Journal of Industrial Strategic Management, Year 2017 , Volume 2 (Issue3), Pages:64-82

Journal of Industrial Strategic Management

Determining the factors affecting the evaluation of business intelligence systems with an emphasis on the integrity of Organizational resources

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C H R O N I C L E

Article history:
Received: 11/5/2018
Received in revised: 4/10/2018
Accepted: 70/10/2018

Keywords:
** Business intelligence*
** Evaluation*
** Information technology*
** Interpretive Structural Model*
** Enterprise Resource Integration*

Abstract

In the information age, the speed of producing and supplying valuable information is considered as one of the keys to success in the organizations and institutes. The major objective of this study was to investigate and specify the effective factors in evaluating the BI systems with an emphasis on the integrity of organizational resources. First, five factors were determined as the major factors through reviewing articles and the related books as well as using the opinion of the experts. Then, using Pareto analysis, 7 models/resources were selected as the reference among the total of 24 models/resources. The frequency of each of them was determined as 369 effective criteria using the model-criterion matrix; 40 criteria were considered as the effective criteria by using the Delphi four-step method. To rank the effective factors, TOPSIS model was used. Using Shannon entropy method, the priority of each of the factors, and their weights was respectively determined as organizational factors, project management and control, technical and technological factors, expectations and requirements management, and integration. Finally, according to the ISM , the relations of each of the effective factors were sorted in a way that the factors of integration and expectations and requirements management were placed at level 1, the technical and technological factors were placed at level 2, and the organizational factors and project management and planning with high influence power and low dependence for paying special attention to make effective changes in evaluating the business intelligence systems were placed at level3.

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Introduction

The information gathered and distributed to managers through a variety of information and communication technologies, now significantly affect management and decision making in modern companies. The amount of information is growing due to modern technologies, sustainable development and improvement in the company. Lots of information has led to the use of complex information systems such as BI. These systems are designed to support the decisions of senior executives in organizations. (Kubina, Koman, & Kubinova, 2015).Given that about 70 percent of these projects fail to provide predictable benefits, three-quarters of these projects fail and also average 178 percent of the budget and 2.5 times more time, while only one 30% of the expected benefits. The importance and the need for the research subject to identify and apply the success factors of implementation and deployment of business intelligence (BI) projects is in order to prevent the occurrence of failure factors and the loss of related costs. The business intelligence system is an integrated set of tools, technologies and products that are planned to be used to collect, coordinate, analyze and make data available. Simply put, the main tasks of the business intelligence system include intelligent exploration, integration, aggregation and multi-dimensional analysis of data originating from various information sources. (Olszak, C & Ziemba, E, 2007) By implication, in this definition, data are resources that are very valuable to the organization, from quantity to quality. As a result, the ability to integrate the bulk of the organization provides various sources of information and 360-degree views of the business. So, in order to facilitate decision-making, information can be provided at a time and place appropriate and appropriate to help individuals, sectors, groups, or even larger units. (Wang, H & Wang, S, 2008)

Based on many researches about CSFs, the implementation of BI systems is not just a purchase of a software package for reporting, but depends on several factors. Including information retrieval infrastructure such as Enterprise Resource Planning (ERP) systems .On the other hand, the correct implementation of business intelligence can become one of the key elements in the main competition of the organization and in turn it becomes one of the most costly mistakes. (Bagheri,M, et al, 2015)

One of the main weaknesses in existing research is the lack of consideration of databases for feeding BI systems. In this study, considering the relationship between business intelligence systems and enterprise resource planning, the lack of infrastructure consideration and databases are covered. Also, due to successive failures in implementing and deploying BI systems, this research tries to use the ISM-TOPSIS hybrid model to initially affect the success of the implementation and deployment of BI systems Identifying and ranking each of the dimensions, components and indicators to provide appropriate mechanisms for deploying business intelligence systems with an emphasis on the integrity of organizational resources.

Literature Review

Business intelligence existed before the advent of technology. Today, business intelligence is known as a set of analyzes whose value and insight come from data. For the first time in 1865, Richard Millard Dunes used the term "business intelligence" in a work titled Encyclopedia of Proverbs of Trade and Commerce. He used this term to describe a way that a banker named “Sir Henry” succeeded. The banker had a great deal of political, instability, and market understanding, and was ahead of his rivals. Richard writes in a statement by Sir Henry: "He had provided a set of complete business intelligence across the Netherlands, Flanders (a region

in Norway), France and Germany." Sir Henry used this advanced knowledge to deceive others and became famous as a corrupt capitalist. But the idea of collecting information about trading conditions was like a grain that was prone to growth. (Heinze, J. 2014)

The organization's resource planning systems offer powerful tools for controlling and measuring organizational operations. Many organizations have believed that if they are equipped with commercial intelligence systems, they will create a much higher value for the organization. Using these tools, you can store customer information over different periods, and after processing and exploring valuable information about their needs, tastes and behaviors. (Ghazanfari, M, et al, 2008)

Based on research on the features required by decision support systems, we can extract the required features of enterprise resource planning systems to support decision making in the following table format: (Ghazanfari,M, et al,2008).

Table 1. Required characteristics and indicators of decision support

Year	Reference / Author	Survey Indicators	Features
۱۹۹۶	C.Holsapple, A. Whinston	Increasing decision-maker power in knowledge processing	Better knowledge processing
۱۹۹۶	C.Holsapple,A.Whinston	Increasing decision-maker power to handle large or complex issues	Coping with complex issues
۱۹۹۴	G.Udo,T.Guimaraes	Decrease the decision time	Reduce time
۱۹۹۶	C.Holsapple,A.Whinston	Decrease the decision time	Reduce costs
۱۹۹۴	G.Udo,T.Guimaraes	Encouraging the decision maker to perform exploratory analyzes	Power of discovery
۱۹۹۸	E.Turban,J.Aronson	Create new thinking options about the issue	Create a new approach
۲۰۰۴	R Hightower	Equipping assumptions with evidence	Visualization
۲۰۰۵	Clyde W. Holsapplea	Increasing process credit and decision outputs	Reliability
۱۹۸۷	G.SeSanctis,R.Gallupe	Improving communication between people who are involved in a decision	Better communication
۱۹۹۴	G.Udo,T.Guimaraes	Improving communication between people involved in interdependent decision making	
۱۹۹۶	C.Holsapple,A.Whinston	Improving communication among people involved in inter-organizational decision making	
۱۹۸۷	G.SeSanctis,R.Gallupe	Improving the coordination of the activities of the decision maker	Better coordination
۱۹۹۶	C.Holsapple,A.Whinston	Improve the coordination of people who decide jointly	
۱۹۹۶	C.Holsapple,A.Whinston	Improving the coordination of outsourced people	
۲۰۰۵	Clyde W. Holsapplea	Promoting satisfaction with the decision process	More satisfaction
۲۰۰۵	Clyde W. Holsapplea	Promote satisfaction with the outcome of the decision	
۱۹۹۴	G.Udo,T.Guimaraes	Creating a decentralized decision-making system and employee participation	Strengthen decision making
۱۹۹۴	G.Udo,T.Guimaraes	Maintaining the competitive advantage of the organization	Competitive Advantage

Carmine D Arconte, in an article titled "Business Intelligence applied in Small Size for profit companies" in 2018, states that Business Intelligence is intelligent technology that helps improve performance and better survival and development capabilities. However, in this regard, we sometimes have a negative double vision, namely, on the one hand, the lack of practical criteria on how to use it in companies, and secondly, that they are often not sufficiently considered in companies. . In this article, in addition to highlighting the role of business intelligence in practice, we tried to find a way to deploy it in small companies, focusing on two critical aspects, namely, customer profitability and their satisfaction level, especially if they interact Their mutual consideration may have a huge impact on the company's outcome through using simple technologies (Arconte, C. 2018).

Marilex Rea Llave In a paper entitled "Business Intelligence and Analytics for Small and Medium-Sized Enterprises: A Systematic Literature Review," in 2017, a Comprehensive Literature Review on Business Intelligence and Analysis in Small to Medium Enterprises have given. Despite much interest in business intelligence and analytics, empirical research has shown that small to medium-sized companies are still lagging behind in the reproduction and replication of business intelligence and analysis. However, research on business intelligence and analysis has shown that no research has been done. This paper collects, categorizes and analyzes 62 articles on business intelligence and analysis in small to medium sized companies. The research topics used in this article are: components, solutions, companion, cloud, software, adaptation, deployment and benefits of business intelligence and analysis. (Rea Llave, M. 2017)

Rikke Gaardboe et al., In an article entitled "business intelligence success applied Healthcare information systems" in 2017, DeLone and Mclean’s IS Success Model is empirically tested on a Business Intelligence System applied Healthcare Information Systems at 12 public hospitals in Denmark. The purpose of this article is to examine the factors affecting the success of business intelligence. In total, 1351 people responded to the questionnaire. And the response rate is 32%. 8 relationship was investigated in this model, and four relationships were significant. Our concern was that: the quality of the system has a positive and significant relationship with the user's use and satisfaction. The quality of the information has a positive and significant relationship with satisfaction, but it has no relation to its use. And user satisfaction does not have a significant relationship with its use, and vice versa. User satisfaction has a positive and significant relationship with individual influence, but its use does not have a significant relationship with individual influence. (Gaardboe, R.Nyvang, T.Sandalgaard, N. 2017)

Adil BAYKASOĞLU et al, In an article entitled "Development of a two-phase structural model for evaluating ERP" In 2017, critical success factors along with a case study have suggested that organizational resource planning systems can be used to increase organizational resource and processing power. The real review that neither all the firms have been successful in implementing ERP systems nor the ERP systems have been used effectively. For this reason, companies focus on critical success factors based on evaluation frameworks to reduce the likelihood of failure of ERP deployment. Though a large number of critical success factors have been expressed in articles, decision makers face a large number of factors. In this regard, an understandable and controllable assessment model is required. In this paper, we present a two-

stage structural model for evaluating the critical factors of ERP success. In the first phase, a structured interpretation model has been adopted to create critical success factors in a hierarchical format. In the second step, hierarchical structural critical factors are evaluated by fuzzy cognitive maps. The model has been implemented in one of the largest Turkish ERP vendors in order to demonstrate its applicability. (Baykasoğlu, A. Gölcük, I. 2017)

Khadivar et al, In a paper entitled "Presentation of a Model for Barriers to Using Business Intelligence in Iranian Tourism Industry Using Mixed Approach", in 2016, a model for identifying and prioritizing barriers to employing business intelligence in the tourism industry. Iran have done. The research method is a mix of quantitative and qualitative methods. In the qualitative section of the method of field theory or fundamentals data, and in the quantitative part, a navigation strategy has been developed. Based on the results, eleven barriers as barriers to the use of business intelligence in the tourism industry of Iran have been discovered and presented in the form of models, presentations and rankings that include: data barriers, management barriers, cultural barriers, Lack of education and awareness, human resource barriers, legal and political barriers, lack of trust in knowledge transfer, organizational barriers, lack of system integration, barriers to funding artificial intelligence projects and infrastructure barriers.

In the survey section, an analysis and evaluation of the status of each of these obstacles in Iran has been carried out through the distribution of the questionnaire among experts in this industry. (Khadivar, A.Abdolvand, N. Nazari, L. 2016)

Masoumeh Bagheri and colleagues reviewed the factors affecting the failure of business intelligence projects in the article entitled "Evaluation and ranking of factors affecting the failure of business intelligence projects in organizations" in 2015. In this paper,They have tried to identify and rank the factors affecting the failure of business intelligence projects in organizations. In this way, by first reviewing related resources and sites and interviewing some of the experts, they identified the eight main factors behind the failure of the business intelligence projects in the organization. Then, using the interpretive structural modeling technique, the impact and significance of each of them are identified and ultimately, these factors are classified according to their degree of dependence and influence power. Further, it has been shown that among these factors, senior management's disapproval factors and lack of education play the most role in the failure of business intelligence projects. (Bagheri,M & Shadmani,SH, 2015)

Ahad Zare Rawasan and his colleagues in an article entitled "Identifying and categorizing critical success factors for implementation of business intelligence systems in Iran" in 2014 reviewed the factors affecting the success of implementing BI systems. The purpose of this research is to identify the critical factors for the success of implementing business intelligence systems in Iranian organizations. To do this, at first, by reviewing past research, 26 critical success factors have been identified in the successful implementation of business intelligence systems. The members of the research community, which consists of managers and experts with at least 3 years of experience in consulting and implementing business intelligence systems in Iran, determined the importance of each of these factors in the form of a questionnaire. Based on the results of this study, organizational, human, project management and technical factors as the main groups of critical success factors in implementing business intelligence systems in Iran have been identified. (Zare,A & Rabie,S.2014)

Mehdi Ghazanfari and his colleagues in an article entitled " Requirements for

Business Intelligence Evaluation in ERP: A Case Study of Iran Trade Development Organization " in 2008 investigated the relationship between smart business resource planning and decision support systems. In this paper, due to the design and implementation of a survey, the basic needs of managers of different levels of the organization from organizational resource planning systems to support decision-making management and creation of business intelligence have been questioned. According to the analysis of managerial characteristics and the nature of decision makers, the assumptions in the domain Relationship between organization resource planning systems and management decision making. In order to provide a practical framework for applying solutions, using the multi-criteria's decision-making methods, the problem of seeking the most suitable solution to meet the needs has been followed. Using the Shannon entropy method, the weight of the criteria (requirements) and then, using the TOPSIS model, the priority of the implementation of the most appropriate Solutions are specified. (Ghazanfari,M, et al,2008)

Saeed Rouhani and his colleagues presented an evaluation model in 2012 in an article entitled “Evaluation model of business intelligence for enterprise systems using fuzzy TOPSIS ". Evaluating business intelligence for use in companies before buying and deploying them is important for decision makers in the organization. This research helps to create a new, easy-to-access model for business intelligence systems. In this research, literature review has been widely used and 34 indicators of business intelligence have been extracted. The fuzzy Topsis technique has been used in this research. Fuzzy weight and fuzzy criteria and judgments about corporate systems are used as the options used to calculate the rating and rating of the evaluation. This model enables organizations to make decisions, choices and achieve the desired systems. (Rouhani,S, Ghazanfari,M & Jafari,M. 2012)

In a paper titled “Integration of Business Intelligence and Enterprise Resource Planning within Organizations “in 2013, Nofal and colleagues reviewed articles published on BI and ERP integration. Today's competitive environment within the complex BI framework and ERP are key strategic tools that directly affect the success of deploying projects. But little attention is paid to the integration between ERP and BI. (Nofal,M & Yusof,Z. 2013)

Ahmed Elragal, in an article titled " ERP and Big Data: The Inept Couple " in 2014, examines the integrity of ERP and Big Data. Nearly 90% of the global network data has been generated in the last two years. Most people are considered as a tool or product when they talk about big data and do not integrate with ERP. (Elragal,A. 2014)

In an article entitled " Business Intelligence During Times of Crisis: Adoption and Usage of ERP Systems by SMEs " in 2015, Antoniadis and colleagues explored factors affecting the use of ERP systems by small and medium enterprises, according to The potential of BI implementation during the crisis period. The adoption of enterprise resource planning systems is considered as significant technological and technological innovation in modern companies. In this paper, the acceptance of ERP systems and their implementation by West Macedonia companies has been studied. The main factors considered are economic characteristics. The main result of this research is that managers do not use the advantage of summarizing heterogeneous data, knowledge and experience gained from these systems. In this research, 37 companies from the West Macedonia region were surveyed in the period from April to May 2014. The questionnaire used was of a structured type with 5 sections and was used from a Likert scale of 1 to 5. (Antoniadis,I. Tsiakiris,T. & Tsopogloy,S.2015).

In an article entitled “Research on using ANP to establish a performance assessment model for business intelligence systems “in 2009, Lin and colleagues have put forward an evaluation model for selecting and deploying BI. As a result of these studies, it has been proven that the most important factors affecting BI are: accuracy of output information, compliance with requirements, and organizational performance support. The application of the proposed assessment model in the study area has improved the effectiveness of 24 %. (Lin,Y. Tsai,K. Shiang,W. Kuo,T. & Tsai,C.2009)

In 2013, Işık and colleagues explored the success factors of BI in an article entitled "Business intelligence success: The roles of BI capabilities and decision environments. Information & Management "In this research, data quality, user access, and BI integration with other systems have been identified as key success factors. (Işık,O. Jones,M. & Sidorova,A.2013)

Research Methodology

In order to achieve the main indicators of success (CSF) in the establishment of business intelligence systems, the stages of implementation of this research are as follows:

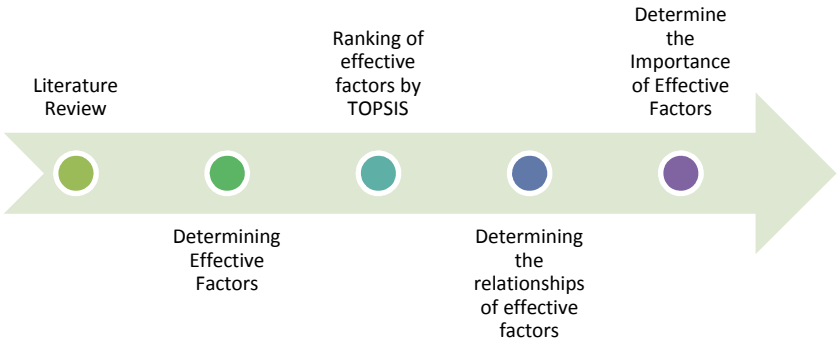

Figure 1. The algorithm for the implementation of the research steps

Also, based on the above algorithm, each of the steps is described as follows:

Table 2 - Steps for the implementation of the research

No	Level	Sub Level	Output Level
۱	Literature Review	• Reviewing and studying internal articles • Reviewing and studying external articles • Review and study published books • Reviewing and studying valid site information	Primary factors and factors
۲	Determining Effective Factors	• Apply Pareto chart • Using the Delphi method	Effective factors and criteria approved by experts

		• Preparation of a questionnaire • Interview with experts†	
۳	Ranking of effective factors by TOPSIS	• Evaluation of indicators • Non-Scale Indicators • Determination of Indices Weight by Shannon Entropy Method • Implement TOPSIS model	Ranking effective factors and criteria
۴	Determine the relationships and importance of effective factors through ISM	• Formation of a structural self-construct matrix • Matrix received • Determining Relationships and Leveling Dimensions and Indicators	• Determining the relationships of effective factors • Determining the relationships of effective factors

† The type of interview used in this research is semi-structured. In this way, they interviewed each of the experts for 30 minutes and their comments were collected.

Given the high volume of information identified in the literature review phase, duplicate and similar data were removed and equated. In this research phase, more than 24 sources have been considered for the extraction of factors and criteria.

Ratings of sources / models of effective factors based on the frequency of references

After examining the factors and criteria by generating a model-criterion matrix, all criteria were weighted according to the number of references in sources, also sources / models were weighed according to their weights, whose weights are called the degree of comprehensiveness of the model; Then, according to the Pareto chart of Law 80/20, resources / models with a total degree of over 20% are selected.

For each criterion, based on the frequency (referrals in each resource / the model), the weight is determined by dividing the sum of the frequency of the criterion (In) by the total sum of the frequencies of the criteria (I) and is indicated by the symbol Wi. In this way, for each resource / the model, the weight is determined, which is represented by the symbol Wm, which is the sum of the weight of the criteria (Wi)

Each resource / model (m) is determined by the relationship of each of them as follows:

Calculate the weight of each criterion:

$$Wi = \frac{\sum In}{\sum I}$$

Calculate the weight of each model:

$$Wm = \sum Wi$$

The research community

Regarding the high failure rate of business intelligence systems deployment projects, in this research, five IT companies in the field of intelligence, Tehran, were investigated in the period from October 2016 to March 2017. The overall structure of the study section in these companies is as follows

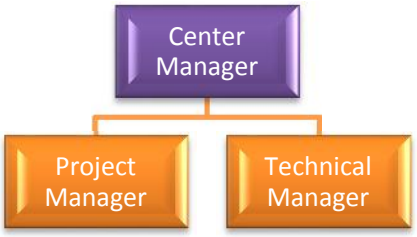

Figure 2. The structure of the study section of 5 companies

For this purpose, the group of experts in this research consists of technical managers, center managers and project managers in this field, which are listed in the table below.

Table 3 - Specifications and number of experts in the surveyed companies

No	Expert	Education	History	Field of Study	Number of persons
۱	Center Manager	MA	۱۰	Software	۵
۲	Technical Manager	MA	۸	Software	۱۰
۳	Project Manager	MA	۴	Industrial/Software	۱۰

Findings

Based on research method and Delphi third-stage output 5 factors and 40 main criteria are Specified by using the TOPSIS Decision Model, factors and criteria are ranked as follows:

Table ۴. Effective Factor Ranking

Factors	Coefficient of proximity	Ranking
Organizational factors	0.42	۱
Project Management and Planning Factors	0.3335	۲
Technical and technological factors	0.325	۳
Expectations and requirements management factors	0.3071	۴
Integration factors	0.2549	۵

Table ۵. Ranking of factors and indicators effective in business intelligence projects

Factor rating	Effective Factors	Indicators	The ideal negative solution	The ideal positive solution	Relative closeness to the ideal solution	Index Ratings
۱	Organizational factors	Resistance of users against software	0.0038	0.0006	0.864	1
		Employee risk aversion	0.0021	0.0006	0.778	2
		Organizational maturity	0.0022	0.0078	0.220	3
		Organizational Commitment	0.0036	0.0172	0.173	4
		Determine the expected strategies and objectives of the system	0.0037	0.0201	0.155	5
		Organizational Culture	0.0039	0.0239	0.140	6
		Selection and utilization of experienced consultants	0.0039	0.0268	0.127	7
		The size and breadth of the	0.0039	0.0271	0.126	8

Factor rating	Effective Factors	Indicators	The ideal negative solution	The ideal positive solution	Relative closeness to the ideal solution	Index Ratings
		organization				
		The relationship between the organization and the end users	0.0039	0.0278	0.123	9
		Motivated through successful rewarding	0.0039	0.0281	0.122	10
		Support, Leadership and Leadership Participation	0.0039	0.0284	0.121	11
		IT staff skills	0.0039	0.0291	0.118	12
		User skills	0.0039	0.0291	0.118	۱۲
		Business and project hero	0.0039	0.0304	0.114	۱۳
		Participation of the operational and operational staff of the organization in the establishment and development of software	0.0039	0.0345	0.102	۱۴
۲	Project Management and Planning Factors	Determine the cost of software selection, consulting, training, deployment and maintenance of software	0.0038	0.0209	0.154	1
		Leadership Committee	0.0037	0.0205	0.153	2
		The amount of turnover within the deployment team	0.0039	0.0236	0.142	3
		Manage Suppliers	0.0039	0.0236	0.142	3
		Applying successful experiences in similar organizations	0.0039	0.0274	0.125	4

Factor rating	Effective Factors	Indicators	The ideal negative solution	The ideal positive solution	Relative closeness to the ideal solution	Index Ratings
		Sufficient resources (manpower, finance, etc.) for deployment of the project	0.0039	0.0278	0.123	5
		Project planning, management and control based on organization priorities	0.0039	0.0284	0.121	6
		Focusing and defining the project scope and proper control during the implementation process	0.0039	0.0313	0.111	7
۳	Technical and technological factors	software-related unreliability	0.0019	0.0006	0.760	1
		Failure to control the system configuration by the contractor	0.0009	0.0004	0.692	2
		IT infrastructure	0.0038	0.0213	0.151	3
		Creating flexible and extensible software information architecture	0.0039	0.0236	0.142	4
		Function and system capacity for operation	0.0039	0.0239	0.140	5
		Data quality and information gathered in the software	0.0039	0.0304	0.114	6
		Technical skills of the project team	0.0039	0.0331	0.105	7
		Easy access and easy-to- use software	۰.۰۰۳۹	۰.۰۳۵	۰.۱۰۰	8
۴	Expectations and requirements management	Inadequate knowledge transfer from the vendor to the	0.0036	0.0006	0.857	1

Factor rating	Effective Factors	Indicators	The ideal negative solution	The ideal positive solution	Relative closeness to the ideal solution	Index Ratings
	factors	operating staff or maintainer of the system				
		Honest, open, and effective communication mechanisms between the project team and the organization	0.0038	0.0228	0.143	2
		Evaluating and meeting user expectations	0.0039	0.0284	0.121	3
		Effective and online after-sales support and services	0.0039	0.0287	0.120	4
		Quality and quantity of training for managers and users	0.0039	0.0291	0.118	5
		Manage requirements changes, processes and requests for the organization	0.0039	0.0345	0.102	6
	Integration factors	Reengineering processes and adjusting them to business	0.0039	0.0281	0.122	۱
۵		Application of Enterprise Resource Planning Systems	0.0039	0.0291	0.118	۲
		Integration and software compatibility with other software	0.0039	0.0322	0.108	۳

Interpretative Structural Model (ISM)

After introducing the five factors affecting the evaluation of business intelligence systems, self-efficiency matrix, self-received matrix, relations and leveling of effective factors, the

matrix of influence power of dependence between the effective factors and the

model of the interactions of the effective factors as follows:

Table 6. Structural self-efficacy matrix of effective factors in the evaluation of business intelligence systems

No	Effective Factors	۱	۲	۳	۴	۵
۱	Organizational factors		X	O	V	X
۲	Project Management and Planning Factors	X		V	X	O
۳	Technical and technological factors	O	A		X	V
۴	Expectations and requirements management factors	A	X	X		O
۵	Integration factors	X	O	O	O	

Table 7. Self-received Matrix Factors Affecting the Evaluation of Business Intelligence Systems

No	Effective Factors	۱	۲	۳	۴	۵	Power of influence
۱	Organizational factors	۱	**1**	۰	۱	**1**	**4**
۲	Project Management and Planning Factors	**1**	۱	**1**	۱	۰	**4**
۳	Technical and technological factors	۰	**0**	۱	**1**	**1**	**3**
۴	Expectations and requirements management factors	**0**	**1**	**1**	۱	**0**	**3**
۵	Integration factors	۱	۰	۰	۰	۱	۲
Dependency		۳	۳	**3**	4	3	

Table 8. Determining the Relationships and Levels of Factors Affecting the Evaluation of Business Intelligence Systems

۰ :Repeat Rank	Output Collection	Input Collection	Common collection	Level
۱. Organizational factors	2,4,5	2,5	2,5	
۲. Project Management and Planning Factors	4,3,1	4,1	4,1	
۳. Technical and technological factors	5,4	4,2	4	
۴. Expectations and requirements management factors	3,2	3,2,1	3,2	Level 1
۵. Integration factors	۱	۱	۱	Level 1
1 :Repeat Rank	Output Collection	Input Collection	Common collection	Level
۱. Organizational factors	5,4,2	5,2	5,2	
۲. Project Management and Planning Factors	4,3,1	4,1	4,1	
۳. Technical and technological factors	5,4	4,2	۴	Level 2
2 :Repeat Rank	Output	Input Collection	Common	Level

	Collection		collection	
Organizational factors . ١	5,4,2	5,2	5,2	Level 3
Project Management and . ٢ Planning Factors	4,3,1	4,1	4,1	Level 3

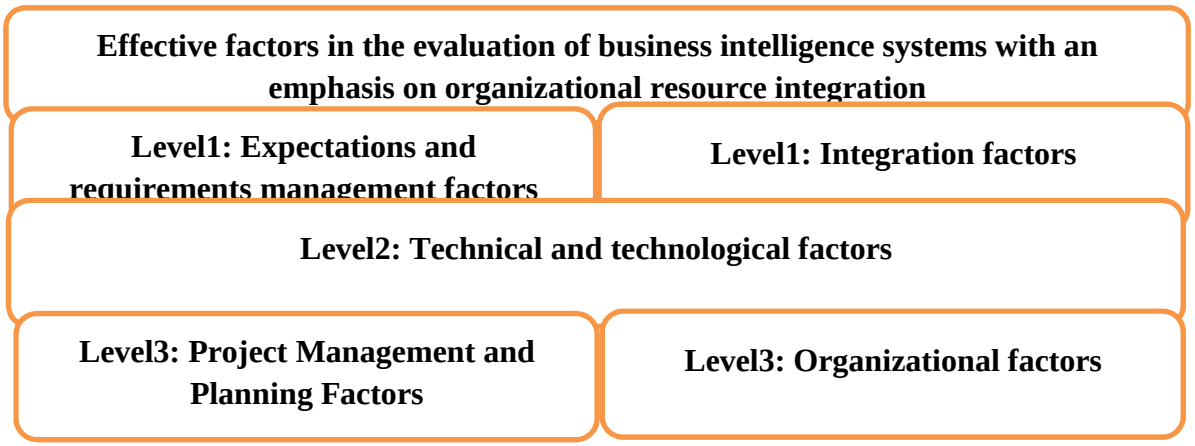

Figure 3. Leveling the Factors Affecting the Evaluation of Business Intelligence Systems with Emphasis on the Integrity of Enterprise Resources

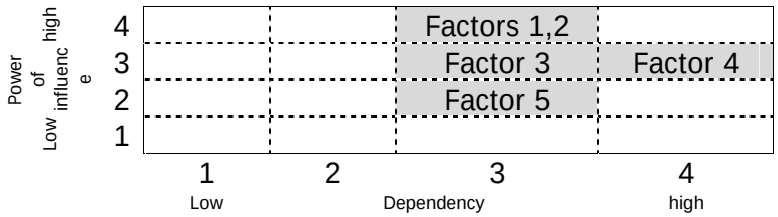

Figure ۴. Interaction Model between Factors Affecting the Evaluation of Business Intelligence Systems

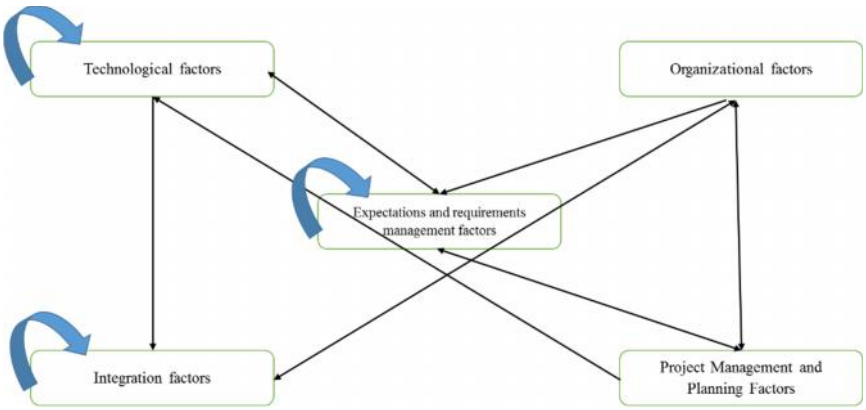

Figure 5. Interaction Model between Factors Affecting the Evaluation of Business Intelligence Systems

The conclusion

Based on the findings of the experts, the Delphi method and TOPSIS decision making model, the factors affecting the evaluation of business intelligence systems, with emphasis on integration of organizational resources, are as follows:

1. Organizational factors: Due to the fact that the establishment and application of software systems in one organization with its employees is always directly related, key criteria in this regard such as employee resistance, risk aversion, organizational maturity, organizational commitment, specific and expected goals and strategies, The organizational culture, the use of experienced consultants, the breadth of the organization, and so on.
2. Project Management and Planning Factors: One of the main factors in the failure of software projects is poor management and planning of the project, for this purpose, some criteria should be considered such as determining the cost of software selection, consulting, training, software deployment and maintenance, steering committee, turnover within the deployment team, supplier management, adequate resources, organizational prioritization, etc.
3. Technical and technological factors: Considering that a software must have the technical and technological capabilities to meet the requirements of the organization, there should be criteria such as software-related unreliability, lack of control of the system's configuration by the contractor, IT infrastructure, flexible information architecture, and Extensibility, technical skills of the project team, and so on.
4. Expectations and requirements management factors: One of the major problems in deploying business intelligence systems in organizations is the lack of compliance between the expectations and the basic requirements of the organization with the software deployed in the organization. For this reason, criteria such as inadequate knowledge transfer from the seller to the operating system staff, assessment and satisfaction of the user's expectations, effective support and after-sales service, the quality and quantity of training for managers and users, management changes, etc. should be considered.
5. Integration Factors: In the establishment of business intelligence systems, due to the wide association between this system and the information systems available in the organization for collecting and aggregating information, there should be integrity-related criteria such as the process reengineering and business matching, Integration and compatibility of the software with other software.

Also, based on the findings of the experts gathered and the use of the ISM model and the dependency power matrix, the factors affecting the evaluation of business intelligence systems with an emphasis on integration of organizational resources in two clusters were as follows:

Associated cluster: In this cluster, criteria are found that have high dependence and low power penetration. Based on research, integrity factors are located in this cluster.

Linked cluster: In this cluster, there are cross-linking criteria that have both strong influence and strong affinity. These criteria are inanimate or unsustainable research, because any action on these criteria will have an impact on other criteria or feedback. Based on research, organizational factors, project management and planning, technical and technological, and management of expectations and requirements are in this cluster.

Accordingly, and ranking factors affecting the evaluation of business intelligence systems, with emphasis on integration of organizational resources, organizational factors, and project management and planning, are considered as the third level of factors that affect other effective factors. Also, factors of integration and management of expectations and requirements are identified as the first level of factors, which means that these

factors are influenced by other factors and their lack of influence on other factors.
In fact, in order to evaluate business intelligence systems, particular attention should be paid to organizational factors and project management and planning. Because these factors are the basis for the recovery of the upstream factors. While focusing on upstream factors only improves its function, this is due to less influence among other factors.

Proposed actions

Based on the rankings of identified factors and criteria, the following suggestions for the establishment and evaluation of business intelligence systems with an emphasis on the integrity of corporate resources are presented.

Table 9 - Proposed measures

No	Effective Factors	Proposed action
۱	Organizational	Organizing management meetings by senior management to align comments and determine the system deployment strategy
۲		Organizing general meetings for employees by managing different departments of the organization to prepare and set goals for system deployment.
۳		Introducing the business intelligence system, benefits, uses, and ... through the public organizational information
۴		Use of outsourcing methods for software systems
۵		Establishing a clear communication mechanism to receive and respond to employee insights on the business intelligence system
۶		Creating employee motivational mechanisms with regard to the advancement of system deployment in each of the organizational sectors
۷		Conducting training sessions at both the user and managerial levels and workshops in specific time periods
۸	Project Management and Planning	Determine the precise scope of deployment of the BI system.
۹		Accurate estimate of sufficient resources of the project, including human resources, software selection costs, consultancy, training, deployment and maintenance of the system.
۱۰		Establishing the Monthly System Deployment Steering Committee to examine the progress of the macro level of the project
۱۱		Establishment of a technical committee for the establishment of the system on a weekly basis to review the ongoing and future work
۱۲		Providing liquidity for the system operator based on actions taken in a specified time
۱۳		Using the experiences of similar organizations
۱۴		Determine organizational priorities for deployment of the business intelligence system
۱۵	Technical and technological	Selection of software infrastructure commensurate with other software systems in the organization
۱۶		Implementing flexible and expandable information architecture for future changes in the system
۱۷		Estimate and provide the capacity and performance of the system in accordance with the organization's needs
۱۸		Applying a qualified technical team with similar work experience
۱۹		User friendly and user-friendly interface for maximizing the systems perceived and maximized use in the organization

No	Effective Factors	Proposed action
۲۰	Expectations and requirements management	Assess and accurately identify organizational requirements at the management and staff levels
۲۱		Determine the specific mechanism for obtaining new requirements during the deployment process
۲۲		Managing requirements changes and organizational requests
۲۳		Establish support and after-sales support mechanisms based on standards and software frameworks such as ITIL
۲۴	Integration	Reengineering organizational processes and aligning them with the business intelligence system
۲۵		Integration and compatibility of the business intelligence system with other software systems
۲۶		Application of enterprise resource planning systems for information aggregation

Future research proposals

Considering that in this research only the investigation, identification and ranking of the factors and criteria affecting the evaluation of business intelligence systems with emphasis on integration of organizational resources is suggested. It is suggested that future research into the development of a business intelligence business evaluation model be proposed.

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