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The Study of Advanced Manufacturing Strategy and Its Effect on Financial Performance in Tehran's Stock Exchange

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ABSTRACT

The aim of this research is to examine the effect of advanced manufacturing strategies and information technology on financial performance of the companies which have been accepted in Tehran stock exchange. The sample is includes manager of these companies. The necessary information has been collected by using the questionnaire and financial lists. Reliability has been controlled by suit test. This research is based on this hypothesis: there is significant relationship between advanced manufacturing strategies and financial performance indicator in Tehran stock exchange. For analyzing data Principle component, regression analysis and correlation have been used. The results show that advanced manufacturing strategies and information technology affected the financial performance.

KEY WORDS: advanced manufacturing strategies, information technology, financial performance, principle component.

INTRODUCTION

The Information technology with the centrality of knowledge and human rationalism and its ideas, has received special attention in the past decades as an axis of development in societies and organizations, in order to utilize the thought and transfer the repetitive and un-innovative affair to the machine and also increase the humanity skill and efficiency. Nowadays information technology makes information more useful than ever before. Information technology had made great evolution and changes in administrative and information systems. Information technology has provided the possibility of transferring electronic data, papers, documents and various correspondences through computer and telecommunications lines. Studies show that there is significant relationship among investment in information technology, organizations productivity and utilization of human force. Moreover Information Technology increases the ability of organization which is the result of products diversity and improves the quality and customer satisfaction, and also facilitates the process administrative and increases the output of human resources and management. One of the advantages of information technology is the possibility of simultaneous *concentration and* deconcentration which means that we can do tasks from a distance without any need to be personally and continually in place; this characteristic emphasizes the reduced time and place intervals as a highway. Growing trends of information technology development requires careful and scientific planning for social usage. Regarding the weak economic conditions in many developing countries, there is a need for special attention of experts and executives of Development Program to the Economic applications. On the other hand regarding the role of investment index in financial decision, financial effectiveness of the information technology is an important issue which can have an effective role in attitude and tendency of economic institution toward development. The levels of investments in information technology industry have a dramatic increase. These investments in the 2003 are three times more than other investments. The sign of private sector for selecting options is generally the efficiency and the risk of investment; there is no doubt that high expectation of efficiency of information technology equipment causes an investment increase in this phenomenon. Some experts believe that the unnatural economic operational improvement in the past decade in United States is related to information technology. From 1995 to 2002, GDP in United States increased approximately 4percent. This figure compared with a figure like 37 percent in the first half-decade shows the unusual economic growth in this country (Adkinson. William and et al (2004))

In the process of globalization, the organization might have to follow the events of the world and one of the most important of these is the information technology application in organization which has a special role in the elevation of the organization. Information technology makes an opportunity for organization employees that wherever they are can be connected to organization and does their tasks. Financial performance as one of the most important parts of an assessment of the organization is an apprehension for many researchers and executives of the organization development. On the other hand, information technology as one of the most important levers of development in recent decades finds its place in development plans.

LITERATURE REVIEW

Sarah Yang et al. (2005) in the research examines the mediating role of both non-financial and financial performance measures in the relationship between a differentiation strategic orientation and organizational

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performance. A path-analytical model is adopted using questionnaire data from Australian manufacturing firms. The results indicate that, firstly, firms pursing a differentiation strategy (product flexibility or customer service focus) utilize non-financial as well as financial performance measures; secondly, these performance measures are associated with higher organizational performance; and thirdly, there is a positive association between a firm's strategic emphasis on differentiation and organization performance through the mediating role of nonfinancial and financial performance measures.

Petros Theodoroua, Giannoula Floroub(2006) in the research "examined the impact of IT on financial performance. The strategic priorities include the cost, quality, flexibility and reliability (delivery) and innovation. Return on invested capital (ROIC) has been used as a criterion of performance. To do this a cross-sectional study was held in the field of Greek manufacturing firms that apply advanced IT, in order to explore which, how and in what level manufacturing priorities have been adopted. For that purpose, cluster analysis and VACOR algorithm were used, to distinguish clusters of firms and estimate the effect of IT on financial performance, for each type and level of strategic choice. It was found that the effect of IT on financial performance was observed to be greater for firms which emphasize the higher level of flexibility strategy and the middle level of cost strategy. On the contrary, the effect of IT on performance was observed to be greater for firms which emphasize a lower level of quality and innovation strategy.

Halim kazan, Golkhan ozer and Ayse Tansel 2005 seek to investigate the effect of manufacturing strategies of manufacturing companies on their financial performance and also the effect of firm size on the impact of manufacturing strategies. A total of 200 manufacturing companies that are registered under the Chamber of Commerce in Gebze, Turkey were selected and their managers interviewed. It was found, that an increase in the quality and cost/flexibility increased financial performance. However, the rate of delivery did not have any statistical influence on the financial performance. On the basis of the analysis done on the firm size, the last finding is that the effect of the quality and cost flexibility on financial performance is higher for large companies compared with SMEs.

Lillis, A. M. (2003) in her study explores the link between strategy and the use and design of manufacturing subunit performance measures by profit centre managers. For designing this model she used financial and non-financial performance measures. Data were collected using a semi-structured interview in conjunction with a structured questionnaire administered to 36 profit centre managers and 12 manufacturing managers in 36 manufacturing firms in Victoria, Australia. Relative reliance on financial and non-financial performance measures for manufacturing management control. She also seeks the relation between the competitive strategy and relative reliance on financial and non-financial measures for manufacturing management control in order to control production cost criteria and the way cost benchmarks used in financial performance measures are constituted to integrate non-financial dimensions of performance.

Saeed Salkhordeh Ziabariand et al (2012) in their study shown that using computer systems in age of information explosion have led to improving the performance and effectiveness of the organization. This research published in Journal of Basic and Applied Scientific Research. Objectives of their study are investigation of computer systems, their application and effectiveness on performance of employees and providing solutions to enhance the performance of employees. Research method used in this study is type of descriptive-analytical method that is applicable goal. Populations studied in this research are eneral Administration of Customs of Bandar Anzali, Guilan and the headquarters of the province Guilan Customs. The statistical community includes total of 123 people and data collection tool is a questionnaire. Data analysis shows that the computer systems effect on improvement of manpower productivity, quality and improvement of job skills.

Sina Sadeh and et al (2012) explores the Application of IT tools in healthcare organizations is an effective way to improve operational performance. Hospitals increasingly use IT tools in several aspects of their operations. In fact, IT tools are able to decrease the time and cost and increase accuracy in doing tasks and operations in hospitals. This study aims to rank IT tools in hospitals based on their importance in improving operational performance. In the first step, review on the literature showed IT tools can be applied in hospitals in three clusters including administrative, clinical, and strategic. Also, in each cluster there are several items which explain application of IT tools in a specific operation. In the next step, this study collected opinions of 20 experts (doctors and IT administrators) with experiences in Iranian hospitals to calculate weights of IT tools. AHP method was applied to evaluate the weights and rank the tools. Finally, it was achieved that application of IT tools in clinical cluster has the most contributory role in enhancing the operational performance of the hospitals. Administrative cluster and strategic cluster have respectively the next important roles. Furthermore, in each cluster the important items were identified. Finally, this study suggests the hospitals to consider usage of IT in clinical cluster as the most contributory area and recommends them put their efforts more in this field.

Successful paradigms of IT strategic impact are reported by Ives [10] and Feeny [11] regarding Wingtip Couriers, and by Clemons and Row and Stoddard [12], regarding Otis elevators [13]. Moreover, frameworks are developed in the sense of helping managers identify IT applications that create competitive advantage, by Porter and Millar [14], Wiseman [15] Ives and Learnmonth [16], Feeny and Ives[17], Jayawardhena and Foley[18], Madnick and Wang [19]. Copeland and Mckenney [20] have traced the history of its competitive advantage within the applications in the airline industry, while others like Clemons and McFarlan [21] on telecommunications. In a more holistic approach, regarding the concept of strategic alignment Luftman[22] refers to the case of Bristol–Myers Squibb Co., a leader company in the pharmaceutical industry. The strategic

alignment concept and how the leverage effect of IT shapes business strategy is examined by Henderson who refers to the examples of Eastman Kodak and IBM, Baxter healthcare, H&R Block[23], Procter and Gamble and Wal-Mart Stores.

A full list of summary details on empirical research in IT and business strategy formulation was made by Galliers[24]. Examples about how strategic targets facilitated by the information technology adoption can be referred by the United Service Automobile Association (USAA) and the American Express Travel Related Services. Specifically, USAA decided to support its low cost strategy (via a telemarketing service) by investing in an up-to-date document-handling system, based on electronic imaging technology. This IT solution was not provided off the shelf and it was developed by a joint venture with IBM. American Express Travel decided to support its dependability strategy (quick approval of purchase) also by IT applications. The ultimate purpose was to decrease the lead time for the approval process on a credit card charge. That lead time was vital for the creation of competitive advantage as customers switch to competitors for faster transaction. To accommodate that strategic target an expert system application was developed (further details are given in Henderson). A model describing how to choose specific IT applications in order to support strategic targets is presented by heodorou1 in a case study of a Greek supply chain. Further extension of examples is out of this research purpose as there are numerous paradigms in various sources like the one mentioned previously.

Computer – Aided Design

In past the design of pieces and products was done manually and by using large tables and tools maps, and often a map on the paper was drawn. So designing was generally time-consuming and inconvenient. Also if a mistake was made in drawing, or the plan was changed, reforming and redrawing of the maps, needed a great amount of the time. This issue is more obvious the products which have numerous and complex structures. Keeping and caring of maps was another problem which needed not only a lot of place but also considerable time to archive coding and recovery. Therefore all these plans just represented shape and the geometric situation and place of pieces regarding each other, in two dimensional spaces. Gradually using computers in drawing the maps and creation and development of CAD software make a great change in the designing tasks.

The decrees of design and production faults creation a balance between the plan and the production methods, easy diagnosis of relations in parts of the piece of analysis, facilitation in preparing references and improvement or increase in design standards are some advantages of Computer – Aided Design.

Computer-Aided Manufacturing

One of the most dramatic developments was the introduction of computer aided manufacturing (CAM), a system of using computer technology to assist in the manufacturing process. The CAM system include planning, manufacturing resource planning, work machine, montaging, maintenance and repairs which in the work machine and montaging field the Artificial Intelligence technology and robots are used significantly

Continuous Performance Improvement would be able to create synergy force which can support growth and develop plans and find opportunities for creating organizational excellence. The governments, organizations and institutions are in an effort to do this action. Continuous Performance Improvement is not attainable unless having the knowledge and awareness of the progress amount, achieving the goals, identifying challenges of organization, gaining feed back and being informed about the successful strategy implementation and identify cases which need serious improvement.

Hypotheses and questions

In our research, we seek answer to the following question: Is there any significant relationship between the manufacturing strategies, advanced information technology and financial performance?

In order to answer this question, we test the follow hypotheses:

H.: advanced information technology and financial performance effect on financial performance.

THE SAMPLE: QUESTIONNAIRE AND METHODOLOGY

This study is a kind of correlation, factor analysis and is based on libraries studies. There are many different kinds of factor analysis but perhaps the simplest and most widely used which we used in this research is principal components analysis. Components are another term for factors and the components in principal components analysis are often referred to as factors.

Factor analysis is a set of techniques for determining the extent to which variables that are related can be grouped together so that they can be treated as one combined variable or factor rather than as a series of separate variables. As strategy cluster is include four clusters i.e. Cost, Innovation, Flexibility and Quality and these cluster measure by many different question we prefer to use factor analysis to mitigate theses answer and grouped them as a factor for any cluster.

Data were collected using a structured questionnaire. The questioner disturbed between the firms that at least have similar organized departments of design and production. This similarity refers to the type of formalization, coordination and cooperation, i.e. the firms have similar levels of hierarchy and span of control, similar departmentalization, type of communication and ruling and more important cellular oriented production.

These similarities probably derive from similarities to age and size. Those firms were selected because they adopt advanced IT for more than 3 years. A reliability test was then performed to assess the consistency. The Cronbach α coefficient of 0.78 indicated good reliability.

Data has been collected 'door-to-door' using a questionnaire completed by IT experts. Moreover, the providers of IT equipment helped to collect and test the questionnaire. A close cooperation during the study has been held with the providers of those IT systems, as the firms of the sample were their clients.

The reliability questionnaire, confirmed by experts and professors specialized in this field. each strategy will be presented on a scale from '1' to '5', where level '1', indicates strongly agree adoption of that strategy, '2' agree '3' medium '4'disagree and level '5' the high intense on that strategy. Firms will be distinguished in groups according to the intense of their strategy. The questioner has 24 questions where 4 first questions are related to cost strategy, 3 next questions according to quality strategy, 5 questions according to flexibility and the last 3 questions according to Innovation strategy.

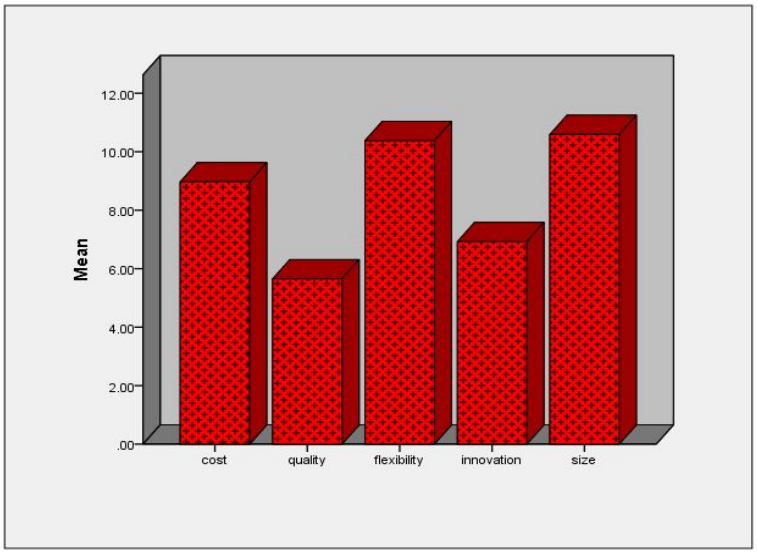
It is worth mentioning that the scale of option in the questioner is Likert. Likert scales were first introduced as a scale for attitude measurement. Likert scales were named after their founder, Likert, who first introduced this '1'–'5' scale with two extremes and a middle point for the measurement of people's attitudes.

The questionnaire was filled, according to the answers given by IT experts and after we had explained to them the main point of each question [25-28].

We had 14 questions with 5 levels for each question. The questions and the strategic choices have been determined from the literature review as they were presented in the previous section. The priorities were selected after a long discussion with the providers of the system and a pilot study of some firms in order to capture the Tehran's Stock Exchange firm's context.

Table1: the descriptive statistic

	size	cost	quality	flexibility	innovation
N	67	67	67	66	67
Mean	10.5870	8.9104	5.7015	10.3788	6.9403
Median	10.5600	9.0000	5.0000	10.0000	7.0000
Mode	10.14[a]	9.00[a]	4.00	10.00	7.00
Std. Deviation	.59320	1.78997	1.95413	2.16806	1.92968
Variance	.352	3.204	3.819	4.700	3.724
Minimum	9.02	5.00	3.00	6.00	3.00
Maximum	12.10	13.00	11.00	17.00	11.00



Graph1: the mean of variables

Research variables

The equation that is estimated has one dependent variable which is the value of information technology. An accepted estimate can be derived from that equation, regarding the effect of IT on performance for each strategic cluster, without losing the impact of other important variables (structure, age, size, etc). The effect of those variables would be significant if they had significant variation in the sample used. Instead, the firms of the sample, have some important similarities: in age, in size (regarding the day of foundation), in time of IT adoption-implementation, in the number of employees. So, we can exclude all the similar variables and assume that the effect of this independent variable (IT) on performance is a good estimator. Additionally, in the regression equation both dependent and independent variables are quantitative and their causal-effect relation is better estimated for the different strategic clusters than if we had qualitative variables. The business structure

leverage is also a very important factor, but that should be taken into account, only in a dynamic analysis where important variations of this factor exist. In this research a static approach is used and business structure is not changing. The similar structural characteristics that the firms of the sample have are: the hierarchy levels, the number of departments, the type of internal ruling system and the cellular type of production. Generally, those firms have similar formalization, complexity, decentralization and coordination. Venkatraman applied that type of analysis (matching perspective) for the variable of business structure, but here the Venkatraman's matching perspective is examined for the business strategy.

By using factor analysis, a total of 37 internal customer-service quality variables were summarized into four factors which indicate the 4 strategy that consider in this research.

Factor analysis is a set of techniques for determining the extent to which variables that are related can be grouped together so that they can be treated as one combined variable or factor rather than as a series of separate variables. Perhaps the most common use of factor analysis in the social and behavioral sciences is to determine whether the responses to a set of items used to measure a particular concept can be grouped together to form an overall index of that concept.

FACTOR ANALYSIS

There are many different kinds of factor analysis but perhaps the simplest and most widely used is principal components analysis. Components are another term for factors and the components in principal components analysis are often referred to as factors. We will use the two terms interchangeably here. In principal components analysis, the amount of variance that is to be explained or accounted for is the number of variables, since the variance or communality of each variable is set to 1.00.

The first factor will always explain the largest proportion of the overall variance; the second factor will explain the next largest proportion of variance that is not explained by the first factor and so on, with the last factor explaining the smallest proportion of the overall variance. Each variable is correlated with or loads on each factor. Because the first factor explains the largest proportion of the overall variance, the correlations or loadings of the variables will, on average, be highest for the first factor, next highest for the second factor and so on. To calculate the proportion of the total variance explained by each factor, we simply square the loadings of the variables on that factor, add the squared loadings to give the eigenvalue or latent root of that factor, and divide the eigenvalue by the number of variables. Finally our scale for extracting the principal components is the factor which their eigenvalues are greater than one.

Before done the factor analysis we must sure about the normality which is one of the necessary conditions for analysis factor. In the below table we present the result of the normality test:

Table2: K-S test

strategy	Z	P-Value	result
flexibility	1.324	.060	Normal
Quality	0.697	0.074	Normal
innovation	0.794	0.215	Normal
cost	1.017	.252	Normal
size	.502	.963	Normal

The above table presents the results from two well-known tests of normality, namely the Kolmogorov-Smirnov Test. Based on this test all variable be normal and can be used in the factor analysis.

RESULTS

By using factor analysis, a total of 14 questions were summarized into four factors. The results show that the KMO is equal 0.504 and bertlett is equal 201.538 which are in the significant level 0.99 and indicate that the selection of factor analysis for mitigate the question was a good strategy. In order to clustering the variables we use the criteria which called eigenvalue and those factor be selected that have the eigenvalue greater than one. In this analysis we have four factor which have the eigenvalue greater than 1 as shown in the below table.

Table3: result of factor analysis

eigenvalue	Cumulative eigenvalue percent	Eigenvalue percent	factor
2.772	19.799	19.799	1
1.733	12.377	32.176	2
1.683	12.020	44.196	3
1.340	9.570	53.766	4

These four components explain 53.766% of the total variance. The initial principal components which explain most of the variance in the variables are rotated to make their meaning clearer. There are various ways in which factors may be rotated. The most common form of rotation is called varimax, in which the factors are unrelated or orthogonal to one another in that the scores on one factor are not correlated with the scores of the other factors. Varimax tries to maximize the variance explained by factors by increasing the correlation of

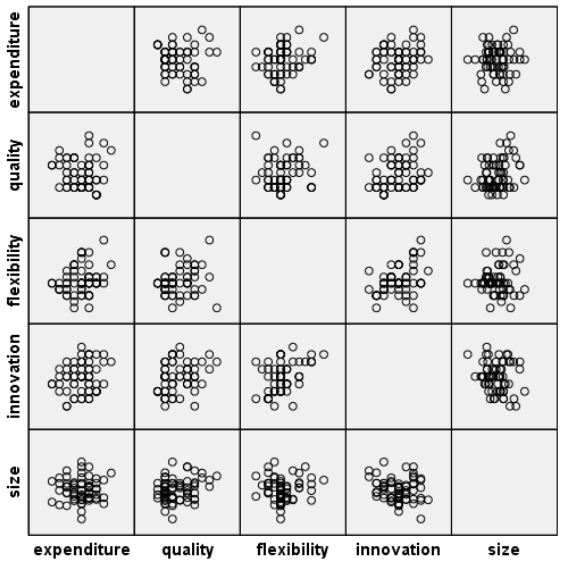
variables that correlate highly with them and decreasing the correlation of variables that correlate lowly with them. The varimax rotation of the two principal components in Table 3 is presented in Table 4.

The first varimax rotated factor seems to represent flexibility strategy, in that all three flexibility items load ±.75 or more on it, whereas all two cost items load ±.74 or less on it. The second varimax rotated factor appears to reflect quality strategy in that all two items load ±.84 or more on it, whereas all two innovation items load ±.54 or less on it. With many variables in an analysis it is useful to order the items in terms of decreasing size for each factor to see more clearly which variables load most highly on which factors. The proportion of variance explained by the two varimax rotated factors is the sum or eigenvalue of the squared loadings for each factor divided by the number of variables. These figures are presented in Table4.

Table4: Principal Component Analysis Extraction and Varimax Rotation Method.

Factors/items loading on each factor	Loadings
Factor1: flexibility strategy	
10: different idea in production.	0.66
12: innovation idea in production.	0.75
9: variety of products.	0.72
factor2: quality	
5: quality enhancement products have always been considered.	0.87
6: use quality control.	0.84
Factor3:cost	
1: price our Products Company, based on similar products.	0.74
2: cost of the operational Products consistent with the policy of company.	0.65
Factor4:innovation	
13: creative methods like brain storm used in production	0.54
14: welcome to the creative ideas	0.32

Now the extracted factor enter in the regression analysis before done it we shown the correlate between variable by the matrix scatter



Graph2: the matrix scatter graph

The result of regression analysis shown in the below:

Table5: ANOVA results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.708	4	.927	2.900	.029
Residual	19.502	61	.320		
Total	23.211	65			

Regression, Residual, Total - Looking at the breakdown of variance in the outcome variable, these are the categories we will examine: Regression, Residual, and Total. The Total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error).

Sum of Squares - These are the Sum of Squares associated with the four sources of variance, Total, Model and Residual. The Total variance is partitioned into the variance which can be explained by the independent variables (Regression) and the variance which is not explained by the independent variables (Residual).

df - These are the degrees of freedom associated with the sources of variance. The total variance has N-1 degrees of freedom. The Regression degrees of freedom correspond to the number of coefficients estimated

minus 1. Including the intercept, there are 4 coefficients, so the model has 5-1=4 degrees of freedom. The Error degree of freedom is the DF total minus the DF model, 65 - 4 =61.

Mean Square - These are the Mean Squares, the Sum of Squares divided by their respective DF.

F and **Sig.** - This is the F-statistic the p-value associated with it. The F-statistic is the Mean Square (Regression) divided by the Mean Square (Residual): 0.927/0.320=2.900. The p-value is compared to some alpha level in testing the null hypothesis that all of the model coefficients are 0.02.

And the coefficient are presented in the below table.

Table6: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	10.115	.494		20.460	.000
cost	.026	.042	.075	.612	.543
quality	.108	.038	.347	2.822	.006
flexibility	.034	.036	.125	.946	.348
innovation	-.104	.042	-.338	-2.505	.015

In the table6, the first column shows the predictor variables (**constant, cost, quality, flexibility, Innovation**). The first variable (**constant**) represents the constant, In other words, this is the predicted value of *financial operation* when all other variables are 0.

The coefficient for **cost and flexibility** (.543 and .348, respectively) are not statistically significantly different from 0 because its p-value is definitely larger than 0.05.

Quality - The coefficient for quality is .108. So for every unit increase in **quality**, a .108 unit increase in *financial operation* is predicted, holding all other variables constant.

Innovation -The coefficient for Innovation is -.104. So for every unit increase in **read**, we expect a 0.1 point decrease in the *financial operation.*

And based on the significant level the supposed model are as the follow:

*Financial operation =10.115+0.108*Quality-0.104*flexibility*

The findings show that there is statically significant relationship between advanced information technology and financial performance firms in the stock exchange in Tehran. So the advanced information technology and Manufacturing strategies effect on financial performance.

Conclusion

The results of the analysis indicate that between the four strategies that we considered, the coast and flexibility strategy are more important for Iranian manufacturing firms. Considering these results apparently Iranian manufacturing firms just served IT to strengthen the traditional strategy specially cost strategy, so we suggest that the firms must focus on quality and innovation strategies. Advanced information technology and IT can find opportunities for companies. Access to this technology can lead to improvement in decision making. It is possible that information technology could not improve the firm's profitability automatically. In fact the information technology is a necessary tool but not sufficient so they must be consistent with other business strategies. The firms can maximum their value by investment on advanced strategies because balancing those with the business strategy would improve economic realms and coordination. Implementation of information technology in organization is not a comprehensive plan which can be advisable for all organizations in fact every organization needs a unique plan. We suggest that firms consider these four strategies which are part of their framework that in performance required special attention.

Information technology and Accounting assessment index effect performance assessment and the relationship between strategies. Information technology makes good opportunities for companies to develop their assessment system and strategy. As this system is used more to submit a report, attention to care of it is so essential.

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