Journal of Applied Science and Agriculture, 8(7) December 2013, Pages: 1321-1329

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Assessment the Maturity Level of Aligning of IT and Business in Firms That Have Implemented Enterprise Architecture (National Iranian Gas Company)

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ARTICLE INFO

Article history:
Received 17 October 2013
Received in revised form 23 November 2013
Accepted 28November 2013
Available online 25 February 2014

Keywords:
Business Architecture, Application Architecture, Data Architecture

ABSTRACT

Nowadays widely is recognized that knowledge is vital for managers. On the other hand organizations need information systems and technology for survival and success, technology and information systems are able to increase the success by offering new products and better services. The current research is studying the assessment the maturity level of aligning of IT and business in companies that have implemented enterprise architecture (National Iranian Gas Company). Therefore , the variables of business architecture, application architecture and information architecture are studied in this research. The purpose of this research is practical and from the view point of performing and data collecting is descriptive–gauging. This research has been done with aim of assessing the maturity level of aligning between IT and business in companies that have implemented enterprise architecture. The population of the research is Tehran Gas Organization. The research instrument consisted of a questionnaire that is made by researcher. The collected data has been analyzed using SPSS and Expert Choice software. The results revealed that there is alignment between business architecture, application architecture, information architecture and business architecture and information architecture and application architecture.

To Cite This Article: Dr. Ghasemali Bazaee and Shima Nargesi., Assessment the Maturity Level of Aligning of IT and Business in Firms That Have Implemented Enterprise Architecture (National Iranian Gas Company). ***J. Appl. Sci. & Agric.,*** *8(7): 1321-1329, 2013*

INTRODUCTION

Nowadays widely is recognized that knowledge is vital for managers. On the other hand organizations need information systems and technology for survival and success, technology and information systems are able to increase the success by offering new products and better services (Issa–Salwe *et al*.,2010). Most researchers believe that if the information technology be accurate and consistent with all parts of the organization and comprehensive approach to be applied to all resources can play a significant role in improving organizational performances (Gartlan *et al*., 2007). Alignment, coordination or consistency between business strategy and business processes for the success of any business and functioning properly is essential and without this kind of alignment, competitive advantage would be virtually unattainable. Information systems technology is active and if it is not controlled and is not aligned with the business strategy of the organization, therefore the competitive advantages of the organization will be disabled (Issa-Salwe *et al*., 2010). The strategic application and successful information technology is reflected on the concept of industrial strategic alignment (Shamekh,2008). A comprehensive definition of strategic alignment of business and IT is the formulation of a coherent and simultaneously of business strategy and information technology, and the nature of the process is mutual. Successful alignment occurs when IT strategy and business strategy can show alignment program which leads tangible and successful output, focused on the business (Gartlan *et al*.,2007). Business Alignment - IT has not been fixed, but rather a continuous process, expressing the full separation of business and IT functions to focus on integrated improving (Evers,2010). Awareness of maturity of strategic choices and alignment practices make it possible for companies to see where they stand and how they can improve it. When maturity is understood then this method of measuring shows a guidance direction to organization which detects development opportunities for aligning IT and business (Luftman,2000). Since establishing alignment between IT and business, is one of the reasons for the implementation of enterprise architecture, In the present study the alignment between the components of the enterprise architecture, those are, business architecture, information architecture and architectural applications, are used for the alignment of IT and business. In fact, the study deals with the measurement of the alignment of IT and business with focus on the enterprise architecture components.

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Theoretical Background and Literature Review:

The Concept of Business Strategy and IT:

In almost all industries, developments such as new technologies, mergers and acquisition, entrepreneurial initiatives, regulatory changes and strategic communication, are creating a dynamic business environment. A key success factor for a successful company in a dynamic environment is the effective and efficient IT which support strategies and business process. Alignment between business needs and IT capabilities is worrying. Information Management Association annual survey of senior managers shows that the alignment of IT and business executives ranked as the first worry of them (Silvius,2007). In the academic literature, several definitions of IT strategic and business alignment are discussed. IT strategic and business alignment are as follows:

- Alignment between IT strategy and business refers using information technology appropriately, timely and in harmony with the strategies, business objectives and needs of the organization. Moreover, strategic alignment is a limit, that in this limit, IT strategy supports business strategies and are supported by business strategy too (Luftman *et al*., 2002).
- Using information technology in a manner that consistent with the general strategy of company (Palmer *et al*.,2000).

Alignment of IT strategy with business strategy is an important issue. It is more than two decades that strategic alignment has been the first worry of executives and senior executives are interested in taking action in the field of information technology. In addition, the information senior managers have been called not only for the IT strategy but also for business strategy. Following up alignment can be repeated to show that the company's business and financial performance is improved, when a company is able to align IT strategy with business strategy. Due to the interest of professionals, it is not unexpected that the strategic alignment is a frequent thread in information systems research topics (Bakers *et al*.,2009).

Enterprise Architecture:

Enterprise architecture is defined by a combination of the basic elements of an organization in accordance with the organization's strategy and mission. Basic elements of enterprise architecture include information, processes, locations, timing, people and motives (Akhavan Niaki, 2002).

Benefits of Enterprise Architecture Approach:

Enterprise architecture has several advantages; these advantages can be grouped in to two general categories:

a) The general advantages of enterprise architecture approach for business: The advantages are as follows: Following strategy, reducing the redundant activities, nature of enterprise architecture process, target oriented investments.

b) The advantages of Enterprise Architecture approach for the IT unit of organization: The advantages are as follows: Waste reduction, efficient systems, increasing quality systems, systems integration, increased understanding of other organizational units, generated documentation, and product reuse (same, 2001).

Background Research:

In this research we have studied the assessment of the maturity level of aligning IT and business in companies that have implemented enterprise architecture. As we see in Table1 and 2, little research has been done in this field. The limited research that has been done in domestic and abroad, are given in Table 1 and 2.

Table 1: Domestic researches in this field.

TITLE OF THE RESEARCHES	YEAR	RESEARCHERS	
Assessment of alignment maturity of IT and business strategies in organization (case study: Saipa company).	1389	Taghva & Hajizadeh	1
Determination of critical success factors for IT strategy and business alignment in organization.	1389	Manian & Arab sorkhi	2
Surveying the relationship between IT and business alignment with organizational performance in companies which are active in the field of information technology, using structural equation modeling.	1388	Manian & others	3
Alignment of IT and business using service-oriented architecture.	1388	Amini Motlagh	4

Table 2: Abroad researches in this field.

RESEARCH TITLE	YEAR	RESEARCHERS	
does employee alignment affect business IT alignment? an empirical analysis	2011	Chong & others	1
assessing IT-business alignment in service-oriented enterprise	2009	Chang & others	2
promoting business and IT alignment with Enterprise Architecture	2009	Vandermerwe	3
the alignment of business and information technology strategy in the financial services sector in south Africa	2008	Thckrah	4

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The Conceptual Model:

The present conceptual model is the result of studying theoretical research basis and identifying existing models in the field of IT and business alignment and then the dimensions and indexes of assessing alignment of IT and business model were extracted according to the enterprise architecture components. Then by reviewing and modifying the existing indexes, some remarkable points were considered by the researcher, then model parameters were selected and some new indicators were also designed. Dimensions and indexes were considered by the Experts, then important dimensions and indexes were chosen by the Experts. In this research the alignment between business, systems and information is defined as a way to determine relationship level of business, systems and information.

If no alignment is the only reason for enterprise architecture implementation, Enterprise Architecture has three components: Business architecture, information architecture, application architecture. The components of the enterprise architecture concepts are not new and has been accepted in the community.

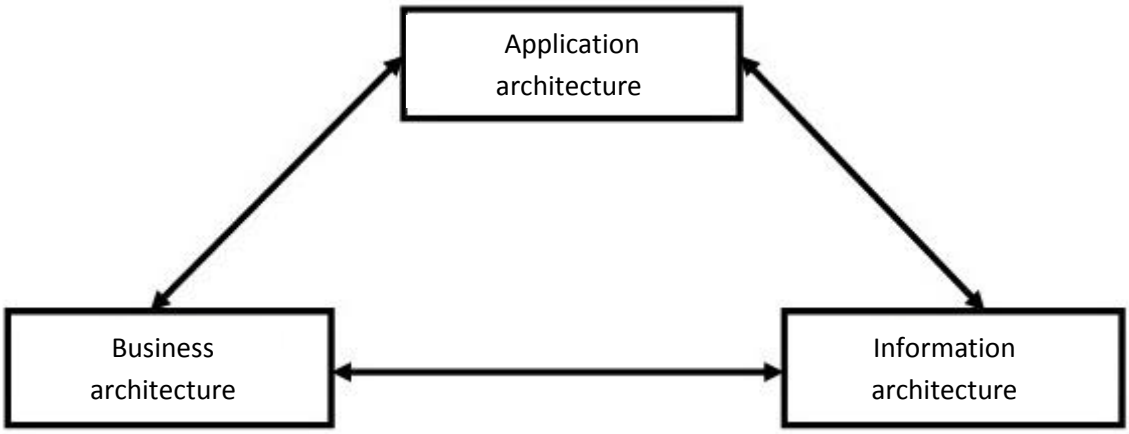

Fig. 1: Conceptual model.

a) Business Architecture: The definition of business architecture is formed by the definition of the strategies, processes and functional requirements of the organization. As a matter of fact, it is the basis for identifying requirements for information systems. The content of business architecture is high-level business objectives, organizational processes, operations, major organizational structures and relationships between these components. In this research, in order to simplify the business architecture, it only includes business processes, which include a series of activities and each activity includes information, time and people.

b) Information architecture: Information architecture describes the organizational information to handle business processes and operations according to organizational business architecture. In this architecture, there is a general overview of organization information, which is in the frame of available information (Camponovo *et al*., 2004). Each data is a responsibility for the manager and should do various functions such as data collection, classification, final control, presentation, distribution, and evaluation.... Each of the data must have a unique ID, and a series of characteristic descriptions, these characteristics are related to business processes and applications that are being created, updated, or deleted.

c) Application architecture: The architecture describes the needed applications to achieve two major objectives as below:

1- Support business requirements

2- Efficient management of data

Naturally, application architecture comes from business and information architecture analysis (Makolai, 2004). The application architecture consists of the following: A description of the automated services to support business processes, describing the interactions and dependencies of enterprise systems, a program to develop new applications, revise the old programs, the development of the technical background of the architectural characteristics such as availability, scalability and ability to access according to the personnel system (Schwalbe, 2005).

Research Method:

This research based on target classification is among applied research and as part of the research method is descriptive - survey. The population of the research is Tehran National Gas Company staff. In the research the 22 employees are randomly selected by using Morgan table. 10 experts were used to prioritize the research variables.

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The tool used for data collection in this study is a questionnaire made by researcher. In the research to ensure the validity of the questionnaire, the questionnaire was provided to a number of experts, supervisors and advisors and shall be used with modifications. Finally after the desired changes, the questionnaire was approved by the members. By using of Cronbach alpha, the reliability of the questionnaire was calculated, the average alpha obtained was 0.765, as it is more than 0.7, therefore, the reliability was confirmed. In this study, for data analysis, SPSS and Expert Choice software were used.

Research Questions:

1- Is there alignment between applications architecture and business architecture in Iran National Gas Company?

2- Is there alignment between information architecture and business architecture in Iran National Gas Company?

3- Is there alignment between information architecture and applications architecture in Iran National Gas Company?

Analysis of Results and Suggestions:

Specifications of Respondents: General specifications of the respondents are summarized in Table 3:

Table 3: The general Specifications of respondents.

Frequency					
Over20years	Between 10 to 20 years	Between 5 to 10 years	Under 5 years		Work Experience
11%	46%	35.5%	7.5%		
Manager	Supervisor	Expert	Employee		Post
5%	22%	56.5%	16.5%		
male		female			Sex
61%		27.5%			
PHD	Masters degree	Bachelor degree	Associate degree	Diploma	
0.5%	18%	52.5%	12.5%	16.5%	Education

Test the Research Questions:

1- The first question of the research: Is there alignment between applications architecture and business architecture in Iran National Gas Company?

One-sample t-test was used to examine the above question and the results are described as below:

Table 4: One-sample t- test of the first question.

P -value	Degrees of freedom	T value	Standard deviation	Average	Mean (Number of questions multiplied by 3)	Samples	Variable
0.047	178	1.53	13.2	67.51	66	179	The first question of the research

According to the above table, the average score of the respondents in variables of the business architecture and application architecture was significantly higher than the mean (66). This finding means that there is alignment between the variable of application architecture and business architecture. The findings show that the hypotheses align with the research of Amini motlagh *et al*., 2009, Frank,Set *et al*., 2010, Oderind 2010, and Pedro *et al*.,2009

2-The second question of the research: Is there alignment between information architecture and business architecture in Iran National Gas Company?

Table 5: One-sample t -test of the second question.

P -value	Degrees of freedom	T value	Standard deviation	Average	Mean (Number of questions multiplied by 3)	Samples	Variable
0.016	199	1.93	20.11	68.75	66	200	The second question of the research

According to the above table, the average score of the respondents in variables of the business architecture and information architecture was significantly higher than the mean(66). This finding means that there is alignment between the variable of information architecture and business architecture. The findings show that the hypotheses align with the research of Amini motlagh *et al*., 2009, Frank,Set *et al*., 2010, Oderind 2010, and Pedro *et al*.,2009

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3-The third question of the research: Is there alignment between information architecture and applications architecture in Iran National Gas Company?

Table 6: One-sample t -test of the third question.

P -value	Degrees of freedom	T value	Standard deviation	Average	Mean (Number of questions multiplied by 3)	Samples	Variable
0.031	199	1.88	16.62	38.21	36	200	The third question of the research

According to the above table, the average score of the respondents in variables of the applications architecture and information architecture was significantly higher than the mean(36). This finding means that there is alignment between the variable of information architecture and applications architecture. The findings show that the hypotheses align with the research of Amini motlagh *et al*., 2009, Frank,Set *et al*., 2010, Oderind 2010, and Pedro *et al*.,2009

Variable Prioritization of Research Using Expert Choice Software:

According to Table 7 below, we ranked these criteria using Expert Choice software.

Table 7: Effective criteria in applications architectur and business architecture and information architecture.

Sub criteria		Sub criteria		Assessment criteria
Business process activities	12	The minimum number of applications	1	alignment between applications architecture and business architecture
Systems can be upgrated	13	The need for integration	2	
Systems with high availability	14	User simplify	3	
Online support	15	Reduce reform plans	4	
Easily adapt the system	16	Section application	5	
Entering same information	17	Multiple Transactions	6	
Offering password	18	Applications with the ability to upgrade	7	
Operation coverage	19	Applications with high availability	8	
Inappropriate applications	20	Support activities	9	
Flexible IT architecture	21	Essential hardware maintenance	10	
Agility of IT architecture	22	The temporary teams become smaller	11	
Usability control	34	A unit of information	23	alignment between Information architecture and business architecture
Classification	35	Updated Information	24	
Nomenclature	36	Remove the information unit	25	
Usability Evaluation	37	Business process activities	26	
Cost-benefit analysis of information	38	understandable ID for employees	27	
Maintain continuity of Use	39	Ability to show the audience	28	
Enough information to do the job	40	Standard Tools	29	
Detailed information	41	Standard applications	30	
Clear information	42	Known sources	31	
Updated Information	43	Data integrity control units	32	
Work-related information	44	Clarity Control Units	33	
Transfer the contents to a data warehouse	51	Identifying applications	45	alignment between applications architecture and Information architecture
Replica versions	52	Create an application	46	
Ensure for dependency	53	Reuse Applications	47	
Data collection system	54	When ID	48	
Encoding Information	55	Design tools	49	
No change in structured data	56	Data Warehouse	50	

Prioritize the Architecture Indexes of Applications and Business:

As can be seen in Table 8, the minimum number of applications with the relative weight of 0.138, is the most important. Therefore among the applications architecture and business architecture alignment criteria , it is the most effective and user simplification criteria with the relative weight of 0.105 is the next priority, and the agility of IT architecture standards with the relative weight of 0. 014 is the last priority.

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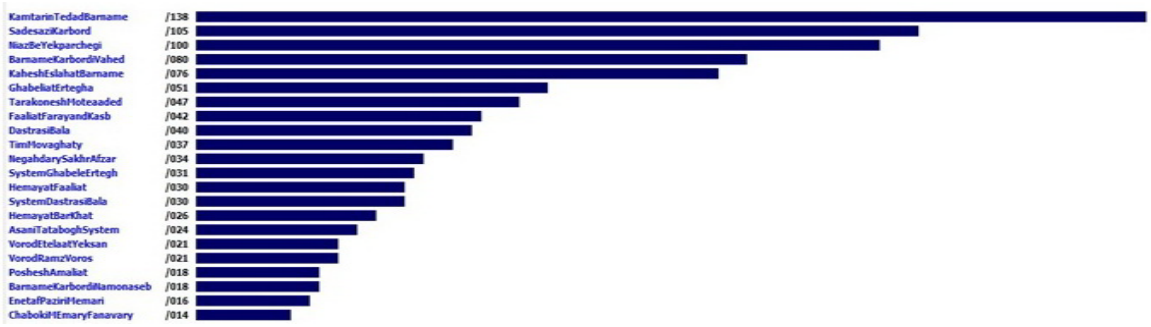

Fig. 2: Prioritize the architecture indexes of applications and business.

Table 8: Prioritize the architecture indexes of applications and business.

Priority	Weight	Components	Row	Priority	Weight	Components	Row
8	0.042	Business process activities	12	1	0.138	The minimum number of applications	1
12	0.031	Systems can be upgraded	13	2	0.1	The need for integration	2
14	0.03	Systems with high availability	14	3	0.105	User simplify	3
15	0.026	Online support	15	5	0.076	Reduce reform plans	4
16	0.024	Easily adapt the system	16	4	0.08	Section application	5
17	0.021	Entering same information	17	7	0.047	Multiple Transactions	6
18	0.021	Offering password	18	6	0.051	Applications upgradeability	7
19	0.018	Operation coverage	19	9	0.04	Applications with high availability	8
20	0.018	Inappropriate applications	20	13	0.03	Support activities	9
21	0.016	Flexible IT architecture	21	11	0.034	Essential hardware maintenance	10
22	0.014	Agility of IT architecture	22	10	0.037	Getting smaller temporary teams	11

Prioritize the Architecture Indexes of Information and Business:

As can be seen in Table 9, a unit of information with the relative weight of 0.101 is the most important. Therefore among the information architecture and business architecture alignment criteria, it is the most effective and remove the information unit with the relative weight of 0.082 is the next priority, and work-related information with the relative weights of 0.02 is the last priority.

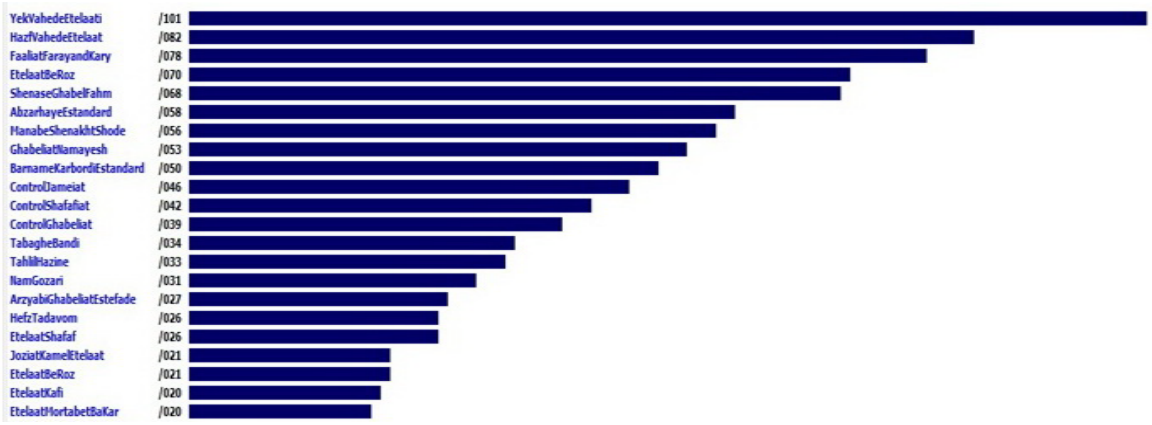

Fig. 3: Prioritize the architecture indexes of information and business.

Prioritize the Architecture Indexes of Applications and Information:

As can be seen in Table 10, Create an application with the relative weight of 0.181, is the most important. Therefore among the information architecture and applications architecture alignment criteria, it is the most effective and Identifying application with the relative weight of 0.155 is the next priority, and Encoding Information with the relative weight of 0.024 is the last priority.

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Table 9: Prioritize the architecture indexes of information and business.

Priority	Weight	Components	Row	Priority	Weight	Components	Row
12	0.039	Usability control	34	1	0.101	A unit of information	23
13	0.034	Classification	35	4	0.07	Updated Information	24
15	0.031	Nomenclature	36	2	0.082	Remove the information unit	25
16	0.027	Usability Evaluation	37	3	0.078	Business process activities	26
14	0.033	Cost-benefit analysis of information	38	5	0.068	understandable ID for employees	27
18	0.026	Maintain continuity of Use	39	8	0.053	Ability to show the audience	28
21	0.02	Enough information to do the job	40	6	0.058	Standard Tools	29
19	0.021	Detailed information	41	9	0.05	Standard applications	30
17	0.026	Clear information	42	7	0.056	Known sources	31
20	0.021	Updated Information	43	10	0.046	Data integrity control units	32
22	0.02	Work-related information	44	11	0.042	Clarity Control Units	33

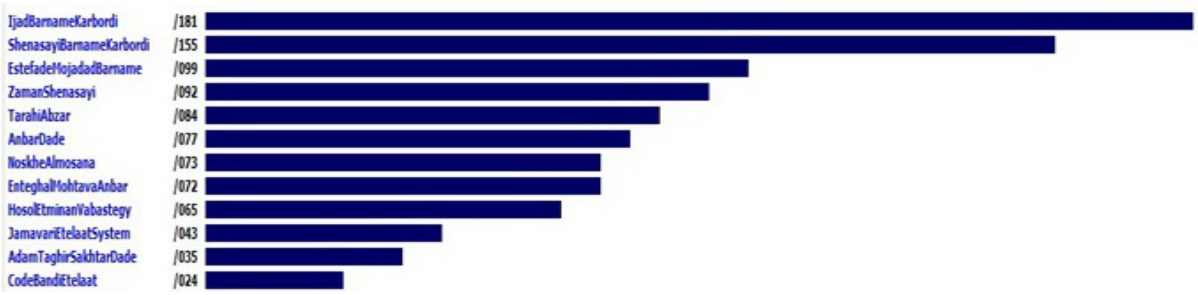

Fig 4: Prioritize the architecture indexes of applications and information.

Table 10: Prioritize the architecture indexes of applications and information.

Priority	Weight	Components	Row	Priority	Weight	Components	Row
8	0.072	Transfer the contents to a data warehouse	51	2	0.155	Identifying application	45
7	0.073	Replica versions	52	1	0.0181	Create an application	46
9	0.065	Ensure for dependency	53	3	0.099	Reuse Application	47
10	0.043	Data collection system	54	4	0.092	When ID	48
12	0.024	Encoding Information	55	5	0.084	Design tools	49
11	0.035	No change in structured data	56	6	0.077	Data Warehouse	50

Suggestions:

Suggestions based on the first research question: As the alignment between business architecture and applications architecture has confirmed, It is recommended to chief executive officers of Tehran gas organization to pay much more attention to these indexes "minimum number of program", "need for integration", "User simplify", "reduce reform plans", "section application", "multiple transactions", "application upgradeability", "applications with high availability", "support activities", "Essential hardware maintenance", "getting smaller temporary teams", " business process activity", "systems can be upgraded", "systems with high availability", "online support", "easy adapt system", "entering the same information", "Offering password", "cover operation", "inappropriate applications", "flexible IT architecture" and "agility of IT architecture" because if the mentioned indexes improve the alignment between applications architecture and business architecture also will improve.

Suggestions based on the second research question: As the alignment between business architecture and information architecture has confirmed, It is recommended to chief executive officers of Tehran gas organization to pay much more attention to these indexes "A unit of information", "Updated Information", "Remove the information unit", "Business process activities", "understandable ID for employees", "Ability to show the audience", "Standard Tools", "Standard applications", "Known sources", "Data integrity control units", "Clarity Control Units", "Usability control", "Classification", "Nomenclature", "Usability Evaluation", "Cost-benefit analysis of information", "Maintain continuity of Use", "Enough information to do the job", "Detailed

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information", "Clear information", "Updated Information" and "Work-related information" because if the mentioned indexes improve, the alignment between information architecture and business architecture also will improve.

Suggestions based on the third research question: As the alignment between applications architecture and information architecture has confirmed, It is recommended to chief executive officers of Tehran gas organization to pay much more attention to these indexes "Identifying application", "Create an application", "Reuse Application", "When ID", "Design tools", "Data Warehouse", "Transfer the contents to a data warehouse", "Replica versions", "Ensure for dependency", "Data collection system", "Encoding Information" and "No change in structured data "because if the mentioned indexes improve, the alignment between information architecture and applications architecture also will improve.

Conclusion:

This research has been done with aim of assessing the maturity level of aligning between IT and business in companies that have implemented enterprise architecture. The results revealed that there is alignment between business architecture, application architecture, information architecture and business architecture and information architecture and application architecture. Alignment between IT and business processes of the organization are the major issues that have a profound influence on agility and flexibility of the organization's business needs. Due to the expansion of application of information technology in Iranian organizations and increasing enterprise architecture implementation, the importance of studying on how to achieve greater alignment between IT and business is greater than before. Due to limited researches have been done it the field of assessing the maturity level of aligning between IT and business considering implementation enterprise architecture, additional research is recommended for assessing the strategic alignment using other models presented in this context, the factors that promote and inhibit the alignment of business strategic and information technology, also should be examined. Among the limitations of this study include the following: Managers fear for filling out the questionnaire and its effects on responses, lack of resources, especially Persian literature in this area and due to the limitations of Likert Rating Scale, which tends to make moderate response to the respondents.

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