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Productivity Paradox Challenge: Impact of Information Technology (IT)-Business Alignment on Business Performance in Iranian IT-Based Firms

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Abstract: The severely competitive and ever fluctuating market is forcing many companies to spend huge amounts of money in the Information Technology (IT) sector, since it has been increasingly accepted as a vital requirement for organizations to obtain competitive advantage and innovation. Yet, despite increasing investment on IT projects, the organization's needs have not been as expected. This controversial issue of IT known as "productivity paradox" has persuaded the authors to study the relationship between strategic IT-business alignment and the business performance by adapting a holistic conceptualization of fit and measuring performance systematically. Despite the increasing adoption of IT in Iran, there is limited empirical research on the impacts of IT projects on the firm performance in Iran. To fill this gap, this study looked into 92 businesses and IT management firms in Iran, and empirically investigated the relashenship between IT-business alignment and performance to indentidy priority of percpectives that are mostly infuenced by alignment, and to determine the most effective dimention of alignment in such a relationship.

Key words: IT-Business alignment, Business strategy, IT strategy, Business structure, IT structure, Balanced Scorecard, Information Technology.

INTRODUCTION

Information Technology (IT) is a crucial tool for enterprises to achieve competitive advantage and come up with organizational innovation. Therefore, IT has emerged as a key issue in the management research (Duhan, 2007; Tseng, 2008). As the applications of IT and information systems started skyrocketing and managers noticed the strategic role of IT, the discussion on IT planning came up and turned into a momentous area. One of the key sides of strategic IT systems planning is the conformity, fit and consistency between the information system and business strategy of an organization (Grover and Segars, 2005; Teo and King, 1996). As Naman and Slevin (1993) argue, "a model of 'fit' is developed that takes into consideration entrepreneurial, structural and strategic factors. Fit is defined as the degree to which a firm has adjusted and can adjust to environmental structure, processes and strategic characteristics." This adjustment is very crucial for the organization to systematically utilize its resources to make the best use of the environment and the opportunities it provides, to maintain enough customers and provide *quality services* to them (Nejati and Nejati, 2008; Nejati *et al*., 2009; Nejati, 2010). According to the report of Society for Information Management (SIM) IT-business alignment is on top of the list of key executives concerns (Luftman *et al*., 2006). Besides, many researchers consider alignment as the most important factor successful strategic IT planning (Avison *et al*., 2004; Grover and Segars, 2005). Yet, despite the concerns of the executives to reach a better alignment, this has still remained unreached for many of the firms during the last twenty years.

There is a belief that failing to perceive the value of IT investment is due to lack of IT-business alignment (Bush *et al*., 2009; Henderson and Venkatraman, 1993). There are some reasons for this failure related to the role of the managers including the inability to maintain the internal and external IT-business communication, failure in practicing the changes, lack of support from senior managers, and resistance to change in organizations (Wiess and Anderson, 2004). In addition, the shortage of research on relating this phenomenon with tangible organization results like organization performance especially with a comprehensive view is another reason for lack of IT-business alignment.

As such, the purpose of this paper is to investigate the impact of IT on the firm performance by developing an evaluation framework based on the Balanced Scorecard method which has been found suitable to investigate the firms' context.

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Literature Review:

Gaining the alignment has been found to lead to sustainable competitive advantage (Viaene *et al*, 2009), higher business performance (Chen, 2010; Viaene *et al*, 2009), superior realized value of IT investment (Bush *et al.*, 2009; Chen, 2010) and enhanced information systems strategic planning (Chen, 2010). There have been many studies, models and frameworks for expressing the nature of strategic alignment by various thinkers, such as the Strategic Alignment Model (SAM) by Henderson and Venkatraman (1993), Strategic Alignment Maturity Model (SAMM) by Luftman (2000), punctuated equilibrium model by Sabherwal *et al*., (2001), the "C4 model: path to alignment" by Wiess and Anderson (2004), "Strategic IT alignment: a model for competitive advantage" by Kearns and Lederer (2001), and "process oriented evaluation model in relation with alignment" by Tallon and Kraemer (2003), each of which brings up some factors and issues for IT-business alignment.

To review the relationship between strategic alignment and business performance in the literature, contingency models have been used. Despite the important role of contingency theory in the advancement of knowledge, some authors have deplored that researchers were not cautious enough in defining the concept of fit and in choosing the most proper analysis approach to a given definition of fit and this carelessness will result in incomparability of the results (Bergeron *et al*., 2001).

Mitchell and Stock (2007) found that 17 percent of information system planning studies do not take into account the congruence between the conceptualization of fit and suited statistical method related to it (Mitchell and Stock, 2007). Venkatraman (1989b) has tried to define the concept of fit and guide researchers to apply appropriate link between the conceptualization of fit and statistical analyses taken to test these relationships. As such, he suggested a framework containing six perspectives, namely: fit as (1) moderation, (2) mediation, (3) matching, (4) covariance, (5) profile deviation, (6) gestalt.

Matching and moderation are bivariat relationships. Covariance, gestalt and profile deviation specify multivariate relationships and operationalise fit systematically. Mediation can have two or more variables in relating alignment and performance.

Table 1 summarizes a list of researches that have reviewed the relationship between IT-business alignment and business performance using the suggested perspectives of Venkatraman (1989b) and shows the results.

Table 1: previous researches on the relationship between IT-business alignment and organization performance.

Researchers	Alignment as	Result
Henderson and Venkatraman (1993)	Gestalt	The fit of main 4 aspects namely business strategy, organizational infrastructure, IT strategy and IT infrastructure improves the business performance.
Bergeron and Raymond (1995)	Mediation and moderation	Strategic IT management –business strategy alignment has a positive influence on organizational performance.
Teo and King (1996)	Mediation	IT strategy-business strategy alignment has a positive influence on organizational performance.
Chan *et al*., (1977)	Matching and moderation	Conformity of IT strategies and business strategies are better criteria for business performance rather than strategic approach on its own.
Palmer and Markus (2000)	Matching	There is no relation between IT strategies and business alignment with organization performance.
Sabherwal and Chan (2001)	Profile deviation	IT-business alignment influences the business performance, that provide futurity and analysis strategies which in defensive organization are meaningless.
Croteau *et al* ., (2001)	Covariance	IT infrastructure-organizational infrastructure alignment influences the business performance positively.
Bergeron and Raymond (2000)	Covariance	Business strategy-IT strategy alignment and IT structure-organization structure alignment increased the performance.
Cragg *et al*., (2002)	Matching and moderation	IT-business alignment had positive effect on business performance.
Bergeron and Raymond (2004)	Gestalt	Contradictory gestalt s of business strategies, IT strategies, IT structures and organization structure alignment were found in organizations that had a low performance.
Cragg *et al*., (2007)	Matching and moderation	Business process-IT process alignment results in the success of IT projects.

As shown in table 1, only a few number of researchers have empirically studied the impact of fit between alignment dimension and business performance systematically while contingency theorists believe that a holistic, rather than a bivariate conceptualization of fit, has stronger explanatory power due to its complex and interrelated nature of relationships between constructs (Bergeron *et al*., 2004).

Theoretical Framework:

In this research regarding the comprehensiveness of Henderson and Venkatraman's model (1993) and since this acts as a reference for most contingency models, we used it as a base for determination of alignment dimensions. Regarding a few numbers of researches has reviewed this relationship using systematic perspective,

in this research we are trying to look at alignment on the whole and mention the consistency of the four dimensions of business strategy, IT strategy, business structure and IT structure as the definition of alignment and use covariance as the selected perspective. The conceptual model is shown in Figure 1. Each aspect will be explained later.

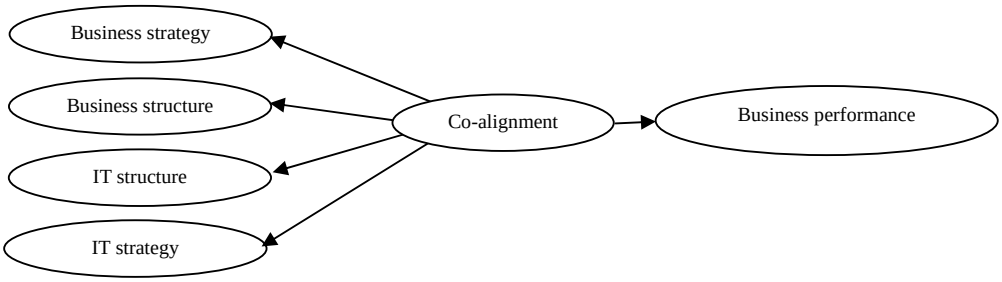

Fig. 1: Conceptual Model.

Business Strategy:

The literature on strategy considers strategic orientation of a business enterprise from three approaches; namely, normative approach, classificatory approach and comparative approach (Morgan and Strong, 2003). In the present research, the comparative approach which was originally suggested by Venkatraman (1989a) has been applied. It consisted of six dimensions for strategic orientation in STROBE instrument, including aggressiveness, analysis, defensiveness, futurity, pro-activeness, and riskiness (Venkatraman, 1989a).

Business Structure:

Business structure is a mean for allocating tasks and act as executive mechanisms that provide the organization with the opportunity to lead, cooperate and control its activities. In the current research, authors have thought of five aspects for business structures, including: formalization (Green *et al*., 2005), centralization, vertical differentiation, professionalization (Bergeron *et al*., 2002) and specialization (Green *et al*., 2005).

IT Strategy:

IT strategy is concerned with outlining the vision on how the organization's demand for information and systems will be supported by technology. It addresses the provision of IT capabilities and resources (i.e. hardware, software and telecommunication) and services like IT operation, systems development and user supports (Ward and Peppard, 2002). In this paper, emphasis is mainly put on the systematic capabilities, and more especially on the role of IT in formulizing and executing the strategy.

IT strategy can be defined from the two aspects:

(1) *IT environment scanning* that indicates the company's capability to identify and react to the technological changes of its rivals. This is especially crucial as analyzing the environment to identify the opportunities and threats related to IT systematic capabilities is one of the key parts in the strategy formulation;

(2) *Strategic use of IT* which shows to what extent the company uses IT to improve its quality, competitiveness and performance;

In the current study, IT strategy was measured using the instrument suggested by Bergeron *et al*., (2004).

IT Structure:

IT structure refers to the management processes and skills that indicate how a firm manages IT architecture and applies IT resources in the organization practically and efficiently (Bergeron *et al*., 2002). Researchers have studied IT structure from 3 different viewpoints, namely IT architecture, IT processes and IT skills (Henderson and Venkatraman, 1993). In the current study, the instrument by Bergeron *et al* (2004) was applied. According to it Bergeron *et al.,* (2004), IT structure consists of skills and processes for managing IT. More specifically, the IT structure encompasses the IT planning and control processes, as well as IT acquisition and implementation processes.

IT planning and control processes are related to the skills and processes that are required in order to overcome the leading current IT products appropriately and improve the technological culture. On the other hand, IT acquisition and implementation processes are related to the selection of IT products and services, tools and methods for the purpose of improvement and change management (Bergeron *et al*., 2004).

Business Performance:

To measure the business performance outcomes, the Balanced Scorecard (BSC) method was used. Balanced Scorecard is a performance management and excellence model that helps to measure and evaluate the performance of strategic initiatives (Kaplan and Norton, 1996; Nejati *et al*., 2007; Oliveira, 2001). Balanced Scorecard has got increasing usage in the management strategic discussions, and was therefore adapted for the purpose of this study. The performance criteria for each aspect are summarized in table 2.

Table 2: Performance criteria used for aspects of Balanced Scorecard.

Perspective	Criteria
Financial perspective	ROI (Return On Investment) (Anand *et al*, 2005); (Bhagwat and Sharma, 2007); (Kaplan and Norton, 1996); (Papalexandris *et al*, 2005)
	Financial productivity of the organization: the proportion of income to the number of personnel (Alibabaee, 2006); (Kaplan and Norton, 1996)
	Profit margin (Alibabaee, 2006); (Papalexandris *et al*, 2005)
	Sales rate of the new product (Alibabaee, 2006)
	Cash (Kaplan and Norton, 1996)
Customer Perspective	Customer survival (Alibabaee, 2006); (Kaplan and Norton, 1996); (Papalexandris *et al*, 2005); (Jou *et al*, 2007)
	Attracting new customers (Alibabaee, 2006); (Jou *et al*, 2007); (Papalexandris *et al*, 2005)
	Suitable after-sale service (Alibabaee, 2006); (Anand *et al*, 2005)
	The quality of the products (Bhagwat and Sharma, 2007)
	Meeting the needs and requirements of customer (Alibabaee, 2006); (Kaplan and Norton, 1996)
Internal business perspective	Expanding new products (Alibabaee, 2006); (Kaplan and Norton, 1996)
	number of found errors in process (Michalska, 2005)
	Improving the production cycle time (Anand *et al*, 2005); (Bhagwat and Sharma, 2007); (Kaplan and Norton, 1996)
	Increasing products capabilities (Alibabaee, 2006)
	Rate of redoing (Alibabaee, 2006); (Kaplan and Norton, 1996)
Innovation and learning perspective	Employee satisfaction (Alibabaee, 2006); (Evans, 2007), (Wong-On-Wing *et al*, 2007)
	employee productivity (Alibabaee, 2006); (Jou *et al*, 2007)
	Training hours (Alibabaee, 2006); (Jou *et al*, 2007); (Evans, 2007); (Wong-On-Wing *et al*, 2007)
	Using new technology (Alibabaee, 2006)
	Using expert personnel (Alibabaee, 2006)

Methodology:

A questionnaire was designed in order to collect the required data and testing the conceptual framework developed in this study. The questionnaire contained criteria to measure alignment dimensions and performance perspectives. It was based on a five-point Likert scale, ranging from 1 (very low) to 5 (very high).

Sample and Data Collection:

The target population in this research includes all business and IT executives, IT experts and researchers in active IT companies which were members of Iranian High Council of Information. Authors chose a sample randomly and distributed 195 questionnaires, out of which 92 were returned and were used in the analysis, resulting in a response rate of 47%.

Data Analysis Method:

Since the Covariance perspective of fit was chosen according to Venkatraman (1989b), authors had to use the second-order confirmatory factor analysis to test the structural model of the research as part of structural equation model.

Validity and Reliability of Instrument:

To make sure that the questionnaire was reliable, it was evaluated by several experts in the areas of strategic IT, and their comments were applied to improve the questionnaire. To determine the Validity, Cronbach's alpha was used.

Using SPSS Software, the Cronbach's alpha of questionnaire was calculated at 0.96 that showed a high validity. Additionally, the Cronbach's alpha for each of the dimensions were calculated which were as follows: aggressiveness = 0.5; analysis = 0.84; defensiveness = 0.83; futurity = 0.77; pro-activeness = 0.82; riskiness = 0.72; IT environment scanning = 0.85; strategic use of IT = 0.95; IT planning and control = 0.9; IT acquisition and implementation = 0.92; financial perspective = 0.87; customer perspective = 0.87; internal business perspective = 0.75; innovation and learning perspective = 0.88. The aggressiveness aspect of strategic approach was omitted because of its low alpha level which was lower than the conventional acceptable Cronbach's alpha level of 0.7.

Results:

Structural equation modeling (SEM) was applied to evaluate measurement model, by using LESEREL 8.5 software. First, the validity of constructs was assessed, followed by testing the research framework by confirmatory factor analyses (CFA).

Evaluation of the Constructs' Validity:

First of all, LESEREL program was used to assess construct validity. The main question in this process is to specify uni-dimensionality of constructs. It means that they can be related within the covariation model. To test the fitness of the model, we mainly focused on CFI and RMSEA index which are least sensitive about the size of the sample. These two indexes are suggested for samples less than 200 to test the fitness of the model in the literature related to structured equations model. The IFI and NNFI indexes are independent from the number of samples (Fan *et al*., 1999). Based on the output of the program, the measures which didn't have acceptable T-value (acceptable rang of T-value is greater than 1.96 and lower than -1.96) were omitted from the analysis. The final revised models of construct were shown in figures 2 to 6.

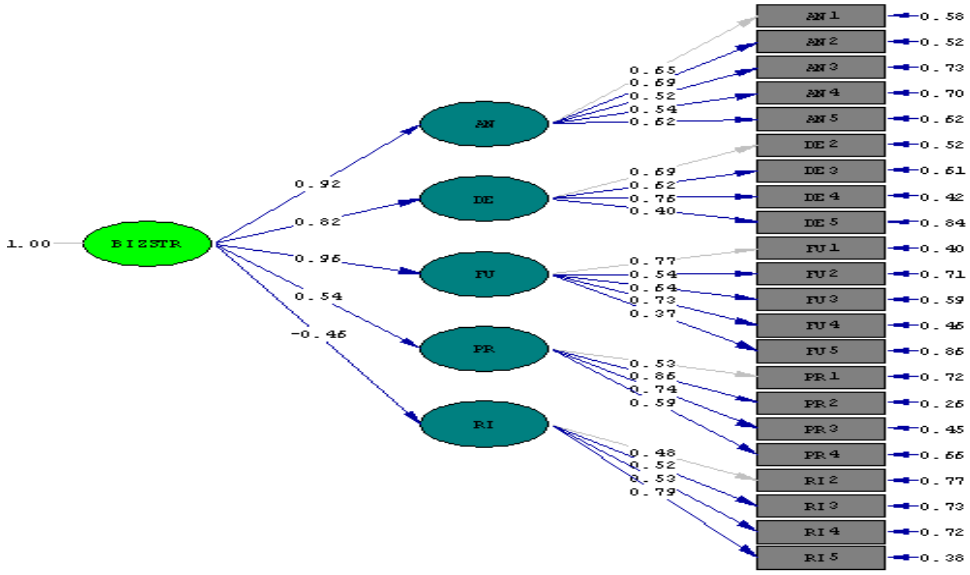

Fig. 2: Conformity factor analysis of strategic orientation measure.

Chi-Square=266.39 df = 204 χ2/df= 1.42
CFI =0.94 NNFI = 0.93 IFI = 0.94 RMSEA= 0.05

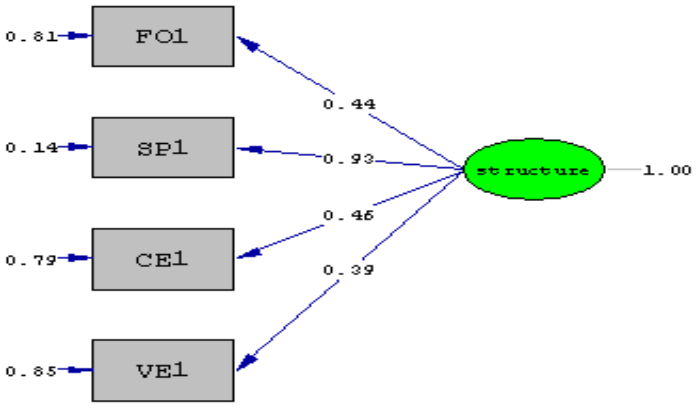

Fig. 3: Conformity factor analysis of business structure.

Chi-Square=4.95 df = 3 χ2/df= 1.65
CFI =0.96 NNFI = 0.90 IFI = 0.97 RMSEA= 0.08

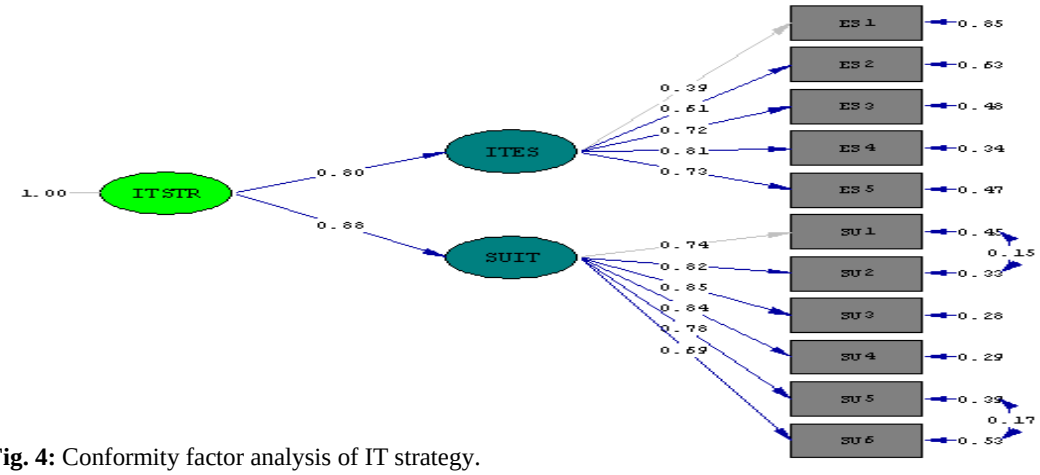

Fig. 4: Conformity factor analysis of IT strategy.

Chi-Square= 64.45 df = 41 χ2/df= 1.57
CFI =0.98 NNFI = 0.98 IFI = 0.98 RMSEA = 0.07

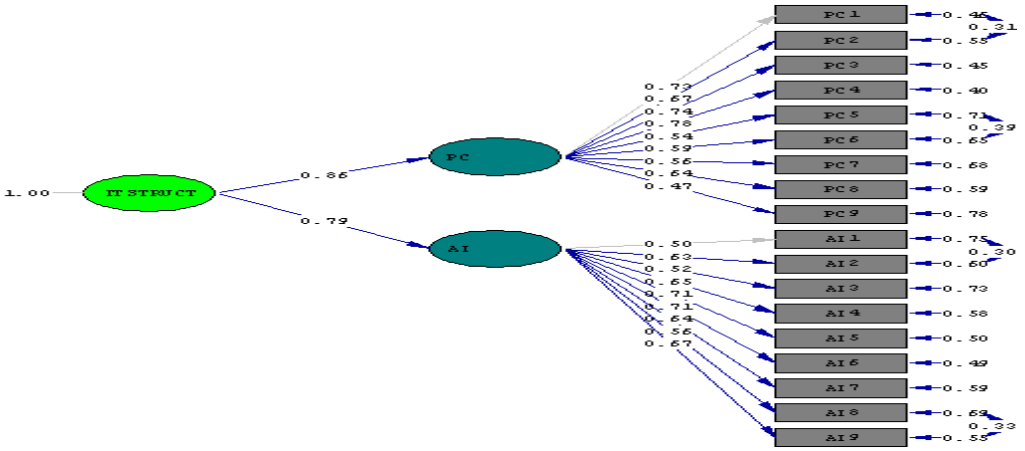

Fig. 5: Conformity factor analysis of IT structure.

Chi-Square= 223.88 df = 130 χ2/df= 1.72
CFI = 0.94 NNFI = 0.93 IFI = 0.94 RMSEA = 0.08

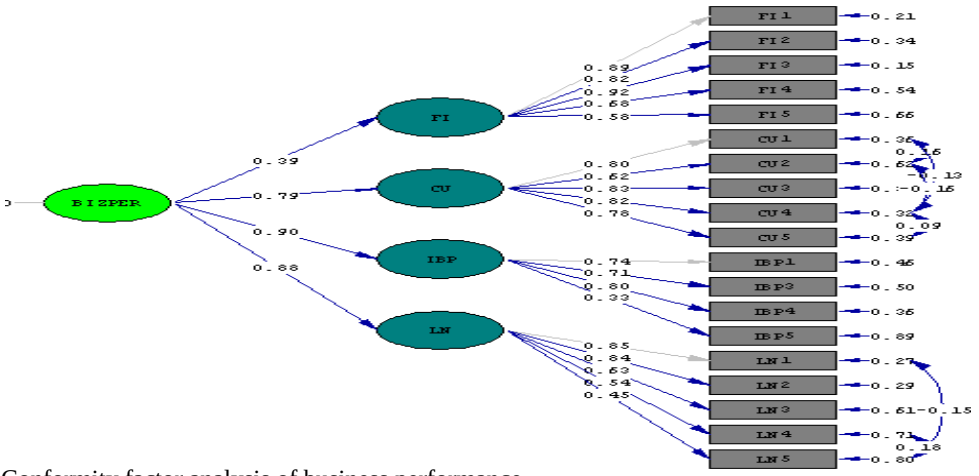

Fig. 6: Conformity factor analysis of business performance.

Chi-Square= 247.62 df = 142 χ2/df = 1.74
CFI = 0.94 NNFI = 0.93 IFI = 0.94 RMSEA=0.09

Test of Research Model:

After confirming measuring models of constructs, the conceptual model of the research was evaluated through Structural equation modeling with LISREL software. The results are as the following:

Table 3: Results of conformity factor analysis for conceptual model.

Latent variable	Dimensions	Factor loadings	Error term	T-value
IT-business alignment	Strategic orientation	0.80	0.37	8.79
	Business structure	-0.12	0.99	-1.09
	IT strategy	0.90	0.20	10.49
	IT structure	0.80	0.35	8.92
Business performance	Financial	0.25	0.94	-
	Customer	0.75	0.43	2.23
	Internal business process	0.81	0.34	2.25
	Learning and Growth	0.80	0.36	2.24

As shown in table 3, T-value was not acceptable for business structure dimension. Therefore this model is crossed out and the analysis is done once more without considering this dimension. Figure 7 displays the final output to evaluate the conceptual model of this research.

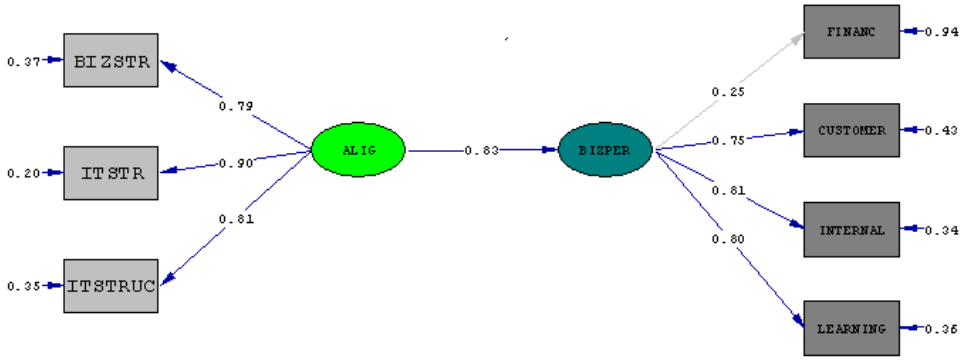

Fig. 7: Standard estimation of conceptual model of the research.

Chi-Square= 16.23 df = 13
CFI = 0.99 NNFI = 0.98 IFI = 0.99 RMSEA=0.05

All the goodness-of-fitness indexes are acceptable. According to figures 7, all the relations are significant and range from 0.25 for financial perspective to 0.9 for IT strategy.

Conclusions and Suggestions:

Business alignment and business performance have a significant relation that is 0.83. It means that firms that have alignment between their business strategy, IT strategy and IT structure have improved and enhanced performance. As it can be seen in figure 7, IT strategy has the strongest effect on IT-business alignment in IT-based firms (factor loadings = 0.90). IT structure and business strategy (with factor loadings of 0.81 and 0.79 respectively) are the next priorities in IT-business alignment. These results are in compliance with the study of Bergeron *et al*., (2002) which concluded that the three dimensions of alignment including IT strategy, IT structure and business strategy influence business performance respectively.

On the other hand, alignment has been effective mostly on internal business process (factor loadings = 0.81) and it has been least effective on financial perspective (factor loadings = 0.25). The low financial outcomes can be caused by high costs of performing IT projects in Iran and rapid changes in this industry.

In addition, learning and innovation viewpoint, as well as customers' viewpoint, with factor loadings of 0.8 and 0.75 respectively, got the highest scores next to the internal business process perspective.

Based on the achieved results, the following suggestions are made to the IT-based firms in order to enhance their performance, especially within the internal business, and innovation and learning perspectives:

Firms should concentrate more on those dimensions of strategic orientation which have had higher correlation with IT-business alignment including analysis, futurity, and defensiveness. As Morgan and Strong (2003) concluded, these orientations are conservative by nature and have more positive influence on the business performance.

Due to the fact that IT strategy had the highest factor loading on IT-business alignment, it is suggested that firms should empower this dimension through setting strategic IT plans and applying IT in other parts of businesses purposefully. Moreover, they should monitor the IT environment permanently to identify new technologies and adapt them with the strategic orientation of the business.

Finally, since IT structure and alignment are highly correlated, firms have to consolidate the processes and managerial skills that are related to IT. These skills include planning skills, change management skills in the acquisition of new technologies, systems development, maintenance and controlling the current systems, informing users of technology usages, and using knowledge sharing in the business.

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