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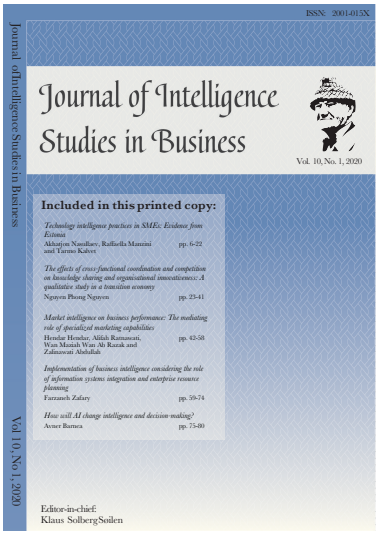

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Farzaneh Zafary[a]*

[a]Islamic Azad University, Science and Research Branch, Tehran, Iran *zafary@gmail.com

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Implementation of business intelligence considering the role of information systems integration and enterprise resource planning

Farzaneh Zafary[a]*

[a]*Islamic Azad University, Science and Research Branch, Tehran, Iran*
**Corresponding author:* zafary@gmail.com

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ABSTRACT The aim of this research is the implementation of business intelligence, considering the role of information systems integration and enterprise resource planning on it. According to the objectives of this research, it is practical research, and the work process is based on descriptive, survey, and exploratory research. The study population of the qualitative part of this research includes experts (information technology and communications managers from Tehran Stock Exchange companies and professors). Twenty-five interviews were performed by a non-random and targeted method, until a theoretical saturation of the questionnaire was reached. The study population of the quantitative part includes all the personnel of 167 companies where business intelligence is implemented in their organizations. Two questionnaires were used for gathering the required data for evaluating and measuring the studied variables. Validity is confirmed by experts' opinions. Finally, seven issues of structural factors, behavioral factors, environmental factors, processes, output, consequence, and the effect and their subcomponents are identified as effective items in business intelligence success. Regarding the outcome, importance, and the model coefficient of the main factors, the processes have the most impact on the results. So, organizations should pay more attention to their working processes to improve business intelligence success. Overall, the results regarding the effective factors on successful implementation of business intelligence reflect best practices of firms that have successfully implemented BI systems and provide insights for BI stakeholders that may increase the chances of successful implementation. This study shows the value of integrated information systems and enterprise resource planning in the success of business intelligence implementation. The findings of this study provide an opportunity for other researchers to study a cost optimization approach. It also suggests it is time to investigate suitable approaches by a focus on the appropriate factors for successful business intelligence implementation and by comparative analysis of ways to boost business intelligence preparation. This study also found further factors, in addition to enterprise resource planning and information systems integration, that can be used to select and rank more factors of business intelligence implementation. Furthermore, a model that examines the integration of business intelligence and the other information systems in the company is proposed for future research.

KEYWORDS Business intelligence, enterprise resource planning, information and communications technology, information systems, integrated systems

1. INTRODUCTION

With the improvement of technology, organizations should consider new technologies like business intelligence as an inevitable necessity for survival. In today's ever-changing world of business, organizations have to be competitive and innovative in order

to supply value to shareholders (Blenkhorn & Fleisher 2007). The business intelligence systems provide a tool to reply to the information requirements of an organization appropriately. One way that organizations can achieve this is to extract the maximum possible value from their internal data assets by using techniques like interactive graphical data analysis, data mining and predictive analytics. These techniques and tools are part of a discipline referred to as business intelligence (Hawking &Sellitto 2010). Business intelligence is a suitable approach to reply to the mentioned problems. Business intelligence (BI) is a modern information technology that helps organizations to gather, manage and analyze structural or non-structural data (Lin, Tsai,Shiang, Kuo, & Tsai, 2009) (Nyblom,Behrami,Nikkilä, & Solberg Søilen, 2012). The main objective of BI is to help the company to improve its function and upgrade its competitive advantage in the market. BI helps companies in their decisions and through this evaluation the activities and functionalities may result in the improvement of the companies. Now, business managers need useful and related realities to make decisions. But often there is a gap between the required information of the business managers and the volume of data that the business unit gathers every day. Business units invest in order to fill the gap for the extension of BI systems that convert raw data to useful information.

The most effective work of BI systems is providing the possibility of accesses, processing a large volume of data, and delivering related subsets of data to the companies' managers instantly. Decision making and analysis based on the reality of BI affect all organizations. We live in a world that is saturated with information and technology (Pall and Ogan 2018). Today, companies focus on their improvement, and businesses are expanding. Availability of high quality and correct information is one of the advantages of BI. In spite of the amount of inappropriate data, irrelevant data, and sometimes contradictory data, new technologies can help decision-makers of organizations use the created added value to find the useful information. Some companies help their decision-makers by producing related and precise information that is presented in easy and understandable formats. These companies use the advantages of BI well and the effect is seen in the companies' operational advantages. Successful BI can help organizations to make the most effective decisions at the most effective time through integrating and analyzing data with decision support systems (Muntean, Gabriel, Cabau & Rinciog 2014).

Receiving correct information at the correct time is the basis of successful decisions and survival of the organization. Successful BI provides the proper information to the proper people throughout the organization to boost strategic and tactical decisions (Li, Shue, Lee, 2008). But always there is a gap between the information required by the managers and the information gathered by the operations of the company in different sections. The tools of BI provide a perspective of the past, present, and future. Implementation of BI approaches removes the gap between intermediate managers and senior managers from the information communication point of view and provides the managers the required information in each level at each instance, and with high quality (Moro et al. 2015). Enterprise resource planning (ERP) may be regarded as a fundamental method for BI, in particular to collect and incorporate data into a central database. Some believe that successful ERP can act as a spinal column for BI at an organization because it is able to give managers an integrated approach of inside processes of BI (Nash, 2000; Parr and Shanks, 2000). This system triggers time reductions in processes and knowledge sharing within the organization, so the company can adapt to the evolving needs of customers (Lee et al., 2010). Some of the information is provided from outside of the operational systems, even out of the organization through market information and competitors. The highest benefit resulting from BI is the possibility of direct access to data by decision-makers at all levels of the organization so they can interact with the information and analyze it. Hence, they can manage the business, improve efficiency, detect the opportunities, and perform their tasks with higher efficiency.

The companies that are members of the Tehran Stock Exchange have tried to improve their organizations' functions in different ways, such as personnel training and optimal use of resources. This was not successful and the companies are now investigating suitable approaches by focusing on external factors. It seems BI is a suitable approach for the improvement of the organizations' functionality. Managers need a way to get good information. One method to support business

activities is BI (Elbashir, Collier& Davern, 2008). This study addresses how the implementation of BI considers the role of information systems integration and enterprise resource planning.

2. THEORETICAL BASICS

2.1 Business intelligence

The term business intelligence was identified in 1989 by the Gartner group. It includes concepts and models presented to improve decision making in business environments. Based on the Gartner definition, BI is an interactive process for structured detection and analysis of specific information to detect the process, or the patterns through which it can gain a specified view or results.

BI refers to the selection, incorporation, analysis, and presentation of business information technology, applications, and practices. BI is meant to help effective business decision-making. BI systems are basically a data-driven decision support system. Often BI is used interchangeably with brief articles, reporting and review methods and the executive information system.

BI may be a solution that may improve the method of gathering and processing data, along with higher cognitive processes (Sacu and Spruit, 2010). Now, BI is one of the issues that information technology has fast development in this field (Chen et al. 2012). BI is a collection of abilities, technologies, tools, and approaches that helps managers to understand business conditions. BI involves the tools and processes that turn data into knowledge that help make decisions (Kandogan, et al., 2014). Moreover, experts and analyzers can improve their activities using simple facilities and receive better results. The most important benefit of using BI systems is increasing the effectiveness increment in decision making. The main objective of BI is converting data to knowledge for the improvement of decision making. The most important tools of BI include data storage, extraction, transmission, load, online analysis process, data mining, and reporting (Ngai and et al. 2011).

Generally the aims of this new approach are 1) determining the business orientation of the organization that results in focus of the organization on big and basic goals without wasting time, cost, and energy in other ways, 2) making market predictions that allow for new marker benefits for the organization before competitors take over the market, 3) efficiency enhancement of the organization on internal issues and transparency in key process trends, 4) standardization and creation of compatibility among the organization structures, 5) facilitating decision making as one of the main objectives of BI, and 6) early detection of risks and identification of business opportunities (Wang, 2015).

2.2 Integration of information systems

In the past, for each process or task a separate systems (island system) provided many benefits, but resulted in some problems such as an inability to connect systems. To address this, network engineers found another solution to provide the objectives to the organization. The resulting integration of information systems gave a high capacity for information propagation throughout the organization. It helped facilitate better decision making based on complete information (Zhou et al. 2018).

The specific advantages of information system integration are improvements in efficiency, better decision making, costs decrement, income increment, and integrated services. Integration of information systems is an indicator for the measurement of availability of the generated information of one of the information components by other components. Integrated information systems include integrated manual and computer components that are designed for gathering, processing, controlling, and storage of information and to ensure of the accuracy of information flow in the organization, and the ease of the operational functionalities to support management information in decisions (Shao et al. 2012). Pragmatic objectives of integrated information systems in the organization are a) performing main and repetitive activities in an intelligent manner with ease of operational functionalities, b) applying internal controls of the main activities in an intelligent manner, c) quick access to categorized information for decision making, d) creation of the field of continuous and on-time reporting in the organization and creation of the cultural background of economic discipline, and e) saving time of information processing (Yun et al. 2018).

2.3 Enterprise resource planning

Enterprise resource planning (ERP) is a system designed for the creation of an appropriated base for complete management of a company. Using this system, communication

possibilities among units of a business and commerce company are provided, and the company's manager can monitor all the company's issues including financial, personnel, and production issues. This system allows all parts of a company and its operations to gather in a computer system. The system meets all the needs of the company's management (Nolz et al.2016). ERP is one of the systems that creates integrated processes by using joint database and sharing information (Chung and Snyder, 2000; Dredden and Bergdolt, 2007). The main advantages of the system that are not in the nonintegrated organizational system include organizational integration of standardization of organizational processes, re-engineering of the organizational processes, faster installation, and the possibility or ease of extension of the new systems and technologies. With the advent of ERP in production, all productive systems are covered. Different sections, processes, and tasks such as quality control, maintenance and repair, accounting, and finance are connected to productive systems, and ERP is identified as the distance between supply chain management systems and communication with customer management (Arun and Derrick 2012).

Many studies have explored critical factors that affect the successful establishment of ERP systems. These include problems that originated in ERP and are from special issues and problems in the running of the system, to behavioral and functional problems and organizational changes after running the system (Jones et al., 2016).

The functional costs of reduction of ERP software for the integration of business processes in an organization and its sub-sections is designed through an information system. The main advantage of the ERP system is the improvement of coordination among different sections of the organization and increment of the process's efficiency. The first advantage that is expected from the ERP systems in a short time and after execution is functional cost reduction, such as the costs of the inventory control, production costs, marketing, and support costs (Chwelos et al. 2014).

2.4 Literature review

The results of Popovič et al. (2019) present useful views for managers and solution providers to help to understand the effect of different factors on increased effectiveness of the processes after utilizing BI in small and big companies.

Pall and Ogan (2018) explain that administration managers make technology, data, and analysis as the conversion force of the business. Hence, most organizations implement BI technologies and analysis to support reporting and decision making.

Torres et al. (2018) explain that technical infrastructures, management ability, and expert orientation result in the improvement of change capabilities, administration, and functional performance of the organizations, and BI leads to improvement in the total performance of the system.

Rabbani and Khalesi (2018) explain that BI and customer relationship management affect organizational success.

Avhadi and Khayyam (2018) explain that there is a meaningful relationship between the existence of a BI team and infrastructures of BI. Also, the observations show that infrastructures of BI and the BI team impact operational capabilities BI. Moreover, they affect strategic capabilities of BI. Other results of their research show the operational and strategic capabilities of BI affect operational and strategic business value.

Bagheri and Alikhani (2018) explain that BI affects the performance of the organization and business processes. The business processes impact the performance of the organization, and they are mediators between BI and organizational performance. Moreover, data mining, analytical storage, and organizational dashboard are effective in the performance of the organization.

Jalali and Khademi (2018) explain that because of the competitive environment, the countries and corporations for decision making and taking competitive strategy don't confine the limited internal resources of the organization or the random information. Indeed, correct, effective, and updated information from the environment is one of the powerful tools at the level of the corporation and internationally.

Fink et al. (2017) propose and test a model of value generation of BI with the aim of removing the gap between the proven research in the field of value generation for information technology and new researche in BI. They hypothesize about the ways that the properties and capacities of BI make business value, analysis of the view based on the resources, and conceptualization of organizational training are performed.

Hasani and Neshat (2016) explain in their paper that BI and organizational performance questionnaires are used for gathering information. The results show BI doesn't affect organizational performance.

The results of Faridi et al. (2015) show the effect of different variables on the organizational effectiveness of an insurance company include the establishment of a BI system gives a 92.7%, investment return rate, 72% sales volume, 69% investment management and 75% inventory turnover.

Kubinaa et al. (2015) explain BI systems are designed to support the decisions of the main workers of the company. According to them, the information infrastructures, technical equipment, and the personnel of the company are expensive. To ensure optimal use of these systems, presenting a fixed program and plan, and performing new orientations in the development and use of the systems is essential. In this paper, the possibility of improving the efficiency of the business systems in the company is explained.

Ghazanfari, Jafari, & Rouhani, (2011) presented an expert tool to judge BI competencies of Iranian enterprises and identified six factors for their evaluation model: analytical and intelligent decision-support, access to related experimentation and integration with environmental information, optimization and recommended model, reasoning, enhanced decision-making tools, and finally, stakeholder satisfaction. Their view of BI competencies is proscribed to BI specification. Their study isn't about organizational level competencies, but they mention some competencies like stockholders' satisfaction that in this research is recognized as an organizational dimension.

3. METHODOLOGY

This research is descriptive, using a survey, and exploratory research, according to its goals of using applied research in terms of the process. The study population of the qualitative part is the experts familiar with the subject of research (information technology and communication managers of Tehran Stock Exchange companies and professors). The 25 interviews were performed by a non-random and targeted method until the theoretical saturation of the questionnaire was reached. Its purpose was to extract and collect qualitative data (variables) that formed the basis for the design of the research questionnaire. Two questionnaires are used, first for evaluating and measuring the data and then for gathering the studied variables. The first questionnaire includes open questions, and the second one includes closed questions using the Likert five-point range. Its validity is confirmed by expert opinions, and its reliability is gained and confirmed by a 0.82 Cronbach's alpha. The analytical approach of qualitative content and structural equations are used for data analysis, applied in the software Amos.

Tehran Bourse or The Tehran Stock Exchange (TSE) is Iran's largest stock exchange, which first opened in 1967. The TSE is based in Tehran. TSE, which is a founding member of the Federation of Euro-Asian Stock Exchanges, has been one of the world's best performing stock exchanges in the years 2002 through 2013. TSE has over 325 listed companies, of which 167 companies utilize BI. The study population of the quantitative part consists of all IT managers of the 167 companies utilizing BI. Considering the limited study population, all the 167 IT managers by the census method are selected as the statistical sample.

4. RESULTS

The content analysis approach is used to implement a BI model considering the role of integration of information systems and enterprise resource planning in TSE companies. According to previous research and experts' opinions, seven issues are identified in the structural factors, the behavioral factors, the environmental factors, the processes, the output, and the effect of the subcomponents of them. According to Table 1, each of the open issues according to the concept of the expression is identified by the pivotal code that is the subcategory of each of the determined categories. They can affect implementation of BI that investigates the experts' opinions consensus by the Delphi approach. The third round of Delphi determines that the consensus between experts' opinion about the components and the indicators is more than 94%.

Table 2 shows the highest average of the dimension is for the output variable (4.9854) with a standard deviation of 0.3983. Moreover, the lowest average is related to structural factors (2.8764) with a standard deviation of 0.5674.

Table1 The results of the third round of Delphi.

The Factors	Sub-factors	Response Avg	Response SD
Structural factors	Organizational structure	3.56	0.45
	Delegation of authority	3.43	0.34
	Optimal division of tasks	3.55	0.65
	Monitoring and control	3.65	0.67
	Multiplicity of working components	4.23	0.71
	Management style	4.11	0.65
	Organizational communications	4.32	0.40
	Democratic structure	3.98	0.74
	Informal organization	3.45	0.47
	Appropriate career path	3.65	0.54
Behavioral factors	Experience	3.46	0.61
	Training	3.21	0.48
	Learning	3.78	0.46
	Individual talent	3.23	0.43
	Work ethics	3.55	0.67
	Individual proposals and critics	3.24	0.43
	Human relationships	3.56	0.46
Environmental factors	Common view	3.44	0.45
	Accepting customer governance	4.21	0.65
	Rules and regulations	4.34	0.74
	Beneficiaries demand	3.54	0.89
	Economic management	3.56	0.58
	Government policies	3.21	0.73
	Competitiveness	3.67	0.83
	Management of environmental changes	4.32	0.74
	Along with globalization	4.34	0.93
	Social responsibility	3.54	0.64
	Customer care	3.23	0.71
Processes	Modifying business processes and workflow	3.54	0.65
	Systematic thinking	3.78	0.45
	Team creation	3.23	0.38
	Empowerment	3.56	0.36
	Technology establishment	3.44	0.65
	Performance evaluation	3.67	0.39
	Access to information	3.24	0.88
	Providing the resources appropriately	3.65	0.74
	Research and development	3.54	0.45
	Process orientation	3.23	0.46
	Attention to motivation	3.65	0.54
	Organizational knowledge	3.78	0.76
	Creativity	3.54	0.67
	Customer appreciation	3.21	0.45
	Change readiness	3.67	0.34
	Clarification	3.24	0.56
	Training needs assessment	3.54	0.67
	Focus on operations	3.23	0.63
Output	Structural cohesion and flexibility	3,56	0.72
	Quick replication	3.34	0.45
	Comprehensive communications	3.65	0.42
	Self-evaluation	4.12	0.56
	Teams with performance	3.43	0.71
	Customer orientation	3.42	0.33
	Evolutionism spirit	3.54	0.71
	Worth oriented organization	3.25	0.43
	Management information systems	3.11	0.78
	Individual responsibility	4.23	0.37
Consequence	Value creation for the customers	4.54	0.45
	Innovation	4.33	0.65
	Self-controlling	3.21	0.34
	Behavioral and ethical character	3.45	0.61
	Pyramid structure reduction	3.65	0.45
	The proportion of responsibility and authority	3.21	0.78
	Informal communications	3.76	0.43
	Motivating	2.45	0.23
	Efficient management		0.81
	Existence of official health	3.24	0.43
Effect	Increase shareholders benefit	3.67	0.54
	Structural resilience	3.89	0.32
	Increase action freedom	3.42	0.72
	Command unity	3.62	0.34
	Low horizontal level	3.54	0.32
	Competent members and synergistic	3.67	0.66
	Talent finding	3.24	0.81
	Existence of customer management system	4.11	0.77
	Collaborative leadership	2.81	0.34

Table 2 Study of the average and standard deviation of the model dimensions.

The model dimensions	Average	Standard deviation
Structural factors	2.876	0.5674
Behavioral factors	3.543	0.6543
Environmental factors	3.2875	0.7222
Processes	3.662	06722
Output	4.9854	0.3983
Consequence	3.9855	0.3655
Effect	3.8272	0.4993

The main components analysis method with orientation and Erimax for analysis of the exploratory factor is used for exploratory factor analysis. Seven dimensions for the model that were extracted along with their subcomponents are studied in this section. Generally, these seven dimensions explain 89.07% of the total variance. The measure of indicator selection for the factors has a special value of more than 1 and the factorial load of 0.7 shows that the final selected indicator is 75. Each of these indicators, the related factors, and the amount of their factorial load are presented in Table 3.

One of the evaluation methods of this validity is the Fornell-Larcker Test. Table 4 shows the results for the research model dimensions. It shows that the structures are completely separated. That is, the main diameter values for each hidden variable are more than the correlation of that dimension with other reflective hidden dimensions.

The redundancy investigation indicator and determination coefficient are used to study the quality of the model. The positive values show the appropriate quality of the model. The main measure for evaluation of the structural model is the determination coefficient. This indicator shows the percentage of the changes in the dependent variable is performed by independent variables. Table 5 shows 77.6% of the model changes are predicted by independent variables (the model dimensions). If the redundancy indicator is more than 0, good observed values are reconstructed, and the model has the ability of prediction. In this research, this indicator value for the considered model is higher than 0.

After determining the conceptual model, suitability of the sample volume, and the effectiveness of all the recognized dimensions in the model, the model is quantified by partial square technique and bootstrapping t test. Figures 1 and 2 show that all the coefficients for the dimensions of the model are positive and all the values of t are more than 1.96 in the Z table. Based on the results, the model is meaningful, and the results are can be cited.

According to Table 6, the amount of the effects of all the structural, behavioral, and environmental factors on the processes is 0.83, with the t value of 12.45. The effects of all the structural, behavioral, and environmental factors on the obtained results is 0.75, with the t value of 10.34. Moreover, the effects of all process dimensions (management of the processes, information technology, and manpower improvement) on the results is 0.87 with the t value of 12.67. So, it can be said that the accuracy of the causal relationships of the model is verified, and it is an appropriate model.

Table 3 The results of the exploratory factor analysis. Struct. = Structural. Behav = Behavioral. Environ. = Environmental. Cons. = Consequence

Subcomponents Factors	Struct.	Behav.	Environ.	Process	Output	Cons.	Effect
Organizational structure	0.741						
Delegation of authority	0.798						
Optimal division of tasks	0.893						
Monitoring and control	0.704						
Multiplicity of working components	0.799						
Management style	0.733						
Organizational communications	0.801						
Democratic structure	0.755						
Informal organization	0.706						
Appropriate career path	0.731						
Experience		0.755					
Training		0.789					
Learning		0.744					
Individual talent		0.765					
Work ethics		0.733					
Individual proposals and critics		0.799					
Human relationships		0.751					
Common view			0.790				

Subcomponents Factors	Struct.	Behav.	Environ.	Process	Output	Cons.	Effect
Accepting customer governance			0.766				
Rules and regulations			0.833				
Beneficiaries demand			0.705				
Economic management			0.762				
Government policies			0.833				
Competitiveness			0.850				
Management of environmental changes			0.765				
Along with globalization			0.865				
Social responsibility			0.888				
Customer care			0.823				
Modifying business processes and Workflow				0.877			
Systematic thinking				0.898			
Team creation				0.744			
Empowerment				0.987			
Technology establishment				0.766			
Performance evaluation				0.844			
Access to information				0.846			
Providing the resources appropriately				0.836			
Research and development				0.866			
Process orientation				0.847			
Motivating				0.832			
Organizational knowledge				0.785			
Creativity				0.766			
Customer appreciation				0.790			
Change readiness				0.754			
Clarification				0.794			
Training needs assessment				0.766			
Focus on operations				0.733			
Structural cohesion and flexibility					0.854		
Quick replication					0.866		
Comprehensive communications					0.845		
Self-evaluation					0.791		
Teams with performance					0.754		
Customer orientation					0.768		
Evolutionism spirit					0.833		
Worth oriented organization					0.765		
Management information systems					0.784		
Individual responsibility					0.743		
Value creation for the customers						0.854	
Innovation						0.867	
Self-controlling						0.783	
Behavioral and ethical character						0.833	
Pyramid structure reduction						0.875	
The proportion of responsibility and authority						0.733	
informal communications						0.856	
Motivating						0.865	
Efficient management						0.834	
Existence of official health						0.754	
Increase shareholders benefit							0.786
Structural resilience							0.744
Increase action freedom							0.743
Command unity							0.856
Low horizontal level							0.867
Competent members and synergistic							0.811
Talent finding							0.755
Existence of customer management system							0.956
Collaborative leadership							0.866
The total primary special values	4.76	5.11	3.76	4.55	4.93	4.83	4.32
Variance percentage	21.77	16.76	28.36	11.54	6.39	2.34	1.91
Variance cumulative percentage	21.77	38.53	66.89	78.43	84.82	87.16	89.07

In the structural equations for the evaluation of the designed model, Amos software is used with the indexes of Chi-2 to the degrees of freedom, fitting index, fitting adjustment index, mean of the squared residuals, smoothed fitting index, non-smoothed fitting index, increasing fitting index, adaptive fitting index, and the second root of estimation of the approximation error variance. Table 7 shows the range of the fitting indexes. The resulting values are more than the desired value.

It is determined that with a reliability level of 95%, all the values are significant. Thus, the main triple dimensions and the related components are verified by the proposed model

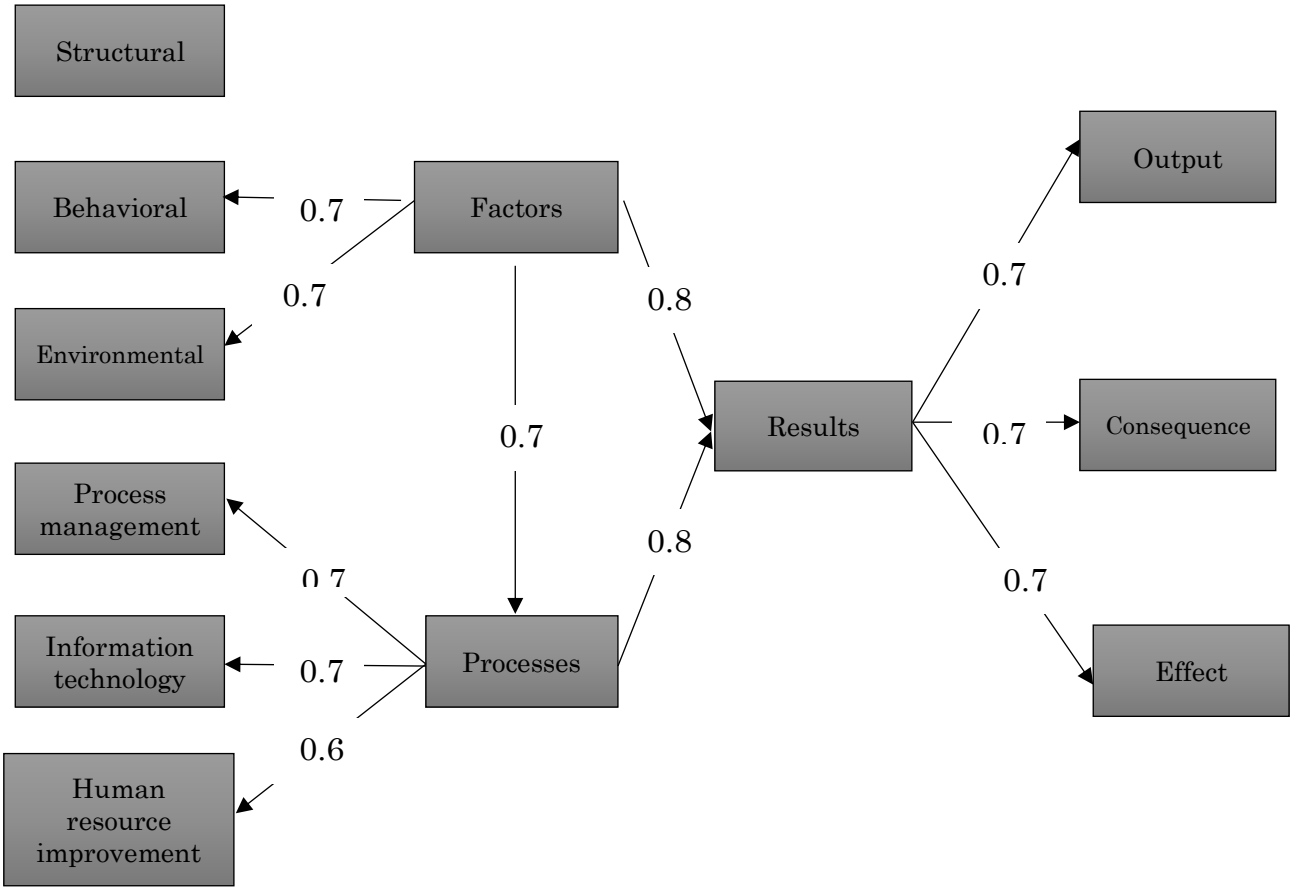

Figure 1 Causal relationships among the model variables in the state of standard estimation.

and are presented in the final and operational model, Figure 3.

Overall, the results regarding the effective factors on successful implementation of BI reflect the best practices of firms that have successfully implemented BI systems and provide insights for BI stakeholders that may increase the chances of successful implementation. In addition, the case studies' qualitative results serve as a framework for deriving information from real-world, BI-based organizations.

Table 4 Fornell-Larcker indicator to study the diagnostic or divergent validity indicator. Struct. = Structural factors. Behav = Behavioral factors. Environmental factors. = Environmental. Cons. = Consequence.

Dimension	1	2	3	4	5	6	7
Structur.	1						
Behavior.	0.655	1					
Environ.	0.764	0.755	1				
Processes	0.894	0.654	0.433	1			
Output	0.677	0.465	0.344	0.355	1		
Cons.	0.322	0.655	0.654	0.766	0.765	1	
Effect	0.544	0.590	0.544	0.465	0.455	0.366	1

Table5 Indicators of the model quality investigation. Det. Co. = Determination coefficient. Red. = Redundancy.

Model	Det. Co.	Red.
Business intelligence implementation considering the role of information systems integrity and its enterprise resource planning	0.766	0.632

5. DISCUSSION AND CONCLUSION

The aim of this research is the implementation of BI, considering the role of the information systems integration and ERP on TSE companies. The research literature was surveyed, and the questions for interviews were designed. Then, seven issues of structural factors, behavioral factors, environmental factors, processes, output, consequence, and the effect and their subcomponents were identified. According to the Delphi Technique, all the factors were effective in BI. Then using the Structural Equations' Technique, the model was quantified, and it was determined that the model fitting was appropriate.

The literature review provided a number of research studies that proved theories for understanding success factors in BI that are

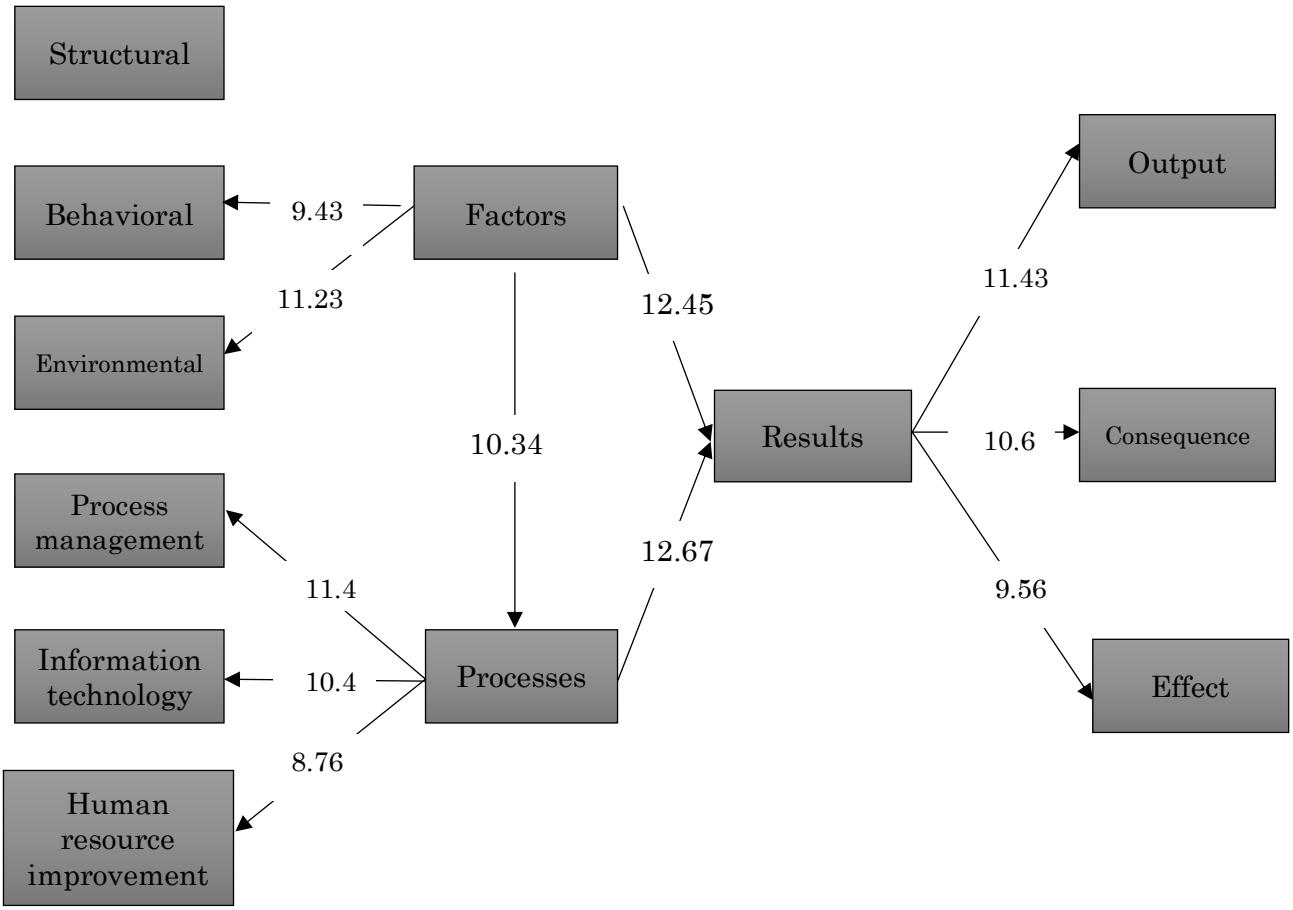

Figure 2 Causal relationships among the model variables in the state meaningful estimation.

still underdeveloped. There is plenty of space for research in this field, which was not considered before. Some of the studies investigated these questions. Most recent researches didn't mention to integration of information systems and ERP on implementing BI. The approach is unique in demonstrating the dynamic relationships between the identified dimensions. This is the first study that discussed BI implementation issues in the context of TSE companies in Iran.

In the structural factors dimension, experts try to direct organizational structure to become organic, and to reduce the pyramid structure by considering subcomponents such as non-pyramid structures, appropriate communications, and management style. It results in the increased use of BI in the organization. Brijs (2013) concluded that established bureaucratic structure is incompatible with advanced BI and strategic knowledge exchange. In the behavioral dimension, paying attention to training, learning, nurturing talents, and ethics results in the improvement of the working and non-working behavior of personnel and helps the organization to meet its requirements. An innovative organizational culture which treats knowledge sharing as a problem-solving strategy is considered to promote employee engagement (Hoegl, et al., 2004).

In the environmental dimension, beneficiaries including customers, governments, and personnel try to achieve better BI utilization by considering environmental subfactors such as rules and

Table 6 Path test results. CSP = Coefficients of standard path. T. = T Statistic. Results include output, consequence, effect. Processes include management of the processes, information technology, and manpower improvement Var. = Verified.

From	To	CSP	T	Result
Structural, behavioral, and environmental factors	Results	0.83	12.45	Var.
Structural, behavioral, and environmental factors	Processes	0.75	10.34	Var
Management of the processes, information technology, and manpower improvement processes	Results	0.87	12.67	Var

regulations, and management of environmental changes along with global developments (Ramakrishnan et al., 2012). It is recommended that companies facing competitive challenges and environmental uncertainty "commit themselves to more awareness and quest" practices in order to better understand their internal and external components. Business environments are constantly evolving (Hoppe, 2013), highly competitive, and increasingly unpredictable (Banerjee & Mishra, 2015) such that the strategies for organizations to escape bankruptcy rely on good BI (Ranjan, 2008). In the processes dimension, paying attention to the management process, technology utilization, and human resources improvement to perform activities has a significant role in the organization's processes improvement to implement BI. The key advice for organizations implementing BI is to consider BI not only as a technology but, in particular, as the overall management of information, the application and use of which involves clearly specified processes as well as skilled personnel and includes formal and informal section for promotion. In addition, it is a highly sophisticated technology on its own (Nemitko, 2019). All the factors provide a situation with the output, consequences, and effects that are effective on organizational coherence, quick response, creativity and innovation enhancement, customer orientation, and making the beneficiaries satisfied. Hence, all results make BI implementation interesting in the organization.

Table7 Fitting values of the proposed model and desired values. Des. = Desired value. Res. = Resulting value.

Fitting index	Des.	Res.
$\chi^{۲}$df	<3.00	1.22
Goodness of Fit Index (GFI)	>0.90	0.93
Adjusted Goodness of Fit Index (AGFI)	>0.90	0/94
Root Mean square Residual (RMR)	<0.05	0.03
Normed Fit Index (NFI)	>0.90	0.93
Non-Normed Fit Index (NNFI)	>0.90	0.91
Incremental Fit Index (IFI)	>0.90	0.93
Comparative Fit Index (CFI)	>0.90	0.91
Root Mean Square Error of Approximation (RMSEA)	<0.08	0.083

According to Figure 3, the effect of the structural, behavioral, and environmental factors on the processes and the results are 0.83, with a value of 12.45 t and 0.75 with a value of 10.34 t respectively. Moreover, the effect of all the process dimensions (management of the processes, information technology, and manpower improvement) on the results is 0.87, with a value of 12.67 t. It can be said that causal accuracy relations are verified in the research model, and it is an appropriate model.

Regarding the results, importance, and the model coefficient, we can say that from the main factors the processes have the most impact on the results. So, organizations should pay more attention to their working processes to improve BI success. These processes are summarized in three main categories: management of the processes, information technology, and manpower improvement to perform the activities related to the processes. The studied companies should identify all their organization's activities through the outline of the working processes. Then according to information technology approaches they should try to systemize all the processes using tools such as re-engineering, reverse engineering, and value chain to remove all inefficient, unnecessary, and excess activities, or merges them. This results in shortening the process flow and increasing the speed and precision of the work performance. Then according to new processes, they should train manpower, and evaluate the personnel operation, and through a training need assessment present periodic training and monitoring. Moreover, based on the changes in the processes, it is expected that the structural, behavioral, and environmental factors of the organization's effect on the processes should be matched with new processes. Also, the required changes in the design of the organizational structure should pay attention to the kind of management, how to empower the personnel, pay more attention to environmental changes for consistency, and the evolution is the result of replying to the beneficiaries including personnel, customers, and other dependental institutions. Finally, it can lead to results in the short, medium, and long-term that give organizational coherence, increased consistency with environmental changes, enhancement of personnel creativity, customer satisfaction increment, and institutionalization of BI in the organization.

The results of the final model and the results of different research are studied in

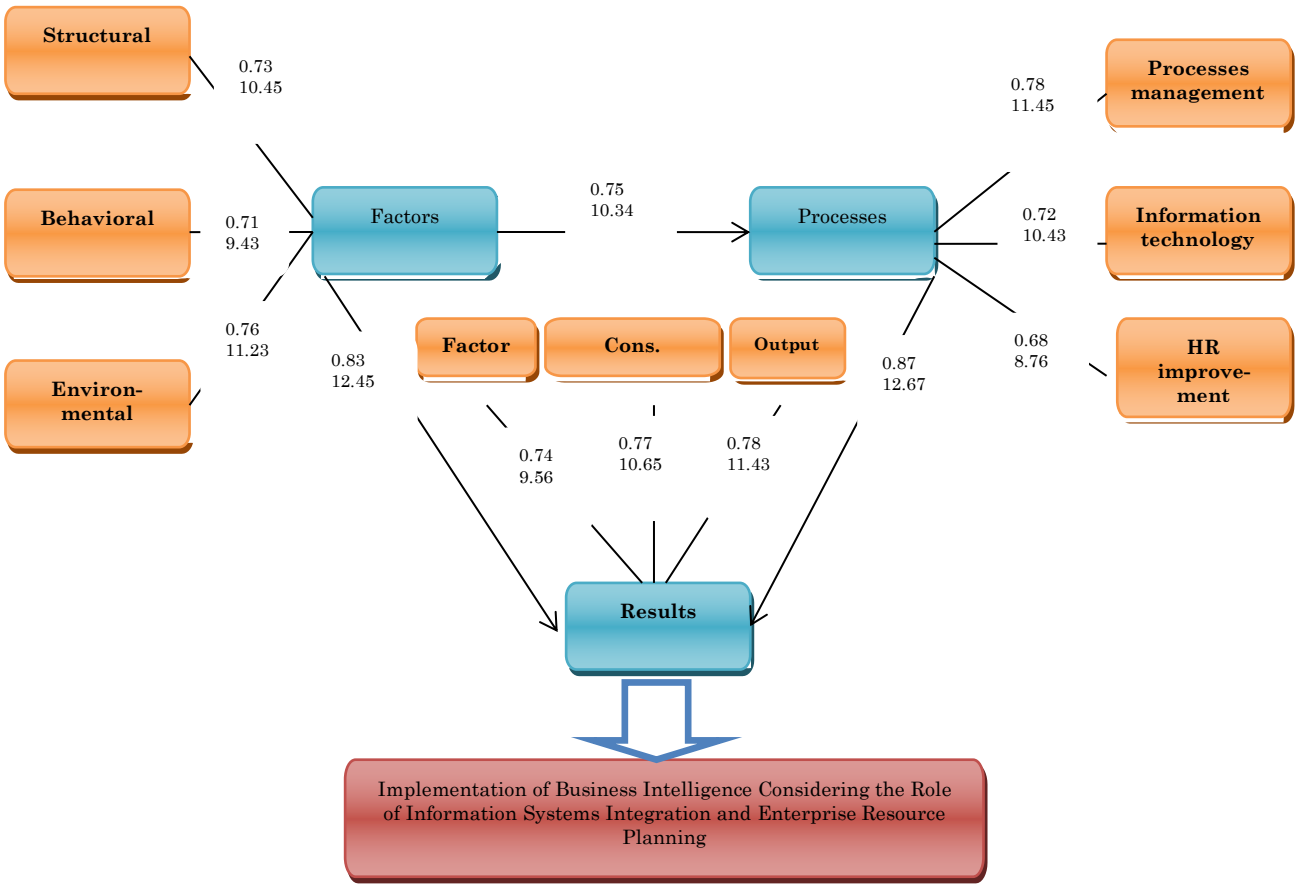

Figure 3 The operational model.

different dimensions (structural, behavioral, and environmental), processes, and results (output, consequence, and effect). The results are consistent with the previous research in different subcomponents. This includes organizational structure and authority delegation subcomponent as in Pall and Ogan)2018), optimal division of tasks and monitoring and control as in Torres et al. (2018), multiplicity of working components and management style as in Nespeca et al. (2018), organizational communications as in Fink et al. (2017), correction of working processes and workflow as in Nofal and Yusef (2013), systematic thinking and process functionality as in Rabbani and Khalesi (2018), and correction and repeat of design and organizational diagnose as in Avhadi and Khayyam 2018). As well as structural cohesion and flexibility and structural resilience as in Bagheri and Alikhani (2018), comprehensive communications, pyramid structure reduction, command unity, low horizontal level, experience, training, learning, beneficiaries demands, and government policies as in Jalali and Khademi (2018), action freedom increment and the proportion of responsibility and authority as in Hasani and Neshat (2016), unofficial communications, clarity of the roles and tasks, access to information, and research and development as in Faridi et al. (2015), and collaboration, team creation, the personnel empowerment, and educational content as in Popovič et al. (2019). All of these studies concluded that the considered subcomponents are effective in BI implementation, as is verified in our research. In addition, the analytical results in this research serve as a framework for helping BI practitioners to better understand and handle what usually is a complex implementation of BI regarding the role of the information management and ERP integration. Some of our suggestions include that:

- The companies, in addition to official communication, should pay more attention to the reinforcement of virtual communications in their organization. One of the current trends is using online social networks to share knowledge in the organization.
- The companies pay attention to the suggestions and critics of their personnel and customers as an information resource.

- The companies should develop rules and regulations such as: create clear career paths, future orientation and strategic goal to enhance the culture of technology use in the organization.
- The companies should utilize updated and localized technologies in the organization to increase the speed and precision of information exchange and working issues, and try to use the latest technologies and the best existing in the market.
- The companies, along with software and hardware infrastructures of BI implementation, should pay attention to their organizational culture.
- The companies should pay attention to the success increment of BI implementation by specialized training for the users. That means formulating and implementing truly knowledge-based strategies because intelligent business is leveraged by networks of people who work together.
- The companies should help with the improvement of the effectiveness of BI by monitoring the implementation process and utilization of BI in the organization and receiving feedback.

This paper shows the value of integrated information systems and ERP in the success of BI implementation. The findings of this study provide an opportunity for other researchers, through a cost optimization approach, to investigate suitable approaches by focusing on the appropriate factors for successful BI implementation.

There are limitations to the research activities that affect the research results and reduce its reliability and generalizability. The study population in this research is limited to the companies that are members of the TSE, and our information is gathered through the questionnaires in companies where the respondents may be affected by the environment. Moreover, according to the importance of the subject, we suggest that more dimensions are considered in addition to ERP and information systems integration to implement BI. Also, recognized factors can be ranked to determine their importance and priority. Furthermore, comparative studies of ways to develop the readiness of BI could enhance future research to show which approach is best. Also, providing a model that examines the integration between BI and other information systems in the company would be useful in future research.

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