement and increase of sales revenue (output), increase of output per unit of production cost (output), the optimal use of workforce (input), and the optimal use of capital.

#### *2.2.3.1 Improvement and Increase of Sales Revenue (output)*

The measurement of customer satisfaction, the customer appreciation ratio and the level of customer loyalty show the improvement and increase in sales revenue (output).

2.2.3.2 *Increase of Output per Unit of Production Cost (output)*

Inventory turnover rate, internal defect rate, return or customer rejection, rework level or wastes, and timely delivery commitment indicate the increase in output per production cost unit.

2.2.3.3 *Optimal Use of Workforce (input)*

With regard to workforce productivity, employee participation rates in group activities and in the system of recommendations, hours of education and training costs are considered on the total income of the optimal use of workforce.

2.2.3.4 *Optimal Use of Capital*

The optimal use of capital is measured by consideration of the share of research and development costs and the optimal use of space, equipment and machinery.

2.2.4 *Performance*

This represents the concept of how well an organization uses its resources to produce its best performance at some point in time. Performance includes a component of inputs/enter data.

2.2.4.1 *Inputs/Enter Data*

The cost of raw materials, the cost of waste reworking, the cost of transportation, the cost of maintenance and storage, and the cost of consumed energy indicate the amount of inputs data.

Table1. Evaluation of Operational Performance Indicators

Dimensions	Indicators	Variables
Innovation	Innovation in product/service	<ul style="list-style-type: none"> <li>• The number of provided products or services</li> <li>• Desire to introduce new products or services (responsiveness time, product attributes)</li> <li>• Efforts for innovation in terms of persons, hours, teams and training (continuous improvement)</li> </ul>
	Innovation in the process	<ul style="list-style-type: none"> <li>• Desire to introduce the new process</li> </ul>
	Innovation in the organization	<ul style="list-style-type: none"> <li>• Search for new management systems</li> <li>✓ Organizational structure</li> <li>✓ Organizational Approaches</li> <li>✓ Strategies</li> <li>✓ Processes</li> <li>✓ Office systems</li> </ul>
Quality	Management and leadership contribution in quality improvement	<ul style="list-style-type: none"> <li>• Support of management</li> <li>• Participation of management</li> </ul>
	Customer focus	<ul style="list-style-type: none"> <li>• Meeting the needs of both domestic and foreign customers</li> <li>• Identification of employees for participation</li> <li>• Customer complaints*</li> </ul>
Quality	Identification and training of employees in making quality	<ul style="list-style-type: none"> <li>• Holding educational courses and upgrading them *</li> </ul>
	Empowerment of staff and teamwork to	<ul style="list-style-type: none"> <li>• Encouraging group performance</li> </ul>

	improve quality	
	Measurement and analysis of quality	<ul style="list-style-type: none"> <li>• Information from domestic and foreign customers and manufacturers</li> <li>• The analyzed quality is available to the departments</li> </ul>
	Process management	<ul style="list-style-type: none"> <li>• Processes are under the control (charts, quality control tools)</li> </ul>
	Relationship with the supplier,	<ul style="list-style-type: none"> <li>• Maintaining relationships and cooperation with suppliers</li> </ul>
	Continuous improvement	<ul style="list-style-type: none"> <li>• Continuous monitoring the processes</li> <li>• Organization persons focus on doing correctly things</li> </ul>
	Improvement and increase of sales revenue (output)	<ul style="list-style-type: none"> <li>• Customer satisfaction</li> <li>• The ratio of appreciation: customer appreciation ratio in one year/total number of customers</li> <li>• Customer loyalty: Fixed number of customers in a year/Total number of customers</li> </ul>
Productivity	Increase of output per unit of production cost (output)	<ul style="list-style-type: none"> <li>• Inventory turnover</li> <li>• Defect rate (Internal)</li> <li>• Return/reject of customer (External)</li> <li>• Level of rework/wastes</li> <li>• A commitment to timely delivery</li> </ul>
	Optimal use of workforce (input)	<ul style="list-style-type: none"> <li>• Workforce productivity</li> <li>✓ Added value\Number of employees</li> <li>• Participation rate of staff in group activities</li> <li>• Employee participation rate in the system of suggestions</li> <li>• Educational hours per each employee</li> <li>• Training fee/Total income</li> </ul>
	Optimal use of capital	<ul style="list-style-type: none"> <li>• Contribution of research and development costs</li> <li>• Optimal use of space and equipment and machinery</li> </ul>
Performance	Inputs/enter data	<ul style="list-style-type: none"> <li>• Cost of raw materials</li> <li>• Rework/wastes costs</li> <li>• Transportation costs</li> <li>• Maintenance and storage costs</li> <li>• Costs of consumed energy</li> </ul>

### 3. Materials and Methods

The present research is a survey and applied study. Also it is considered as a field study according to the content of subject. The study population consisted of 30 experts and managers in different departments including administrative, human resources, engineering and finance of the manufacturing company which produces utility gas meters. Then, they were evaluated by interviews and questionnaires. In this research, Cronbach's alpha coefficient is 0.853 for questionnaire, which is a high and acceptable coefficient; therefore, its reliability is confirmed. Content validity was used to determine the validity of the questionnaire. In this regard, the questionnaire was evaluated by professors and researcher and related supervisor professor and its validity was confirmed.

### 4. Results and Discussion

Investigating the assumption of the normalization of data by the Kolmogorov-Smirnov test (ks) Parametric statistics require assumptions about the population from which sampling has performed. As the most important presumption in the parametric statistics, it is assumed that the distribution of

the society is normal, but nonparametric statistics do not require any assumptions about distribution. The parametric statistics techniques are strongly influenced by the scale of variables and the statistical distribution of population. If the variables are nominal and sequential, they should be used with nonparametric methods. If the variables are interval and relative type and it is assumed that the statistical distribution of the population is normal, parametric methods are used; otherwise, nonparametric methods are used. Kolmogorov-Smirnov test was used to investigate the normality of components of pattern dimensions. In all tests, the statistical hypothesis is as follows.

H0: The relevant variable data has a normal distribution.

H1: The relevant variable data does not have a normal distribution.

The final result of this test indicates the existence of a normal distribution for variables. If the significance level is more than 0.05, the null assumption is confirmed and the data has normal distribution; otherwise, the null assumption is rejected and the distribution of the data is abnormal.

Table2. The test result of normalization of variables

Variable	Significance level	Error value	Confirmation of assumption	Result
Operational performance	0.966	0.05	H0	Normal
Innovation	0.569	0.05	H0	Normal
Quality	0.730	0.05	H0	Normal
Productivity	0.576	0.05	H0	Normal
Efficiency	0.234	0.05	H0	Normal

According to the results of Table 2, the significance levels for all variables are more than the error value of 0.05, as a result, the data has a normal distribution and parametric tests can be used.

- Investigating demographic variables

Frequency distribution of respondents' gender was that the most frequency percentage of gender is related to men who were 19 persons (63%) and women were 11 persons (37%). Frequency distribution regarding the level of education of respondents was 17 respondents (57%) had university degree and 9 persons (30%) of them had master's degree and 4 persons (13%) had vocational school. Regarding the work experience of respondents, 13 respondents (43%) had work experience of 11 to 15 years, 10 persons (33%) had 6 to 10 years, 4 respondents (13%) had less than 5 years and 3 persons (10%) had 16 to 20 years. According to the findings of the research, 9 respondents' age (30%) were 36 to 40 years old and 8 persons (27%) were between 31 to 35 years old and 6 respondents (20%) were between 25 and 30 years old and 5 persons (17 %) were between 41 to 45 years old and 3 respondents (10%) were more than 45 years old.

Explaining and interpreting the research hypothesis

Research hypothesis: The relationship between the operational performance of the company which produces utility gas meters with innovation, quality, productivity, and performance is significant.

One sample T-test is used to compare each of the components of the operational performance with a moderate value (3) (change range of variations was 1 to 5). Parametric statistical tests are used for a time group that we intend to compare the mean of a sample with the hypothetical and theoretical mean. This hypothetical or theoretical mean can be either a common or usual value, a standard

value, or an expected value. In other words, when we try to compare the mean of a variable in a study with a given mean, we use one sample t-test. In this test, we compared the average of the sample with the value of 3, which is the considered average value.

Table3. One sample t-test

The effect of operational performance components in the Company	Test value=3			Average	Statistic t value	Freedom degree
	High level	Low level	Significance level			
Innovation	0.009	1.20	4	2.6	1.409	29
Quality	0.000	1.95	3.53	2.74	0.432	29
Productivity	0.006	1.40	3.87	2.64	0.611	29
Efficiency	0.000	2	4.50	3.25	1.229	29
Operational performance	0.003	2.05	3.63	2.84	0.694	29

The output of this test indicates the average operating performance status and its components are as follows in the order of the above table: ( $\bar{x}$  = 2.84, 3.25, 2.64, 6.74, 2.2). Significance level was equal to (Sig = 0.003) for operational performance status and for its components were (Sig = 0.009) for innovation, (Sig = 0.000) for quality, (Sig = 0.006) for productivity, and (0.000 = Sig) for efficiency. Therefore, it can be said that, in general, the performance and its components (innovation, quality, productivity and efficiency) have a strong performance in the population of this research among the studied information. As a result, the project hypothesis is confirmed.

## 5. Conclusion and Recommendations

Today's world brings facilities among organizations by proper management and the appropriate performance of human resources management is conducive to optimal transfer especially at the operational level. In other words, operational performance plays a significant and important role in the right selection and informed use of the tools and methods. According to the findings of the research and based on the research background, the operational performance status of the company is in terms of innovation, quality, efficiency and performance. As the results of the hypothesis, It is shown that the improving of the performance evaluation systems and identifying indicators that accurately evaluate the operational performance, as well as developing integrated systems for the supervision of personnel from the beginning of the job path to the end, as well as the redefining of job specifications and the competencies required by the staff to enter the organization effectively and competently, as well as continuous search for industry professionals, and monitoring these professionals can facilitate the process of the operational performance in organizations.

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