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Evaluating business intelligence components in hospitality industry: a case study of Ferdowsi Hotel-Tehran

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Abstract

Today, most of organizations such as hotels and tourism agency s require setting up an intelligent and business intelligence-based system to use modern technologies in order to identify tourists and passengers' needs and demands as well as increasing business and profitability. Integrating organizational information, business intelligence allows controlling and detecting key processes of organizations. It is also regarded as a base to adopt effective decisions. Business intelligence refers to a set of concepts, methods and processes that not only improve business decisions but supports organizational strategies. The present paper tended to investigate the effect of business intelligence and evaluate its performance to improve tourist/passenger relation management with the aim of obtaining their satisfaction. In this applied and descriptive study, the population included tourists and passengers introduced by 41 tourism agencies to reside in Ferdowsi Hotel in Tehran-Iran (2500 people). Using Cochran formula, the sample size was calculated 333.To gather required data, a 42-item Likert Scale-based questionnaire (from very high to very low) was used. The employed questionnaire investigated the extent of tourism satisfaction from various viewpoints of hotel and travel agency. The respondents were provided with the Likert Scale questionnaire through an online opinion polling system. After identifying dimensions and components of business intelligence as well as collecting and classifying the questionnaires, the research hypotheses were tested using statistical statistics. Based on the collected data and the statistical analyses, a recommender system was created for the studied business intelligence through data mining technique and neural network algorithm.

Keywords: business intelligence, hospitality, tourist, tourism agency, neural network, data mining

Introduction:

As one of the biggest industries of the world, tourism entails about 11% of gross domestic production (GDP) in the world. In addition to creating 200 million occupational opportunities, it serves to 700 million tourists across the world and it is expected to grow up to 1400 million tourists by the 2020 (Ping,

2011). Possessing a unique advantage, tourism industry simultaneously provides several aims in national space of a country and its prosperity involves political, economic, social, security, cultural, and scientific stability of countries in the world (Kazemi et al., 2010) (Mafi et al., 2012).

Nowadays, tourism and hospitality industry is regarded as one of the most dynamic economic activities of the present age. It, in fact, plays an important role in local stable development. Tourism industry is followed by many social, economic, environmental, and cultural benefits by simultaneous use of domestic and external resources (Ebrahimzade et al., 2009). Due to mutual dependency of beneficiaries, scatter resources, lack of a hierarchical structure, control mechanisms, and complex regulations and rules, attracting tourist requires an intelligent system. Organizations need managerial information systems to be able to react to market changes in order to perform causality analyses through organization and its environment. Intelligent business systems, as the most complex component of information systems, provide a tool based on which information demands of organization is appropriately responded.

Business intelligence refers to a wide range of technologies to collect data to generate query in line with organizational performance management as well as adopting intelligent and precise business decisions. Business intelligence not only improves business but it causes supporting organizational strategies.

Statement of the problem

With respect to the aforementioned, this study tends to define and create a business intelligence system for Ferdowsi Hotel of Tehran to provide the best services to internal and foreign tourists based on their opinions, with the aim of satisfying tourists, attracting more tourists and increasing income. To create such an intelligent system, a data set including the opinions of all customers who are in relation with tourism agency and their hotel has been collected through an online questionnaire (the internet provided by WIFI). Then, the collected data has been analyzed using data mining techniques to obtain an intelligent business system.

Significant of the study

Business intelligence systems help users recognize and solve problems, discover risks and opportunities, predict market trends, estimate rivals' activities, obtain better understanding about business demands and better mange customers and suppliers' relation. Using such systems, mangers can faster react to problems and properly estimate situation against rivals; accordingly, organizations will be able to obtain competitive advantage. Therefore, employing business intelligence in tourism and hospitality industry can specify demands of tourists and hotel staffs. It can also satisfy tourists and achieve more profitability in this industry.

Research objectives

The main research objective is to evaluate the relation between using intelligent business systems and the satisfaction of tourists resided at hotel.

The secondary research objectives are as following:

1. Determining the relation between end user's satisfaction (EUCS) and using intelligent business systems
2. Determining the relation between using intelligent business systems and individual performance
3. Determining the relation between end user's satisfaction and individual performance

In this regard, the following research questions are formulated:

1. Whether higher levels of EUCS lead to higher levels of using BI system?
2. Whether higher levels of using IB systems lead to higher levels of individual performance?
3. Whether higher levels of satisfaction lead to higher levels of individual performance?

Research hypotheses

Parikh and Fazlallahi (2003) revealed that higher levels of users' satisfaction lead to positive attitude towards using systems and increasing actual use of system in voluntary situations. Delen and McLeen (2003) reported that increasing user satisfaction leads to higher willingness to use system. On the other hand, unsatisfied users may do not continue using the system and look for other alternatives (Azanja & Skemel, 1993). In the present paper, it is expected that EUCS has a significant effect on using BY systems. Additionally, some researchers have shown that using the system leads to higher levels of satisfaction (Baroudi et al., 1986; Lee & Kim, 1995; Torjzade & Dayer, 1994). In the following, the research conceptual model is presented.

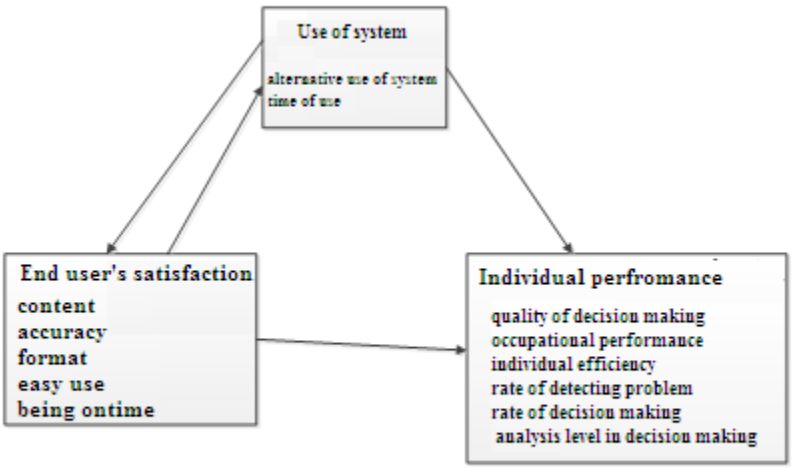


Figure 1. The research conceptual model (Chung Yung Ho, 2012)

Accordingly, the research hypotheses are as following:

H1a: higher levels of EUCS lead to higher levels of using BI system.

H2b: higher levels of using BI system leads to higher levels of EUCS.

H2: higher levels of using B system lead to higher levels of individual performance.

H3: higher levels of EUCS lead to higher levels of individual performance.

Research Background

Business intelligence (BI) refers to a set of ideas, methods, processes, and technologies that are used to change war data into useful and meaningful data. BI employs large amount of data to identify and develop new opportunities. Making use of new opportunities and applying an effective strategy can cause competitive advantage and long-term sustanability.BI means the process of increasing the profit of an organization using information existing in the market; therefore, BI associates data-related systems such as data storage, data mining, statistical analysis, predicting, and supporting decision to each other. A large volume of data in databases is stored and their increasing trend continues such that accessible data is doubled every 5 years. As previously conducted studies showed, today, organizations analyze only a small part of their data. During the last decade, almost all organizations have invested on IT such as software and hardware. Conceptually, BI systems cover various business processes management led to high levels of organizational performance. BI of a system is changing data into information and then knowledge and subsequently, adding considerable value to decision making processes of a company (Qiu, 2010). Operationally, BI systems are evaluated by some variables such as company size and duration of using BI system.

To implement a BI system, main components including data warehouse (an usual database but main core of BI systems), data marts (where a main volume of data are maintained), data mining (extracting data or certain models and relations hidden in big volume of data resided in one or more databases), reporting and control dashboard (including analyzing special results obtained by organizations in detailed or very brief form), online analytical processing (OLPA- enables users to consider unit data as various forms using multiple dimensions), and business performance management (including reporting, statistical analyses and other components used in BI employed along with planning, budgeting, and predicting situation) are required.

Barakat et al. (2013) studied the role of business intelligence in knowledge sharing. In this study, they revealed that there is a significant relation between online data analysis, data mining and data storage and knowledge sharing. Bernhard et al., (2015) investigated the effect of BI on the quality of managers' decision making in several active companies in Australia. As they concluded, Bi has a significant effect on the quality of IT senior mangers' decision making. Vegas et al., (2014) studied BI as a knowledge management tool to provide financial consultation services. They reported that using BI systems can lead to present financial consultation services. Rouhani et al. (2012) analyzed the model evaluating BI level for organizational systems. Analyzing the obtained data, they revealed that increasing trend of using BI systems in organizations has increased the need of BI evaluation in organizations. Richard et al. (2005) conducted a study on the relation between knowledge management and BI. In this study, they focused on the combinational role of knowledge management and BI and presented a qualitative model for the relation of these two variables. Coady et al. (2002) studied the relation between BI and knowledge management and their integration using a combinational model called OLAP. Ghafari Naraghi (2011) investigated BI evaluation models and presented a model based on the approach proposed by Williams and Williams to analyze an organization's readiness to establish BI system. Then, using this model, they measured the level of the organization's BI readiness, IT and Tehran municipality communications. As they concluded, the considered organization has not adequate readiness to

implement BI system. Mohaghar et al. (2008) studied BI employment as a strategic information technology in banking. They revealed that BI can present an effective technology in industries like banking for sensitive activities such as inspection and discovery. Sazrou et al. (2011) attempted to present a model to improve BI in electronic insurance marketing. Introducing a model for BI with 20 indices in electronic insurance industry, they concluded there is a serious gap between quo status and desirable status.

Research methodology

This study investigated the effect of business intelligence and evaluated its performance to improve tourist/passenger relation management with the aim of obtaining their satisfaction (Mafi et al., 2014). In this applied and descriptive study (2016-2017), the population included tourists and passengers introduced by 41 tourism agencies to reside in Ferdowsi Hotel in Tehran-Iran (2500 people). Using Cochran formula, the sample size was calculated 333. To gather required data, a 42-item Likert Scale-based questionnaire (from very high to very low) was used. The employed questionnaire investigated the extent of tourism satisfaction from various viewpoints of hotel and travel agency. Using Cronbach's alpha, the reliability of the questionnaire was evaluated (0.91).using the experts' opinions, the validity of the questionnaire was evaluated as well. The respondents were provided with the Likert Scale questionnaire through an online opinion polling system.

Research Findings

To analyze the data obtained from the questionnaire, descriptive and inferential statistics were used. To investigate the relation between BI systems and knowledge sharing, correlation tests were used. To investigate the role of BI system indices in knowledge sharing, linear regression was used. All the statistical analyses were run through SPSS version 19 and LISREL version 8.8.

Descriptive statistics

The analysis of the respondents' responses including gender, age, and education are presented in the following tables.

Table 1. Frequency distribution based on gender

Gender	Number	Percentage
Male	147	92%
Female	12	8%
Total	159	100%

According to Table 1, 92% of the sample (147 people) is male and 8% (8 people) were female. Also, Figure 1 shows frequency distribution of gender variable among the sample members.

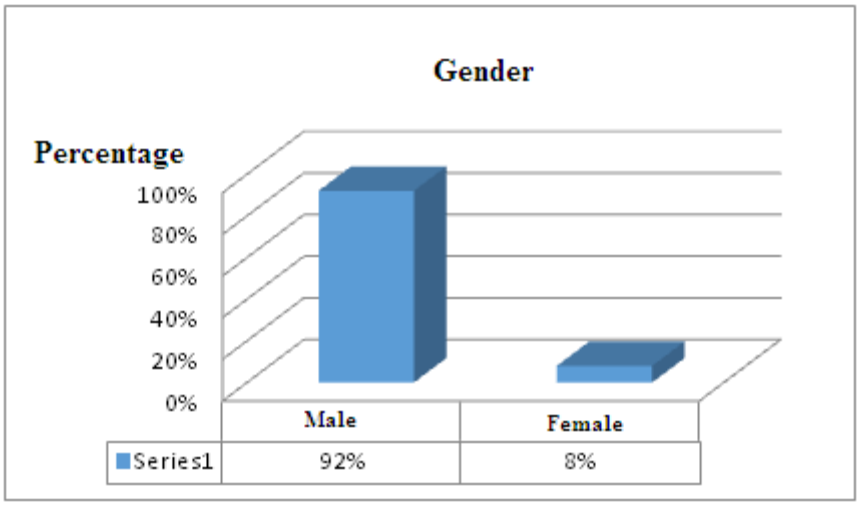


Figure 1. The diagram of frequency distribution based on gender

Table 2. Frequency distribution based on age

Age	Number	Percentage
20-35	96	61%
36-45	48	31%
46-60	15	8%
Total	159	100%

As shown in Table 2, 61% of the sample (96 people) was 20-35 years old; 31% (48 people) was 36-45 years old, and 8% (15 people) was 46-60 years old. Figure 2 shows the diagram of frequency distribution based on age of the respondents.

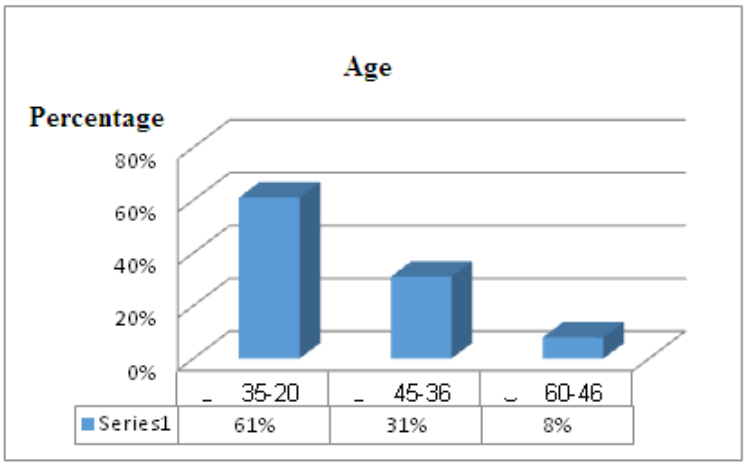


Figure 2. The diagram of frequency distribution based on age

Table 2. Frequency distribution based on education

Education	Number	Percentage
Associates of degree	34	21%
BA	113	71%
MA and above	12	8%
Total	159	100%

Shown in Table 3, 71% (113 people) of the respondents had BA degree; 8% (12 people) of them had MA degree and above and 21% (34 people) had associates of degree. Figure 3 shows the diagram of frequency distribution based on education of the respondents.

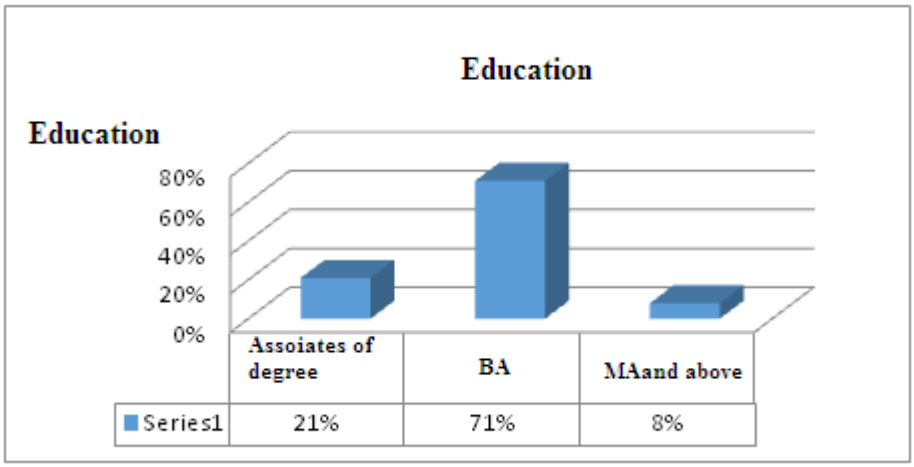


Figure 3. The diagram of frequency distribution based on education of the respondents.

Inferential statistics

To investigate normal distribution of the data, Kolmogorov-Smirnov (K-S) test was used. The statistical assumptions of normal distribution are as following:

H_0: data has normal distribution.

H_1: data has not normal distribution.

Table 4 shows the results obtained from K-S test. Since P-value (Sig.) was greater than 0.05 and K-S varies between +1.96 and -1.96, the null assumption was confirmed and the normality of data distribution was confirmed.

Table 4. K-S test results

Measured factor	Statistic	Sig.	Result
End user's satisfaction	1.041	0.299	Normal
Individual performance	1,408	0.088	Normal
Using BI system	1.422	0.075	Normal

The measuring model used in the study (questionnaire) has 42 components (content, accuracy, format, easy use, and being on time) based on Likert Scale. Table 5 shows fitness indices of the measuring model.

Table 5. Fitness indices of the measuring model

Index	Obtained value	Allowed value
$\chi 2/df$	2.61	Below 3
GFI	0.89	Above 0.9
RMSEA	0.101	Below 0.9
CFI	0.93	Above 0.9
IFI	0.93	Above 0.9
AGFI	0.81	Above 0.9
NFI	0.90	Above 0.9
NNFI	0.90	Above 0.9
RMR	0.07	Below 0.07

*Resource: The research findings

As shown in Table 5, RMSEA (should be below 0.1) and RMR (should be below 0.07) are the criteria of fitting the model. Further, AGFI, GFI, IFI, NFI, and NNFI are good criteria for model fitting and their best value is above 0.90. The obtained values shown in the table indicate that some models are at a good status but others are not. Since most of the indices show good fitness, it can be stated that the model has a good fitness.

Neural network results analysis

The most important problem to compute customer satisfaction is to understand the status quo of the institute, i.e. the current satisfaction level of customers. Given to the presented model, these levels were obtained and based on which, customers were classified, using the statistical factors, the most effective factors of satisfaction were identified and focused. After improving the activities, the number of unsatisfied customers was decreased to 47500 people (out of 141200 people). To validate the presented model, neural network was used. Out of the obtained statistical values, confidence interval, accuracy, RMS, and R are good indicators to show the model performance. For example, if R values in test and training sets are close to each other, the model will be well generalized and new information will present precise predictions. Moreover, correlation values near to 1 indicate a good level of model performance. In general it can be stated that the values obtained from neural network model confirm the accuracy of customer satisfaction level model.

Table 6. The results obtained from neural network

LNS	R	Net-R	Avg.Abs	Max.Abs	RMS	Accuracy (20%)	Conf.Interval(95%)	Records
ALL	0/98525	0/98525	/007966	0/07355672	0/011583	0/9933333	0/02273701	150
Train	/984588	/984588	/008007	0/07355672	0/011917	0/9903846	0/02349356	104
Test	/987328	/987328	/007875	/03088802	/010791	1	/02165984	46

Conclusion

Based on the research findings, it was revealed that BI system has a significant effect on EUCS at the confidence level of 99%. This finding is consistent with the result reported by Cohen and Bimach (2013). Testing the second research hypothesis, it was found that using BI system has a significant effect on individual performance at the confidence level of 99%. It is in line with the finding reported by Jafari and Jafari (2011). Regarding the last research hypothesis, it was found that EUSC has a significant effect on individual performance at the confidence level of 99%. Sub and Bimayer (2013) obtained the same results as well.

Considering the research findings, the following recommendations can be provided:

- Creating a unit for BI to improve business activities of the company
- Integrating information system to obtain competitive advantage relative to other companies
- Holding competitive intelligence courses for personnel to know about competitive intelligence indices and practicing them
- Obtaining credit through participating in famous global companies
- Paying attention to managers to create competitive and motivating atmosphere in working environment
- Enabling information infrastructures of the company for producing, processing and transferring competitive information

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Appendix

Business Intelligence Questionnaire

The present questionnaire is aimed to gather data about the level of tourists' satisfaction about business intelligence system and available information range, their satisfaction about the hotel's service providing and other aspects of resident and their satisfaction about tourism agencies' service providing quality. You are kindly asked to complete the questionnaire to contribute the research objective.

Country: ……. City ……. Gender: male/female

Age: 20-35, 36-45, 46-60 occupational status: temporary/contract/official

Education: below associated of degree/associates of degree/BA/MA and above

The questionnaire of information range in available BI systems

Component	Item	Do agree	Agree	Undecided	Disagree	Do disagree
Informational content quality	In this organization, there is adequate information range (not very high and not very low).					
	In this organization, there is adequately precise and real information.					
	In this organization, information can be easily perceived by					

	target group.					
	In this organization, information refers to the target without additional elements.					
	In this organization, information is contradictory.					
	In this organization, there is no complex and vague information.					
	In this organization, there is updated information.					
Information access quality	In this organization, information is presented according to users' demands and habits.					
	In this organization, information is processed and submitted quickly.					
	In this organization, information background (e.g., author, data, etc.) cannot be observed.					
	In this organization, users cannot interactively access to information.					
Using	This					

information in business process	organization can appear problematic aspects of current business process and inform shareholders about them through information management.					
	This organization's available information is used to evaluate business processes which are in contrast with standards. This organization also provides valuable information for continuous improvement plans and business process change projects.					
	Our available business information causes creativity in internal business processes and presents external services.					
	Information enables this organization to more promptly react to business events					

	and dynamically plan business.					
	This organization uses presented information to change organizational strategies and plans, modify available key performance indices (KPI) and analyze more recent KPI.					
	Using information management, this organization adds values to services provided for customers.					
	Using information management, this organization reduces business processes and service providing costs.					
	Using information management, this organization reduces business risk.					
Analytical decision making culture	Using information management, this organization decision making process					

	has been well established and well introduced to shareholders.					
	The policy of this organization is to embed accessible information in every decision making process.					
	This organization makes presented information involved in decision making regardless of decision nature.					

The questionnaire of Satisfaction about Ferdowsi Hotel-Tehran

Row	Item	Do agree	Agree	Undecided	Disagree	Do disagree
1	Level of satisfaction about the hotel manger					
2	Level of satisfaction about the hotel staff					
3	Level of satisfaction about the hotel servants					
4	Level of satisfaction about the hotel green space					
5	Level of satisfaction about the hotel's recreational space					
6	Level of satisfaction about the hotel's breakfast quality					
7	Level of satisfaction about the hotel's lunch quality					
8	Level of satisfaction about the hotel's dinner quality					
9	Level of satisfaction					

	about the hotel's service providing					
10	Level of satisfaction about the hotel's health					
11	Level of satisfaction about the hotel's information system					
12	Level of satisfaction about the hotel's rooms					
13	Level of satisfaction about the hotel's WC					
14	Level of satisfaction about the hotel's entertainments					
15	Level of satisfaction about the hotel's cost					
16	Level of satisfaction about the hotel's transportation and tourism service					
17	The quality of the hotel's lighting					
18	The quality of the hotel's conditioning system					
19	The quality of the hotel's discipline					
20	The hotel's cleaning					
21	Level of satisfaction about the hotel's area cleaning					
22	Level of satisfaction about the hotel's restaurant services					
23	Observing codes of ethics in the hotel					
24	Level of the hotel's freedom and welfare					
25	Level of the hotel's security					
26	Level of satisfaction about the hotel's WIFI					
27	I am interested in reading					
28	Level of satisfaction about the hotel's					

	library					
29	I am interested in historical books					
30	I am interested in geographical books					
31	I am interested in psychological book					
32	I am interested in daily walking					
33	I am interested in nature					
34	I am interested in ancient museums					
35	The number of family members interested in tourism					
36	The number of freiends interested in tourism					
37	I am interested in computer games					
38	Level of satisfaction about tourism leader					
38	I am interested in football					
40	I am interested in swimming					
41	I am interested in morning exercise					
42	I am interested in music.					