PRESENTATION OF AN INTEGRATED MODEL TO IDENTIFY AND CLASSIFY BUSINESS INTELLIGENCE SKILLS

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Abstract. Business Intelligence has been proposed as a new approach in enterprise architecture based on the speed in data analysis in order to make accurate and smart business decisions in the shortest time possible and not as a tool or a product or even system. The objective of this study is determination of business intelligence skills in organizations as well as identification of relations and modeling of these elements. Identification of business intelligence skills and determination of mutual relations and their interactions have been carried out by evaluation of related literature and expert opinions. Then the relations between these skills are identified using Interpretive Structural Modeling and a structural model of business intelligence skills within organizations is offered based on the obtained relations.

Keywords: Business intelligence, Interpretive Structural Modeling, Business

1 Introduction

New technologies are developing at a dizzying speed, in a way that the societies in general and market in specific are searching for tricks to guarantee their survival in this chaotic field with indescribable accelerate. Organizations must accept that their philosophy of life has changed and survival no longer means having sustained profitability and must look for competition and its tools because today few of the companies in this field act in traditional way and away from new rules and companies must be fluent in new rules in order to remain competitive or move one step forward hardly and skillfully so that maybe one day they can create a new rule themselves. Thus, mastery of new technologies such as business intelligence in business is considered an inevitable necessity requirement. The objective of this study is also nothing more than reminding the growing and unstoppable trend of innovation in technology and changes in methods of business, developments which has occurred in this revolution and changes in procedures have and will cause conflicts and deep splits between tomorrow and today.

Even though there have been a lot of researches about the literature of business intelligence, there has been no study about identification of necessary and influencing skills on business intelligence and interaction of these relations as well as obtaining the effectiveness of these skills. Thus, the researchers are planning to submit this article to decrease the mentioned research gap.

2 Research literature

2.1 Overview of business intelligence

Business intelligence which contains a more major form such as commercial or non-commercial (nonprofit and military) use is a wide range of applications and technology for collection of data and knowledge for creation of query in order to analyze the firm to have accurate and smart business decisions. Business intelligence has been formed based on a firm architecture and analyzes the trade data and makes accurate and smart decisions based on online analytical processing (OLAP) (Peter, 2010). Business Intelligence is considered not as a product or a system but rather as a new architecture and approach which of course includes a set of practical and analytical applications which helps in decision making for smart business activities according to operational and analytical databases (Barjis, 2008). But from another perspective of Business Intelligence: from the perspective of Architecture and Process, the Business Intelligence is considered as a framework which increases the efficiency of organization and integration of processes and ultimately focused on decision-making processes at different organizational levels (Bandara et al., 2007). Market believes the Business intelligence to be a tool for competitive advantage which is monitoring and analyzing the market and customers. From the perspective of technology, Business Intelligence is an intelligent system which is considered as intervention points in the brain of hardware and software by accurate data processing. But simpler expression is that business intelligence is nothing but the process to raise the profitability of the organization in the competitive market with intelligent use of data in decision making process. If the concept of business intelligence is understood and transferred correctly, it will suddenly increase the expectations of managers and not meeting these expectations will cause issues such as lack of confidence of people, especially managers to this system because business intelligence is just looking to shorten the course of the inquiry in information and it cannot provide a strategy or proposal on its own and without proper information. Determination of business trends which is among the consequences of business intelligence makes the organization to focus on the major objectives without wasting time and money in other paths (Hung, 2006).

2.2 Necessary skills to promote necessary skills

For the system to function correctly with the Business Intelligence, the relations between people and information and process implementation must be carefully evaluated in order to identify the opportunities of who shall receive which information (Melao and Pidd, 2000).

Business intelligence in the organization considers all users as well as their relations so that the enterprise value chain is covered to perfection and no process be omitted. Special skills should be arranged to implement any kind of improvement process in organization among which the macro processes such as business intelligence need special attention (Bandara, 2005).

Business skills include business process and communication with organizational strategy along with transformation processes which is very important in determining the enterprise policy (Shi, 2008). Information technology skills which technically help in management change and support analytical methodology should also exist sufficiently in the organization (Smith and Fingar, 2003). Other skills entitled analytical skills including summarizing the analysis and correct exploring and explaining are as important as other skills and these three types of skills have intersection points in some firms which is considered to be exactly the point of promotion of business intelligence and its majority will certainly lead to more business intelligence across the organization and vice versa (Vergidis, 2008).

3 Interpretive structural modeling and development of the model

Interpretive structural modeling is a technique which makes the evaluation of complexity of the system possible and forms the system in a way that it can be easily understood. Interpretive structural modeling process converts non-transparent and vague mental models of the system to clear and evident models which are useful for many purposes. This approach is an interactive learning process in which a series of different elements are structured in the form of a comprehensive systematic model (Ravi and Rajat, 2008). Interpretive Structural Modeling is a suitable technique to analyze the effect of a factor on the other factors. This methodology evaluates the type and direction of the complex relations between elements of a system. In other words, this technique is a means by which the group of decision-makers can overcome the complexity of an issue. Among the advantages of this method are its comprehensibility for a wide range of users, its integration in conjunction with expert opinions and it applicability in the study of complex systems which contains a large number of components (Adeyemi and Aremu, 2008).

3.1 Self-interaction structural matrix

The first step in the Interpretive Structural Modeling is the analysis of conceptual relations between factors. In order to determine these factors, factor are evaluated pairwise. Self-interaction structural matrix is formed through this method (Ravi and Rajat, 2005). Following four symbols are used for this purpose:

V: factor i helps in realization of factor j.

A: factor j helps in realization of factor i.

X: factors i and j help in realization of each other.

O: factors i and j have no relation with each other.

The opinion of 14 experts familiar with the subject was used in order to determine the relation between factors. Self-interaction structural matrix of this research has been shown in table 1.

Table 1: Self-interaction structural matrix

Business intelligence skills	14	13	12	1 1	10	9	8	7	6	5	4	3	2
1. Recognizing the need	V	V	V	V	V	V	V	O	V	O	V	V	V
2.Connection with organizational strategies	O	O	V	V	A	A	O	V	V	V	V	A	
3.Summarizing the Analysis	V	V	O	V	X	X	V	O	V	V	V		
4.Development of options for decision-making	O	V	X	X	A	A	O	O	V	V			
5.prioritization of expectations	V	V	A	A	A	A	V	O	V				
6. identifying data	V	V	A	A	A	A	X	X					
7. Data Extraction	O	V	O	A	O	O	X						
8. data integration	V	O	A	O	A	A							
9. Explore and Explain	O	V	V	V	X								
10.transformation processes	V	O	V	V									
11. The results of the monitoring	O	O	X										
12.Change Management	O	V											
13.data storage	V												
14.Data Retention													

3.2 Availability Matrix

The above mentioned symbols must be converted to binary (one and zero) symbols in order to achieve the primary availability Matrix. The primary availability Matrix is obtained using this method. The following rules are used to form this matrix:

- In case of having V in (i, j) input of self-interaction matrix, (i, j) input in availability matrix is one and (j, i) input is zero.
- In case of having A in (i, j) input of self-interaction matrix, (i, j) input in availability matrix is zero and (j, i) input is one.
- In case of having X in (i, j) input of self-interaction matrix, (i, j) input in availability matrix is one and (j, i) input is one.
- In case of having O in (i, j) input of self-interaction matrix, (i, j) input in availability matrix is zero and (j, i) input is zero.

The final availability matrix will be obtained after achieving the initial availability matrix by adding the transmissibility to the obtained relations. This matrix has been shown in Table 2. Transferability indicates that if factor A affects factor B and factor B affects factor C, the factor A affects factor C. The dependence and influence of each of the key factors has also been shown in this matrix. Influence in obtained from the sum of ones in each row and dependence is obtained from the sum of ones in each column.

3.3 Level segmentation

The set of Input and output for each factor will be obtained in this step using the final Availability Matrix. The set of output for each factor contains the factor itself and factors which affect those and the set of inputs for each factor contains factor itself and factors which are affected by those (Vittal, 2008).

Table 2: The final Availability Matrix

business intelligence skills	1	2	3	4	5	6	7	8	9	10	1 1	12	13	14
1	1	1	1	1		1	0	1	1	1	1	1	1	1
2	0	1	0	1	1	1	1	0	0	0	1	1	0	0
3	0	1	1	1	1	1	0	1	1	1	1	0	1	1
4	0	0	0	1	1	1	0	0	0	0	1	1	1	0
5	0	0	0	0	1	1		1	0	0	0	0	1	1
6	0	0	0	0	0	1	1	1	0	0	0	0	1	1
7	0	0	0	0	0	1	1	1	0	0	0	0	1	0
8	0	0	0	0	0	1	1	1	0	0	0	0	0	1
9	0	1	1	1	1	1	0	1	1	1	1	1	1	0
10	0	1	1	1	1	1	0	1	1	1	1	1	0	1
11	0	0	0	1	1	1	1	0	0	0	1	1	0	0
12	0	0	0	1	1	1		1	0	0	1	1	1	0
13	0	0	0	0	0	0	0	0	0	0	0	0	1	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1

The common parts of these sets are determined for each of the factors after determination of the sets of input and output. The common set for each factor is obtained using this method. Factors with exact same output and common set are placed at the highest level of hierarchy of interpretive structural model. As it can be observed in table 3, factors 1, 3, and 6 are at the highest level of the model.

Table 3: the first repeat

Criteria	Output set	Input set	Common
1	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10, 11, 12, 13, 14	1	1
2	2, 4, 5, 6, 7, 8, 11, 12, 13, 14	1, 2, 3, 9, 10	2
3	2, 4, 5, 6, 7, 8, 11, 12, 13, 14	1, 3, 9, 10	3, 9, 10
4	4, 5, 6, 7, 8, 11, 12, 13, 14	1, 2, 3, 4, 9, 10, 11, 12	4, 11, 12
5	5, 6, 7, 8, 13, 14	1, 2, 3, 4, 5, 9, 10, 11, 12	5
6	6, 7, 8, 13, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 ,12	6, 7 ,8
7	6, 7, 8, 13, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 ,12	6, 7 ,8
8	6, 7, 8, 13, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 ,12	6, 7 ,8
9	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	1, 3, 9, 10	3, 9, 10
10	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	1, 3, 9, 10	3, 9, 10
11	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	1, 3, 9, 10	4, 11, 12
12	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	1, 3, 9, 10	4, 11, 12
13	13, 14	1,2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	13
14	14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	14

When the factors of the highest level are determined in the first repeat, these factors must be separated from other factors and in other words be removed. This will be repeated until all the level of all factors is determined. 8 repeats took place in this research and 2nd to 8th repeats are shown in table 4.

Table 4: 2nd to 8th repeats

repeats	Criteria	Output set	Input set	common	Level
2	13	13	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	13	2
3	6	6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	6, 7, 8	3
3	7	6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	6, 7, 8	3
3	8	6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	6, 7, 8	3
4	5	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	5	4
5	4	4, 11, 12	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	4, 11, 12	5
5	1 1	4, 11, 12	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	4, 11, 12	5
5	12	4, 11, 12	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	4, 11, 12	5
6	2	2	1, 2, 3, 4, 9, 10	2	6
7	3	3, 9, 10	1, 3, 9, 10	3, 9, 10	7
7	9	3, 9, 10	1, 3, 9, 10	3, 9, 10	7
7	10	3, 9, 10	1, 3, 9, 10	3, 9, 10	7
8	1	1	1	1	8

3.4 Forming the interpretive structural model

The initial interpretive structural model is drawn by considering the transfer-abilities given the level of each of the skills as well as the final availability matrix. The final interpretive structural model in formed by removing the transfer-abilities. The final obtained model has been shown in figure 1. The final obtained model in this research has been from by 8 different levels. Skills at higher levels of hierarchy have less influence. Data maintenance skills was placed at the highest level of the hierarchy. In fact, it can be stated that this skill is mainly derived from lower levels' factors.

3.5 Analysis of Analysis of influence – dependency

Factors are divided into four groups in this section with respect to the influence and dependency. The first group consists of autonomous factors (area 1), the second group is related to affiliated factors (area2), the third group is related to bonding factors (area3) and the fourth group is related to influential factors (area4). Skills with high influential power are called key skills. It is clear that these skills are placed in one of the two influential or bonding groups. Influence and dependency of each of the key skills of business intelligence have been shown in Table 2. The diagram of influence – dependency is formed based on this matter and has been shown in figure 2.

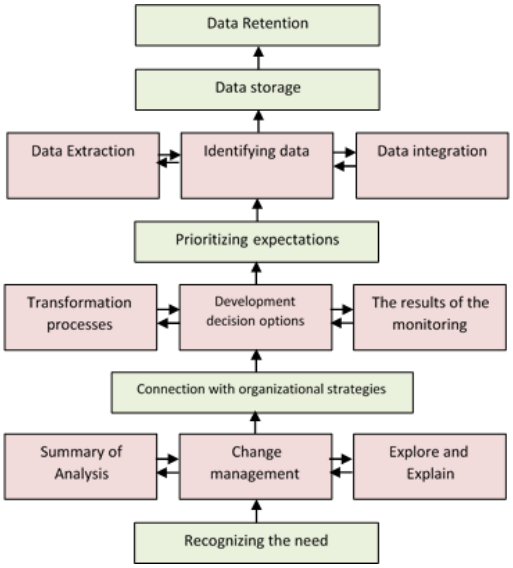

Figure 1. Structural model of business intelligence skills

influence															
14	1														
13				3, 9, 10											
12															
1 1			Area 4									Area 3			
10					2										
9								4, 11, 12							
8															
7															
6									5						
5													6, 7, 8		
4			Area 2									Area 2			
3															
2														13	
1															14
	1	2	3	4	5	6	7	8	9	10	1 1	12	13	14	

Dependency

Figure 2. influence – dependency diagram

4 Discussion and conclusion

This article tries to evaluate the behavior of business intelligence skills in addition to identification of these skills. Interpretive structural modeling approach has been used in achieving this goal. A model of influencing method of these skills and relation between them has been obtained in this regard. The mentioned model is formed of 8 levels. Skills at higher levels had lower influence. Lower levels have higher influence rate. Results of the research show that identification of needs is at the lowest level and all factors affect the higher levels. This indicates that the identification of needs is the most important skill in business intelligence in organizations. Business intelligence results in change management, exploring and explaining and summarizing analysis. Thus, these skills provide the context of using relation with organizational strategies and facilitate the activities related to the development of options for decision-making, the results of monitoring and transformation process. The result of this can prioritize the expectations. Prioritization of the expectations can also provide a context for data identification, integration and extraction. Thus, these skills provide the context for using data storage. This step can lead to data storage.

The results of the analysis of influence- dependency also show that skills are divided into our different areas. There was no skill in the first area which consisted of autonomous skills. Skills such as prioritization of expectations, data identification, data maintenance, data integration, and data storage and data extraction are in the second area. These skills have high dependency and low influence. The third area also covers skills such as decision-making options change management and results of monitoring. These factors or skills have high dependency and influence and are called bonding factors. Skills such as recognizing the need, relation with organizational strategies, and a summary of the analysis, exploring and explaining and transformation processes are in fourth area. This analysis shows that skills in 3rd and 4th areas have a high influence. Thus, these

groups have key skills and organizations need to pay more attention to these groups of factors in Business intelligence.

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