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IMPLEMENTATION OF BUSINESS INTELLIGENCE TO INCREASE THE EFFECTIVENESS OF DECISION MAKING PROCESS OF MANAGERS IN COMPANIES PROVIDING PAYMENT SERVICES

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Abstract

The most important purpose of this research is implementation of business intelligence to increase the effectiveness of decision-making process of managers in service providing companies (Case Study: Saman Kish Electronic Payment Company). The

importance and necessity of such research becomes clear according to criteria such as Development of knowledge about techniques to facilitate decision-making in business intelligence, strategic level of business intelligence, tactical level of business intelligence, operational level of business intelligence and quality of business intelligence implementation and absence of a system to provide advice for manager to for decision-making on matters related to business intelligence implementation. In the end, the sample size for this research consists of 30 available experts willing to cooperate who were selected using a combination of Purposive non-probability (judgment) sampling and snowball sampling. Data were collected using first set of measuring tools (tools to measure the effect of variables in order to increase the effectiveness of decision-making process of managers) and the second set of measuring tools (tools to validate “support system for decision making based on the principle of business intelligence implementation in order to increase the effectiveness of decision-making process of managers”). This fact that analyzing "business intelligence techniques to facilitate decision making" can make decision-making process of managers in Saman Kish Electronic Payment Company comprehensively effective is among the most important results of this study. In the end, it was determined that the final difference between the outputs of support system for decision making in this research which are BI+FDSS and average expert opinions has not been significant and has been calculated to be 0.06475 which means there is no significant relation between expert opinions and outputs of " BI+FDSS System". ”Techniques to facilitate decision-making in business intelligence”, ”strategic level of business intelligence”, ”tactical level of business intelligence”, ”operational level of business intelligence” and quality of business intelligence implementation” and “Companies providing payment services”.

Keywords: **Chines To Facilitate Decision-Making In Business Intelligence; Strategic Level Of Business Intelligence; Tactical Level Of Business Intelligence; Operational Level Of Business Intelligence; Quality Of Business Intelligence Implementation; Companies Providing Payment Services**

INTRODUCTION

Development of decision making in an organization is usually in this way that the lowest level of business activity in an organization is the operational level which is repeatedly executed in high numbers in low ranks of the organization and deals with a small amount of data. Decisions at these levels are often in the field of structured issued and are made by low ranked managers. The results of these decisions have short-term and micro effect on the organization. Customers, competitors, business partners, economic environment and internal employees are among factors affecting organizational business intelligence [1]. Technical level in the organization is related to operation which is performed in in the area of middle managers. This operation can include operation at low level, how it is done, reporting and ultimately summarizing useful data for organization's medium-term decisions. Decisions made at this level are often semi-structured and made by middle managers and finally the highest strategic level is related to organization's macro decisions which are made by top managers. Such uses

are in low frequency and long periods but can be associated with high volume of data and process Decisions at these levels are often unstructured issues and are made by senior managers and the results have macro and long-term effect on organization's direction. The usage of Business Intelligence at strategic level can be considered as a way to help increase overall efficiency and optimize processes together. Such systems focus on some key financial features and other parameters important in increasing the efficiency of the organization. It is obvious that system must also consider external processes of organization in such levels [2]. Different properties of applications in different levels of organization lead to differences in tools, techniques and infrastructures needed for each one. Use of analytical and intelligent tools is done more at higher levels which require high computing with availability of a host of strategic and technical information more than operational information. Operational sector of business intelligence has the responsibility of collecting information and storing them in private data bases [3,4]. Business Intelligence has been raised in enterprise architecture as a new approach which helps managers for making accurate and intelligent decision for bossiness in the shortest possible based on speed in data analysis. Business Intelligence is a framework of processes, tools and technologies which required for transforming data into information and information into knowledge using which managers are able to make better decisions and thus, improve the performance of their organization. Business intelligence is the collection of capabilities, technologies, tools and strategies which helps managers to have a better understanding about business conditions. Business intelligence tools provide visions of past, present and future for individuals. The gap between middle managers and senior managers will vanish by implementation of business intelligence solutions and information required by managers at every level, will be provided at the moment with high quality. Also, the experts and analysts can use simple facilities to improve their activities and achieve better results in an era where time is key in business, companies have resorted to the use of information tools so that they can quickly extract the intended resources. Business intelligence provides great facilities in decision making at different organizational levels, particularly senior managers using analysis and methods of inquiry [5,6].

In fact, since a set of applications and data related to topics of business intelligence in organizations which are designed for helping in analysis and decision making and the fact that these systems have a database of existing knowledge on the subject and a language which is used to formulate the issues and questions and are a modeling program to test the possible decisions, the issues in this research are exhaustion of business intelligence decision makers in organizations due to combination of different methods of deploying business intelligence in organizations, business intelligence techniques to facilitate decision-making, strategic level of business intelligence, tactical level of business intelligence, operational level of business intelligence and implementing quality of business intelligence and also the need to use supporting system for business intelligence decision making in organizations using fuzzy logic to increase trust and confidence in decision-making as well as the need for multiple specialties by using several experts in different fields to solve the problem of business intelligence in organizations. In fact, the supporting system for decision making based on principle of business intelligence implementation will be provided in the present research for the first time in the research field related to the topic to increase the

effectiveness of the decision-making process in Saman Kish Electronic Payment Company using fuzzy logic entitled BI+FDSS.

THEORETICAL FOUNDATION

The term of "business intelligence" has been used for the first time in 1865 by Richard Millar Dunes in Encyclopedia of commercial terms. Organizational Intelligence helps all companies obtain effective and reliable performance without additional hassle and high operating costs and try and error using reporting and data analysis [7,8]. ERP and CRM and other systems and software are critical factors for managing organizations and companies. The mere existence of all these techniques across the organization regardless of organizational culture and systemic approach between employees cannot prove business intelligence in that organization. That is why the words deployment and implementation are used for business intelligence and not the installation because factors other than software packages affect creation of business intelligence, so it is defined as the modern architectural approach, because intelligence is a tangible behavior from the beginning of the process of data compilation until storage and retrieval processes and extraction of required knowledge [9]. Intelligent strategies of a business determine the future direction of organization to achieve long-term goals. Researches show that the main concern of business intelligence for an information technology based organization is solving them. A typical organization with the ability to make decisions quickly with high quality may fail but if the same organization uses business intelligence, not only it can speed up the decision-making process, it can also guarantee decision-making with high quality and fertility [10]. The necessity of deploying business intelligence in organizations in the age of knowledge and in information society can be studied from different aspects. From the perspective of senior management, use of business intelligence tools seems necessary for analyze the current state of organization, setting short-term long-term goals and controlling performance indicators. From the perspective of executive management, this seems necessary for making decision about areas of uncertainty and ambiguity and prediction and estimation of the results of decisions. From the perspective of supply chain management, this seems necessary for controlling and improving relations with suppliers and partners of organization. From the perspective of customer relationship management, this seems necessary for identification, categorization, policy-making and improving communication with customers of organization and so on [11]. Here, we will define the main concepts of research:

Business Intelligence

Business Intelligence includes a wide range of business processes, applications and technologies using which intelligence data are collected, stored and analyzed and the obtained results are provided for the user in proper way. These users are in fact the decision makers for organization who can make better decisions for organization using obtained results [2].

Managers Decision Making

Decision-making is an integral part of management process in each organization and at

all organizational levels. Weber has considered decision making as "determined task of managers". Since some managers enjoy success in decision-making more than others, many studies have been carried out for evaluation of roots, causes and elements which are effective in decision making process. Rove and Bolgharidz state that the best way to get to know the managers in studying their decision-making methods [12]. Based on concluded studies and theoretical literature review and research background, the following Table 1 shows the theoretical framework of research for evaluation of implementation of business intelligence in order to increase the effectiveness of the decision-making process of managers in service providing companies (CASE STUDY: Saman Kish Electronic Payment Company):

Table 1: The theoretical framework.

Levels of business intelligence	**Implementation of business intelligence**
Viviers et al. [13] and Ansari et al. [8] and Hosseini et al. [14]	Haghighat et al. [3] and Safarzadeh et al. [4] and Maté et al. [1] and Kao, et al. [2]
A) Strategic level • Increase organizational performance and optimize processes • Focus on financial characteristics, other important factors in the increased focus on businesses • Focusing on external processes	**A) Strategic planning** • Various types of modeling in the development of the organization, • Information about the realization of the strategy, Mission and objectives and tasks of the organization, • Identify problems and bottlenecks, • Provide information on the institutional environment and market trends.
B) Technical level • Follow-up activities • Medium-term decisions • Provide periodic reports of the process • Image provided an overview of the organization's activities for managers	**B) Improve relationships with customers:** • Providing sales representatives with appropriate knowledge and sufficient to meet the needs of customers • Providing a level of customer satisfaction each other with the productivity of business practices and identify market trends. • Analysis of productivity products and services apparent, among other things
C) The operational level • Monitoring of business activities • Preparing of business processes • Making short-term decisions in carrying out business activities • Focus on conducting internal business processes	**C) The analysis of the operational efficiency of the organization** • Provide analysis of deviations from the realization of projects Providing knowledge and experience to develop and launch new products on the market • The exchange of knowledge among research teams and sections of the

	company. • The operational efficiency of internal processes
	D) The control and management accounting • The analysis of the real costs • Analysis of financial flows • The organization is committed strategic level • Increase organizational performance and optimize processes Focus on financial characteristics, • Other important factors in the increased focus on businesses Focusing on external processes
Techniques to facilitate decision-making in business intelligence Muntean et al. [15], Wieder and Ossimitz [5], Kowalczyk and Buxmann [6]	**Decisions of manager** Ghazanfari et al. [16], Khodaee et al. [7], nd Williamse and Williamse [17]
On-Line Analytical Processing (OLAP) On-Line Transaction Processing (OLTP) Data Warehousing (DW) Data Mining (DM)	The use of information and analytical tools The organization's readiness to deploy business intelligence system
On-Line Analytical Processing (OLAP) On-Line Transaction Processing (OLTP) Data Warehousing (DW) Data Mining (DM) Intelligent Decision Support System (IDSS) Intelligent Agent (IA) Knowledge Management System (KMS) Supply Chain Management (SCM) Customer Relationship Management (CRM) Enterprise Resource Planning (ERP) Enterprise Information Management (EIM)	The use of information and analytical tools The organization's readiness to deploy business intelligence system Culture of continuous process improvement Culture methodical decision making and process engineering Organization and Information Technology Technical preparation systems, business intelligence and data warehousing Strategic alignment of business and IT Portfolio management
	Increasing the decision-making process knowledge Decision-making capacity to handle large or complex issues Ability to solve large and complicated problems Helping carry out exploratory analysis and historical trend analysis Create new options in the decision (an alternative) Increased funding decisions based on accurate and sufficient information Improve communication between interdependent individuals in decisions (decision chain)

	Improving inter-agency communications between people in decision making Improve coordination of the decision by manager Satisfaction the outcome of the decision Employee participation in decision-making decentralized system Reduce time in the organization's decision-making process Reduce the cost of decision-making in the organization

In this research, we will evaluate the existing literature and consider previous findings in order to evaluate the role of management information systems and business intelligence and also identify success factors for these systems. A new perspective can be obtained about the role of information systems in management and business intelligence and a new step can be taken in design of prospective strategies for creation of new competitive advantages by implementing the success factors of these systems using the results of this study. In fact, the most important purpose of this research can be considered as “designing support system of business intelligence decision making in order to increase the effectiveness in decision making process of managers in service providing companies”. The importance and necessity of such a research can be noted according to criteria such as development of knowledge about the issues of business intelligence in order to increase the effectiveness of decision-making process of managers as well as the absence of a system for providing recommendations for managers in making decision about business intelligence issues.

Research Method

Since design researches have their own unique methodology, a combination of critical theory and design science research approach have been used in this research by evaluation of the main paradigms of philosophical grounding for social and management science researches and research method for information systems. In fact from the perspective of ontology of critical research paradigm, facts and issues in this research which deal with implementation of business intelligence to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company based on scientific documentation of organizational IT industry which are surrounded by social, political, cultural, economic, moral and other factors which are affecting decisions relating to the implementation of business intelligence in order to increase the effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company based on scientific documentation of organizational IT industry become transparent over time and in interactions with members of organization. In fact, this is a practical Research because its results and findings are used to solve issues related to the implementation of business intelligence in order to increase the effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company based on scientific documentation of organizational IT industry which is one of the specific problems of the company. On the other hand, philosophical

assumptions use alternative situations with technological - social theme for science research approach from the perspective of ontology. From the perspective of epistemology, the researcher in this study comprehensively evaluates the studied issue by interaction with experts in this field and experts provide their opinion about correctness and relevance of the concepts and principles in tools for determination of decision-making components. Here, subjectivity and values of experts in the field of study will affect the issue. Epistemology in research approach of science in this research refers to two cases:

One is becoming aware by designing decision-making support system based on the principle for implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company using fuzzy logic and the other is limited objective structures within the context of implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company. In terms of value, this research is about creation of a new knowledge in the field of implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company, improvement in business intelligence deployment status in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company, understanding the business intelligence implementation issues in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company. Advantage of design research strategy and its creation in the field of information systems is its attention to technical aspects of IT products based on assumptions about the nature of the universe and method of understanding those. Here, models produced by the designer, are true representatives of the truth and the designer uses logical thinking and mathematical and logic-based tools and methods instead of politics and human intuition for this task. Outputs of research approach for designing science can be one of the following: structures (conceptual vocabulary of a scientific field), models (a set of proposals or statements expressing relations between structures), Methods (a set of steps used to perform a task), prototyping idea (making models, structures and methods real and operational) or a better theory (creating artifacts comparable to natural laboratorial science). In short, steps for a research based on research approach of designing science are as follows: awareness about the problem, guessing (designing prototype), development (creating artifact), and evaluation (system performance measures), and conclusion (final outputs and results). Since the interactive nature of this research requires discussion between researcher and experts in the studied field, Misunderstandings and omissions of researcher are solved. This is a descriptive – evaluation study in terms of method because it precisely describes concepts and rules related to the implementation business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company on one hand and the relation between these concepts and rules are evaluated and determined by expert on the other hand. The library studies have been carried out by referring to the Internet, studying researches, and books, articles in national and international journals and studying statistics and documents published by the University. Also, researcher made tool for gathering information, interviews with IT experts, staff and administrators of university

and IT companies and university professors have been intended for field studies. The need for observations and interviews are also among the necessities of evaluation in this research. Due to the use of articles and documents from different sources related to the implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company, the data collection method in this research is "case study of documents" and tools to determine components of decision-making and Interview model have been used to evaluate the principles of support system for decision making based on the principle to implement business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company which are extracted from the opinions of experts. The timeline of the present study is as follows: this research started in August 2016 and its duration was 6 months and it ended in January 2016. It is necessary to separately predict all activities and implementation phases of research (including the time of periodical reports) and time required for each and those listed in related tables and are observed as much as possible during the research. Since a research process requires at least several months of effort, maximum advantage must be taken from the spent time. The scope of this study is organizational IT industry.

The logical criteria to prepare and set the conceptual model of research is the principle of information richness which means that the researcher considerers considerations, facilities and research time continues to collect theoretical data in the field of components affecting the implementation of business intelligence in order to increase the effectiveness of the decision-making process of managers and continues to evaluate and study domestic or foreign resources until the collecting information are repeated and vicious cycle begins. After evaluations in the field of components affecting the implementation of business intelligence in order to increase the effectiveness of the decision-making process of managers, the most important components and indicators affecting implementation of business intelligence in order to increase the effectiveness of the decision-making process of managers have been presented in the Figure 1 below in form of the theoretical framework of research. It is obvious that these components and indicators derived from the theoretical principles are in form of an initial model which must be evaluated by experts in order to be able to achieve the final research model by further processing:

With respect to the application of fuzzy decision support system designed in this study, after reviewing the structure of research systems and at the end, five steps have been considered for designing support system for decision making based on principle in order to implement business intelligence based on fuzzy logic which are as follows (Figure 2) [18-20]:

1. Modeling the concepts in the field of business intelligence implementation in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company for identification of input and output components and drawing relations between them.
2. Defining qualitative components using linguistic constraints and allocation of numbers and fuzzy sets and membership functions to them.

3. Designing support system for Fuzzy decision making based on definitions and designs using MATLAB software: this step includes extracting the rules of practice and assessment by experts and creation of base for fuzzy rules as well as designing inference engine with access to fuzzy rules.
4. Designing user interface and method of display for options and method of using the designed support system for fuzzy decision making.
5. Selection of a method for defuzzification in order to convert numbers and fuzzy sets to definitive values to evaluate the actual performance of the system.

Figure 1: Conceptual Model.

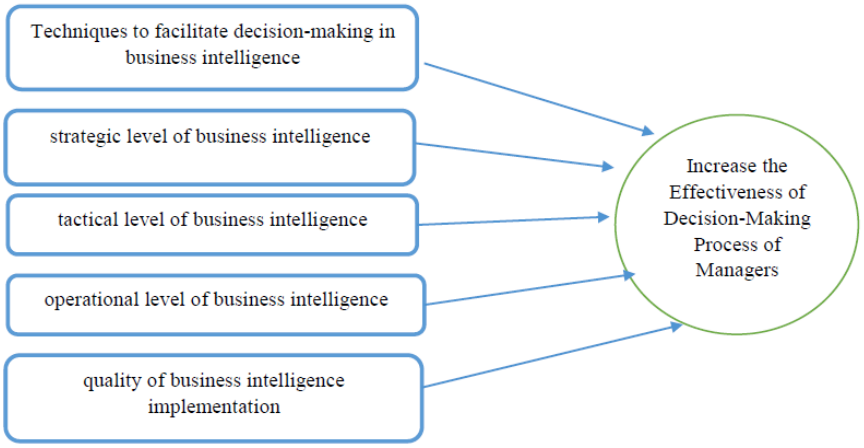
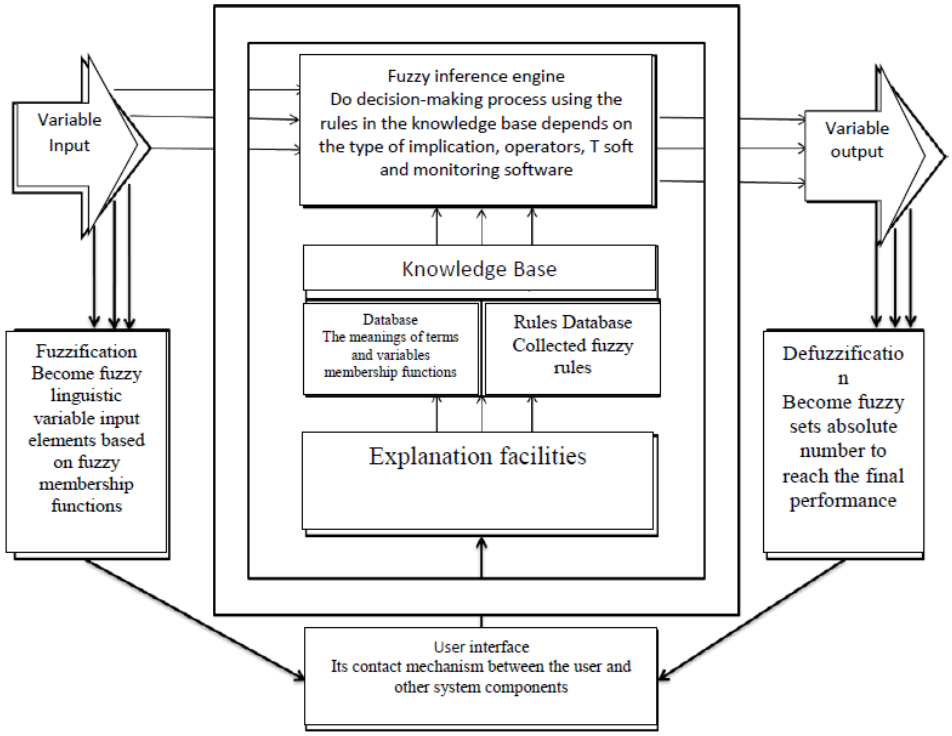


Figure 2: Structure of Fuzzy Decision Support System (BI+FDSS).



"Implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company" determines the relation between components and method of this relation in decision-making model of the research. A good theoretical framework should include all components and method of their relation with each other. The relation between dependent and independent variables are initially determined in form of proposal in the initial model of research: in the present study, component is a feature or factor which is common between people in society and can have different quantities and different values. Components are factors which are measured or assessed. In fact, the input variables of support system for fuzzy decision making in the present research are as follows: The first input component: "quality of business intelligence implementation", the second input component: "operational level of business intelligence", the third input component: "tactical level of business intelligence", the fourth input component: "business intelligence techniques to facilitate decision-making", the fifth input component: "strategic level of business intelligence" and output component of support system for fuzzy decision making is the status of "effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company".

We compared outputs and responses of "principle-based decision making support system to implement business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company" using the average of experts' opinions in the evaluated field using a separate tool in order to validate principle-based decision making support system to implement business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company. The following Table 2 shows validation tool for principle-based decision making support system to implement business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company (BI+FDSS) to evaluate the responses of research system:

Table 2: System Validation Tool BI+FDSS.

Rule	**Components of the system input BI+FDSS**					**The output component of BI+FDSS**	**Other Comments**
	Status of quality of business intelligence implementation	Status of operational level of business intelligence	Status of tactical level of business intelligence	Status of techniques to facilitate decision-making in business intelligence	Status of strategic level of business intelligence	Status of increase the effectiveness of decision-making process of managers	

DATA ANALYSIS AND SYSTEM DESIGN

The study population included in this study can be divided into two general groups: the first group consists of experts and the second group consists of those working in the field of business intelligence in Saman Kish Electronic Payment Company or similar positions in Saman Kish Electronic Payment Company. In the end, the sample size for this research consists of 30 available experts willing to cooperate who were selected using a combination of Purposive non-probability (judgment) sampling and snowball sampling. Data related to the first set of measuring tools (tools to measure the effect of variables in order to increase the effectiveness of decision-making process of managers) were collected in December 2016 and data related to the second set of measuring tools (tools to validate "support system for decision making based on the principle of business intelligence implementation in order to increase the effectiveness of decision-making process of managers") were collected in late December 2016 (Table 3). The Pearson correlation coefficient based on the criteria of variables used in the research has been used in the present research to evaluate the impact and effectiveness between dependent variable and independent variables.

Table 3: a) The correlation between variables. b) Correlations between variables.

The correlation between variables												
The correlation between the variables		**The correlation between " Techniques to facilitate decision-making in business intelligence"**										
		OLAP	OLTP	DW	DM	IDSS	IA	KMS	SCM	CRM	ERP	EIM
OLAP	correlation coefficient	1	0.476**	0.492**	0.562**	0.796**	0.417*	0.777**	0.479**	0.873**	0.447*	0.550**
	Sig.		0.008	0.006	0.001	0.000	0.022	0.000	0.007	0.000	0.013	0.002
OLTP	correlation coefficient	0.476**	1	.887**	0.927**	0.428*	0.845**	0.645**	0.782**	0.538**	0.333	0.641**
	Sig.	0.008		.000	0.000	0.018	0.000	0.000	0.000	0.002	0.072	0.000
DW	correlation coefficient	0.492**	0.887**	1	0.960**	0.426*	0.868**	0.678**	0.820**	0.555**	0.253	0.755**
	Sig.	0.006	0.000		0.000	0.019	0.000	0.000	0.000	0.001	0.178	0.000
DM	correlation coefficient	0.562**	0.927**	0.960**	1	0.505**	0.918**	0.738**	0.858**	0.622**	0.243	0.725**
	Sig.	0.001	0.000	0.000		0.004	0.000	0.000	0.000	0.000	0.197	0.000
IDSS	correlation coefficient	0.796**	0.428*	0.426*	0.505**	1	0.340	0.788**	0.453*	.875**	0.658**	0.523**
	Sig.	0.000	0.018	0.019	0.004		0.066	0.000	0.012	.000	0.000	0.003
IA	correlation coefficient	0.417*	0.845**	0.868**	0.918**	0.340	1	0.615**	0.779**	.484**	0.120	0.646**
	Sig.	0.022	0.000	0.000	0.000	0.066		0.000	0.000	0.007	0.527	0.000
KMS	correlation coefficient	0.777**	0.645**	0.678**	0.738**	0.788**	0.615**	1	0.634**	0.905**	0.439*	0.740**
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.015	0.000
SCM	correlation coefficient	0.479**	0.782**	0.820**	0.858**	0.453*	0.779**	0.634**	1	0.540**	0.174	0.561**
	Sig.	0.007	0.000	0.000	0.000	0.012	0.000	0.000		0.002	0.357	0.001
CRM	correlation coefficient	0.873**	0.538**	0.555**	0.622**	0.875**	0.484**	0.905**	0.540**	1	0.533**	0.627**
	Sig.	0.000	0.002	0.001	0.000	0.000	0.007	0.000	0.002		0.002	0.000
ERP	correlation coefficient	0.447*	0.333	0.253	0.243	0.658**	0.120	0.439*	0.174	0.533**	1	0.371*
	Sig.	0.013	0.072	0.178	0.197	0.000	0.527	0.015	0.357	0.002		0.044

EIM	correlation coefficient	0.550**	0.641**	0.755**	0.725**	0.523**	0.646**	0.740**	0.561**	0.627**	0.371*	1
	Sig.	0.002	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.000	0.044	

Correlations between variables

Strategic level of business intelligence		Strategic level of Business Intelligence	tactical level of business intelligence	operational level of business intelligence
strategic level of business intelligence	Pearson correlationcoefficient	1	.763**	.875**
	Sig		.000	.000
tactical level of business intelligence	Pearson correlation coefficient	.763**	1	.708**
	Sig.	.000		.000
operational level of business intelligence	Pearson correlation coefficient	.875**	.708**	1
	Sig.	.000	.000	

As it can be observed in Table 3 which is related to correlation between variables of research, since the sign of correlation coefficient is the slope of regression line, there is a positive and significant relation between "strategic level of business intelligence" and "technical level of business intelligence" because the Pearson correlation coefficient between them is equal to 0.763. On the other hand, there is a positive and significant relation between "strategic level of business intelligence" and" operational level of business intelligence" because the Pearson correlation coefficient between them is equal to 0.875. On the other hand, there is a positive and significant relation between " operational level of business intelligence" and" technical level of business intelligence" because the Pearson correlation coefficient between them is equal to 0.708. In fact, in can be concluded based on the high correlation between the levels of business intelligence which are A) strategic level of business intelligence (increasing organizational performance and optimizing processes, focusing on financial characteristics, focusing on other important factors in the increased business, focusing on external processes of organization) B) technical level of business intelligence (following activities up, making medium term decisions, providing periodic reports of the process, providing the overall picture of the organization's activities for managers) C) operational level of business intelligence (monitoring business activities, providing information of business processes, making short-term decisions in conducting business activities, the highest concentration in conducting internal business processes) that the decision-making process of managers can become comprehensively effective by analyzing the "business intelligence levels" because "strategic level of business intelligence", " tactical level of business intelligence" and "operational level of business intelligence" have a significant impact on increasing the effectiveness in decision-making process of managers in Saman Kish Electronic Payment Company. It can be observed in evaluation of the effect of "business intelligence techniques to facilitate decision making" on increasing the effectiveness in decision-making process of managers in Saman Kish Electronic Payment Company that there is a significant positive relation between "OLAP" and "IDSS" in increasing the effectiveness in decision-making process of managers because the Pearson correlation coefficient between them is equal to 0.796. On the other hand, there is a significant positive relation between "OLAP" and "KMS" in increasing the effectiveness in decision-making process of

managers because the Pearson correlation coefficient between them is equal to 0.777. On the other hand, there is a significant positive relation between "OLAP" and “CRM" in increasing the effectiveness in decision-making process of managers because the Pearson correlation coefficient between them is equal to 0.873. In fact, there is a positive and significant relation between "OLAP" and "DM" to increase the effectiveness of managers in the decision-making process because the Pearson correlation coefficient between them is equal to 0.562. Thus, it can be concluded that evaluation of the effect of “business intelligence techniques to facilitate decision making" can increase the effectiveness in decision-making process of managers in Saman Kish Electronic Payment Company. The supporting system for decision making based on principle of business intelligence implementation will be provided in the present research for the first time in the research field related to the topic to increase the effectiveness of the decision-making process in Saman Kish Electronic Payment Company using fuzzy logic entitled BI+FDSS. In fact, BI+FDSS system is a system which can have inaccurate input data which means the input data of a fuzzy system is in form of a fuzzy set or fuzzy numbers. On the other hand, processes of a fuzzy system can be done inaccurately. One of the most famous and useful inaccurate processes in fuzzy Systems is the use of fuzzy rule base. Each rule in fuzzy rule base is defined with "if - then" structure. With respect to the application of support system for fuzzy decision making designed in this study, five steps have been considered for design of support system for fuzzy decision making for implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company which are:

First Step

Identification of system input and output variables: we acted on defining input and output variables of support system after finalization of the conceptual model of support system for decision making. Input variables of support system for decision making based on the principle of business intelligence implementation in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company using fuzzy logic entitled BI+FDSS are: "quality of business intelligence implementation "; “operational level of business intelligence"; “tactical level of business intelligence"; “business intelligence techniques to facilitate decision-making" and “strategic level of business intelligence" and the output variable of the mentioned system is “implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company”. The input and output variables of support system for decision making can be shown as follows based on conceptual model and applying the opinions of experts.

Second step: defining qualitative variables using language constraints and allocation of fuzzy numbers and sets and membership functions: table and figure of linguistic variables show fuzzy values and triangular and trapezoidal numbers membership functions associated with the input and output variables of support system for decision making in triple and quintet spectra (Table 4, Figures 3 and 4).

Figure 3: Model of module input variables "to implement business intelligence in order to increase the effectiveness of decision-making process in managers".

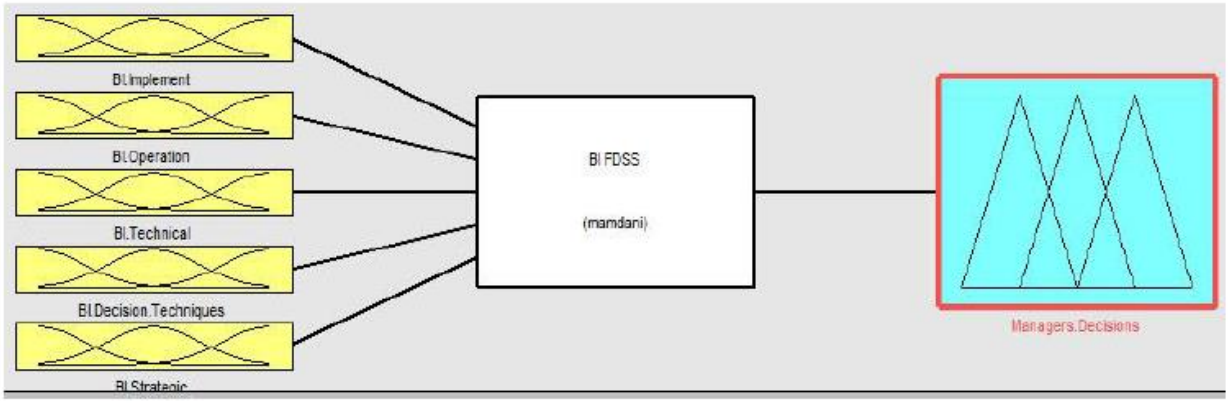
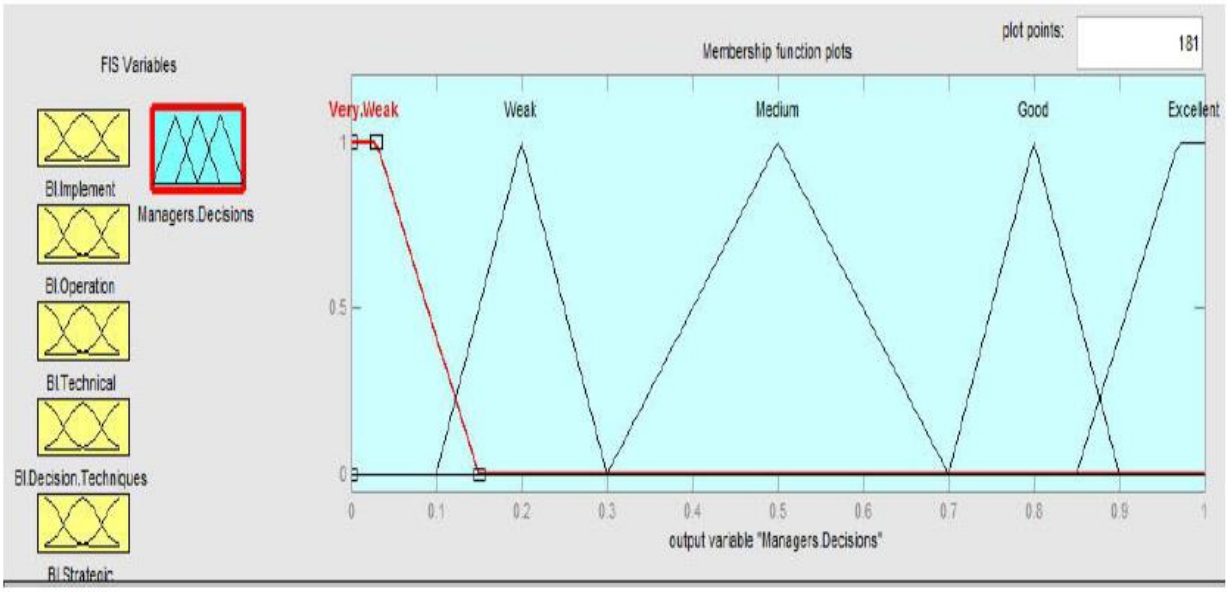


Table 4: linguistic variables associated with module output variable "implementation of business intelligence for effective the decisions made by managers".

linguistic variable	Equivalent to English	Triangular and trapezoidal membership functions
Very weak	Very Weak	(0 0 0.03 0.15)
Weak	Weak	(0.1 0.2 0.3)
Medium (normal)	Medium	(0.3 0.5 0.7)
Good	Good	(0.7 0.8 0.9)
Excellent	Excellent	(0.85 0.97 1 1)

Figure 4: Classification of decision support system research output variable (triangular and trapezoidal membership functions).



The Third Step

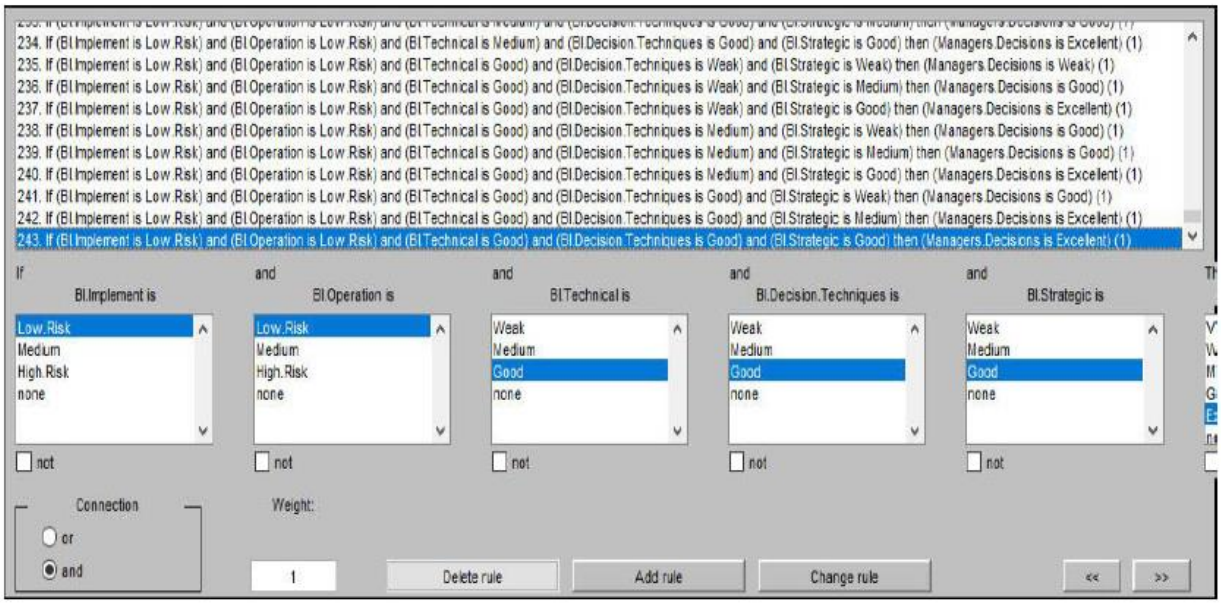
Designing knowledge base of support system for decision making: this step includes the rules of extracting expertise and assessment by experts and creation of fuzzy rules base. Fuzzy rules base is a set of "if-then" rules which is considered as the heart of BI+FDSS system because the rest of fuzzy system components are used effectively and efficiently for implementation of these rules. Here, we have considered similar probability for different states between the main variables of support system for decision making. The starting point to create a knowledge base based on rules in a fuzzy system is obtaining a set of "if-then" rules from experts or the knowledge in the evaluated field. The next step is combining these rules in a single system. The method to create rules for knowledge base of the main module in BI+FDSS system is as follows: “implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company” can be evaluated in different states based on weight of each of the input variables of support system for decision making. Here, we have considered similar probability for different states between the main variables of support system for decision making (Table 5). In fact, we can create fuzzy rules based on the following terms and conditions after interviews with experts in the evaluated field.

Table 5: How to calculate the weight of possible states rule in the knowledge base for decision support system.

The possibilities for the production of base	The weight of each variable × variable definitive amount Language	given weight
If Status "implement quality of business intelligence" is low (high risk)	0.15 × 0.202 (Has an inverse relationship (1 to 0.5)	0.0303
And "operational level of business intelligence" in normal condition	0.5 × 0.196 ((Has an inverse relationship (1-.5))	0.098
And 'tactical level of business intelligence "is good	0.85 × 0.198	0.1683
And " techniques to facilitate decision making of business intelligence " is good	0.85 × 0.205	0.17425
And " strategic level of business intelligence" is normal	0.5 × 0.199	0.0995
Then; The "effectiveness of the decision-making process I in managers of Kish payment electronic company" is at what level?	weighted average assumptions: 0.57035	

Based on the membership functions of linguistic variables by experts in Table 5, 0.570 are in range defined for linguistic variable of "average (normal)". Thus, the "effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company" in above conditions will be "Medium (normal)". Other rules of knowledge base of this support system for decision making have also been created in this way. In the end, the number of fuzzy rules modules of "implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company" in BI+FDSS system is equal to 243 due to existence of five main variables that each had 3 modes. The following Figure 5 is related to Fuzzy rule databases of BI+FDSS module system.

Figure 5: Method of creating fuzzy rules in the knowledge base for module of "implementation of business intelligence in order to increase the effectiveness of decision-making process of managers.



The Fourth Step

Designing the inference engine of BI+FDSS system: in this step, Centroid method has been used for defuzzification to transform fuzzy numbers and fuzzy sets to definitive numbers to evaluate the actual performance of the system.

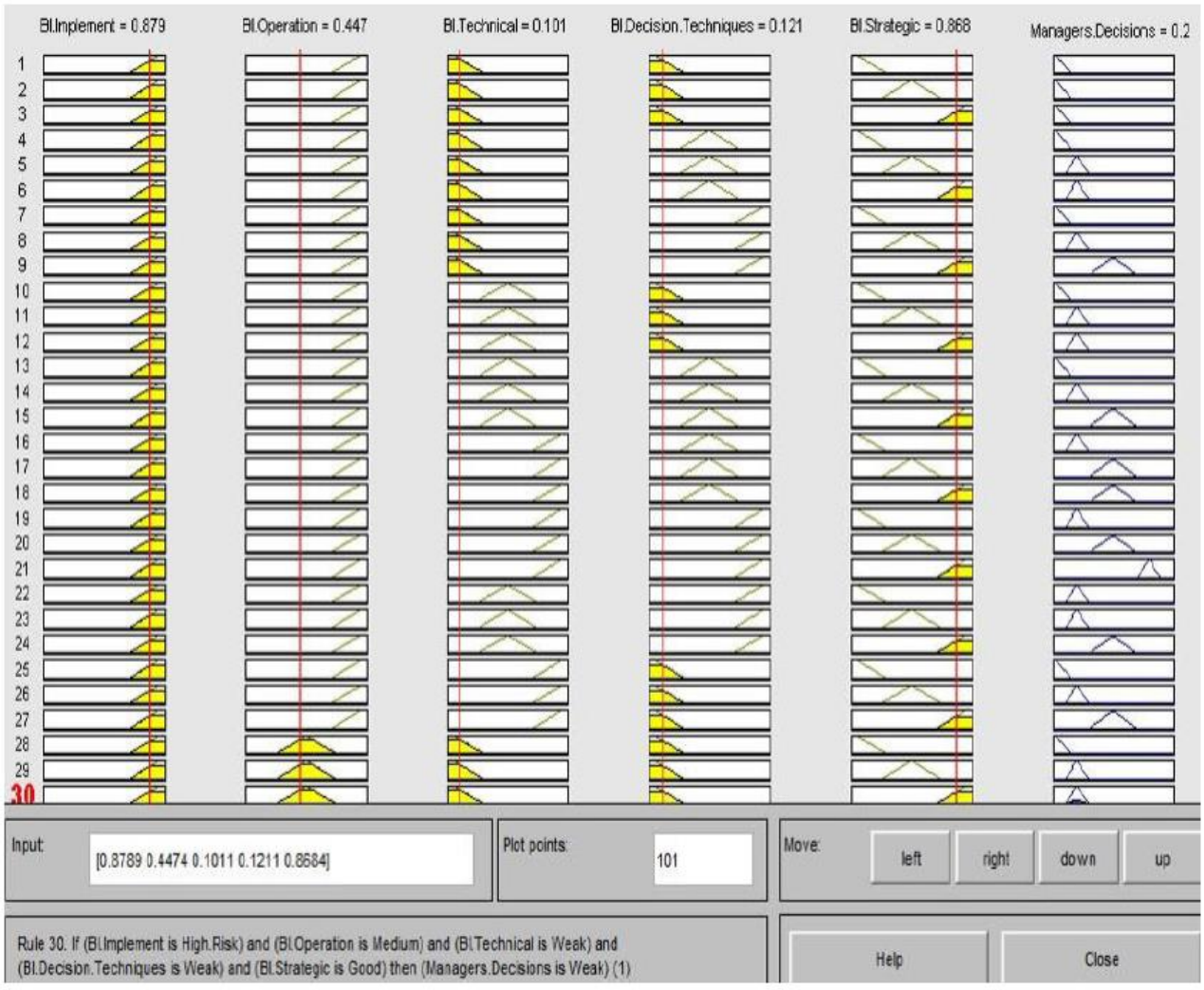
MATLAB software can be used to have inference based on rules in knowledge base of BI+FDSS payment system. In fact, the he main reason for using Mamdani inference engine (instead of Sugeno) is that selection of type of requirement and aggregation of fuzzy rules (in order to collect fuzzy rules for inference and conclusion) has been deactivated in Sugeno inference engine. Prod is used in MATLAB software to select the type of requirement because Min operator makes the output fuzzy set short and incomplete. Defuzzification mechanism in the BI+FDSS system turns fuzzy output into a certain number. Central method is used MATLAB software in defuzzification because

this method of defuzzification reduces the complexity of the problem and leads to less time for calculations. Here, we select "Sum" aggregation method for fuzzy rules due to connected fuzzy rules due to "And" operator. In this case, the more accurate set of output rules are considered and not their maximum.

The Fifth Step

Describing the method of using support system for decision making and analyzing its outputs: the outputs of BI+FDSS system can be considered in form of numbers (accurate) and in linguistic form in order to analyze the behavior of the system output variable of “implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company”. The following Figure 6 analyzes the behavior of input and output variables of module of BI+FDSS system.

Figure 6: Analyzing the behavior of output variable in form of numbers (accurate) and in linguistic form based on 5 input variables.



Here, we can use the outputs of BI+FDSS system to analyze “the effectiveness of the decision-making process in Saman Kish Electronic Payment Company” based on variables such as “business intelligence techniques to facilitate decision making”, “strategic level of business intelligence", “tactical level of business intelligence", “operational level of business intelligence" and “quality of business intelligence implementation".

For example: If the condition of "implementation quality of business intelligence" is weak and “operational level of business intelligence" is in normal condition and “tactical level of business intelligence" is good and “business intelligence techniques to facilitate decision making” is good and “strategic level of business intelligence" is normal, then” the effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company” will be at its third level which is "Medium (normal)". In other words, we can use support system for decision making designed in this research to numerically and more precisely evaluate the “effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company”:

If the condition of "implementation quality of business intelligence" is weak and is exactly 00:15 and “operational level of business intelligence" is in normal condition and exactly 0.5 and “tactical level of business intelligence" is good and exactly 0.85 and “business intelligence techniques to facilitate decision making” is good and exactly 0.85 and “strategic level of business intelligence" is normal exactly 0.5, , then” the effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company” will be at "Medium (normal)" level which is exactly 0.570.

Outputs and results of decision support system have been separately compared with opinions of 18 experts after its design, the results of which can be observed in the following Table 6 based on the rules of decision support system and average response of experts.

Table 6: Information on comparing the outputs of “BI+FDSS System" with an average opinion of experts.

Rules of decision support system	Output of decision support system	Average experts responses	Difference ratio	Final difference
Rule. 3	1	1.22	0.22/4=0.055	0.06475
Rule. 45	3	2.72	0.28/4=0.0675	
Rule. 79	3	2.78	0.22/4=0.055	
Rule. 86	2	1.67	0.22/4=0.0825	
Rule. 103	2	1.67	0.22/4=0.0825	
Rule. 140	3	2.78	0.22/4=0.055	
Rule. 157	3	3	0/4=0	
Rule. 219	2	1.94	0.06/4=0.015	

Rule. 224	2	1.39	0.61/4=0.1525	
Rule. 235	2	1.78	0.22/4=0.0825	

We can compare decision support system outputs in this system which are BI+FDSS with based on the information described in the Table 6 above average opinion of experts based on the information described in the Table 6 above. Since the opinions of experts have been expressed in form of 5-point Likert spectrum (1 to 5), the difference between decision support system outputs in this research which are BI+FDSS and average opinion of experts is not significant and is equal to 0.06475 (Table 7). Since there is no sufficient reason for accepting the null hypothesis, the alternative hypothesis is accepted which means there is no significant difference between decision support system outputs in this research which are BI+FDSS and average opinion of experts.

Table 7: Comparison of the most relevant studies in the theoretical literature with findings in the present research.

No	Research title	Reference	Compare results							
			Investigating the " techniques to facilitate decision making of business intelligence"	The study "business intelligence levels"	Study the "implementation of business intelligence"	Managers focus on the decision-making process	Decision Support System	Fuzzy Logic	Validation System	Case Study
1	In order to increase the effectiveness of the implementation of business intelligence in decision-making executives in the Saman Kish Electronic Payment company	Zamani, (study)	*	*	*	*	*	*	*	*
2	Identify and prioritize the critical success factors in the implementation of business intelligence systems using AHP Method Case Study: Small and medium companies	Badizadeh et al. [21]	*	*	-	*	-	*	-	*
3	Approaches use of business intelligence to improve decision-making bank managers (case study Samen credit institution)	Falah et al. [12]	-	*	*	*	-	-	-	*
4	Business Intelligence Application Development as a decision support tool in the banking system	Naderlo and Naderlo [10]	-	*	*	*	-	-	-	*
5	The impact of BI maturity on the use of information systems in business processes according to the analytical decision-making culture among managers of Bank Saderat Iran	Mollaei, 2014	-	*	*	*	-	-	-	*
6	Design of decision support system for employee performance evaluation Case Study on Saderat Bank of Iran	Jalalian et al. [22]	-	-	-	*	*	*	*	*

7	Development and validation of a rule-based time series complexity scoring technique to support design of adaptive forecasting DSS	Adya and Lusk [20]	-	-	-	-	*	*	*	*
8	An ambidextrous perspective on business intelligence and analytics support in decision processes: Insights from a multiple case study	Kowalczyk and Buxmann. [6]	*	*	-	*	-	-	-	*
9	The Impact of Business Intelligence on the Quality of Decision Making – A Mediation Model	Wieder and Ossimitz [5]	*	*	-	*	-	*	-	*
10	Social Business Intelligence: A New Perspective for Decision Makers	Muntean et al. [15]	*	*	-	*	-	-	-	*
11	Towards business intelligence systems success: Effects of maturity and culture on analytical decision making	Popovič [23]	*	*	-	*	-	*	-	*

CONCLUSION

One of the most important results of research based on “designing decision support system based on principle of business intelligence implementation in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company using fuzzy logic” is that since the sign of correlation coefficient is the slope of regression line, there is a positive and significant relation between "strategic level of business intelligence” and "technical level of business intelligence" because the Pearson correlation coefficient between them is equal to 0.763. On the other hand, there is a positive and significant relation between "strategic level of business intelligence” and” operational level of business intelligence" because the Pearson correlation coefficient between them is equal to 0.875. On the other hand, there is a positive and significant relation between "operational level of business intelligence” and” technical level of business intelligence" because the Pearson correlation coefficient between them is equal to 0.708. In fact, in can be concluded based on the high correlation between the levels of business intelligence which are A) strategic level of business intelligence (increasing organizational performance and optimizing processes, focusing on financial characteristics, focusing on other important factors in the increased business, focusing on external processes of organization) B) technical level of business intelligence (following activities up, making medium term decisions, providing periodic reports of the process, providing the overall picture of the organization's activities for managers) C) operational level of business intelligence (monitoring business activities, providing information of business processes, making short-term decisions in conducting business activities, the highest concentration in conducting internal business processes) that the decision-making process of managers

can become comprehensively effective by analyzing the "business intelligence levels" because “strategic level of business intelligence”, "tactical level of business intelligence” and “operational level of business intelligence” have a significant impact on increasing the effectiveness in decision-making process of managers in Saman Kish Electronic Payment Company. It can be observed in evaluation of the effect of “business intelligence techniques to facilitate decision making" on increasing the effectiveness in decision-making process of managers in Saman Kish Electronic Payment Company that there is a significant positive relation between "OLAP" and "IDSS" in increasing the effectiveness in decision-making process of managers because the Pearson correlation coefficient between them is equal to 0.796. On the other hand, there is a significant positive relation between "OLAP" and “KMS" in increasing the effectiveness in decision-making process of managers because the Pearson correlation coefficient between them is equal to 0.777. On the other hand, there is a significant positive relation between "OLAP" and “CRM" in increasing the effectiveness in decision-making process of managers because the Pearson correlation coefficient between them is equal to 0.873. In fact, there is a positive and significant relation between "OLAP" and "DM" to increase the effectiveness of managers in the decision-making process because the Pearson correlation coefficient between them is equal to 0.562. Thus, it can be concluded that evaluation of the effect of “business intelligence techniques to facilitate decision making" can increase the effectiveness in decision-making process of managers in Saman Kish Electronic Payment Company. Here, we can use the outputs of BI+FDSS system to analyze “the effectiveness of the decision-making process in Saman Kish Electronic Payment Company” based on variables such as “business intelligence techniques to facilitate decision making”, “strategic level of business intelligence", “tactical level of business intelligence", “operational level of business intelligence" and “quality of business intelligence implementation". The Table 7 compares the most important results and findings in the present research with results and findings of relevant studies in the theoretical literature.

Given the fact that Saman Kish Electronic Payment Company provided the means of contactless payment for the clients as the first Internet payment service provider in the banking system, evaluation and analysis of research variables which are “business intelligence techniques to facilitate decision making”, “strategic level of business intelligence", “tactical level of business intelligence", “operational level of business intelligence" and “quality of business intelligence implementation" and “effectiveness of the decision-making process of managers in Saman Kish Electronic Payment Company” can improve the decision-making process of managers in Saman Kish Electronic Payment Company in main fields of activity of this company as follows: Providing e-commerce services, installation and support of Card readers, Providing payment services via mobile phone. According to above discussion, the most important recommendations for further researches are as follows:

- Using other artificial intelligence techniques especially artificial neural network and the most important and most relevant algorithms in the field of artificial intelligence in order to increase the richness of the content of the mentioned system
- Using Fuzzy multi-criteria decision making techniques (MCDM) for network

ranking of relations between model for implementation of business intelligence in order to increase the effectiveness of decision-making process of managers in Saman Kish Electronic Payment Company

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