Journal of Economic & Management Perspectives, 2018, Volume 12, Issue 2, 255-265.

How to Improve Decision Making Process through Decision Support Systems & Business Intelligence: Evidence from Jordan University Hospital

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ABSTRACT

This study aimed to know How to Improve Decision Making Process through Decision Support Systems & Business Intelligence at Jordan University Hospital. To achieve this purpose, a questionnaire was distributed to the sample of the study at the middle, and top management levels, (76) valid questionnaires recovered out of (92). The study concluded with some results, the most: decision support systems available at high rates, business intelligence in a moderate level, there is a significant statistical relationship between decision support systems and business intelligence with decision-making process at ($\alpha \leq 0.01$), there is also significant effect of decision support systems and business intelligence on decision-making process. The study recommended updating the abilities of Decision Support Systems & Business Intelligence in Decision Making Process; also; top management and employees have to believe in the role of Decision Support Systems & Business Intelligence in decision making, also recommended improve decision making process phases in all its phases.

JEL Classification: D81; M21.

Keywords: Decision Making; Business Intelligence; Jordan University Hospital.

1. INTRODUCTION

The tremendous developments in communication and information technology have led to emergence of many challenges, which causes many developments and changes at different economic, social and technological levels. This causes organizations to work in an environment characterized by dynamic, complexity, globalization of business operations and markets, technological development, openness, and increase the diversity of consumers' needs, as well as increase awareness and understanding of the advantages and characteristics of the services offered to them. This imposes rapid response to these challenges, which requires from organizations to abandon traditional methods of administration, and adopt methods and policies to cope with the risks, challenges and changing needs, to exploit the opportunities. This requires also boldness and accuracy in decision-making based on a solid scientific, methodological foundations, and knowledge base that enhances the role of decision-makers, this requires provision of decision support systems, business intelligence, and modern methods to deal with the information and knowledge availability with the required quantity and quality.

The strength in the correlation between organizations activities, the method of managing it, controlling it, and successful use of technologies; is the secret of their success in a rapid changes in the business environment (Shubair, 2015). In trying to understand the whole picture, most of the organizations in the world are seeking to raise their level of competitiveness, or at least stay within the competition and try to find more innovative ways to attract customers by offering new goods and services. This requires organizations to take the right and quick decisions in response to unexpected and uncalculated changes results, so institutions are under great pressure by competitors and the market demands to provide new products and services in high quality. The dynamic structure of the organization represents the prerequisites for success in dealing with these pressures; as such the main issue of this structure is to respond quickly to the changes in achieving business work. So in this regard decision support systems (DSS) and business intelligence (BI) are the most important tools to be considered.

2. LITERATURE REVIEW

There are many research studies and theories in the administrative literature that studied decision making as a key variable depending upon the success of organizations, however computer emergence of information systems has increased the importance of this subject and researchers thoughts focused about the means to support these

decisions and ways to provide decision-making process with the necessary quality information required to make decisions which raise the level of organization and increase its competitiveness, this is given by DSS& BI.

Decision support systems are the output of the development of information technology during the seventies of the last century, which grow up during the eighties. It was a natural progression for the way of using your computers. DSS is known as the interaction of information systems with experience in order to be used by managers in decision-making. The basic idea of decision support systems is to highlight the role of computers in the decision-making process (Shubair, 2015), it is known as the process of providing the environment and conditions, mechanisms and technologies that serve the industry to make good decisions. Decision-support systems represent an information system depends on computing, methods of conventional and smart quantitative technique to support the decision-maker in dealing with semi-structural and non-structural problems to reach a decision or set of alternatives (Turban, 2015). They are systems based on computer designed to help decision-makers in the use of data and advanced analytical models in dealing with the problems at middle and top levels. So decision support systems can serve as technological tools to facilitate decision-making which requires a large effort and in-depth analysis. Thus, decision support systems are responsible for the performance of creating information for decisions, as well as delivery of decisions and interaction with users (Yasin, 2006, p. 13) (Ahmmad, 2012).

Decision support systems have many important features and capabilities the most (Turban, 2015):

- Dealing with semi-structured and unstructured problems.

- Support managers at senior and middle management level.

- Support the level of the individual or the team at all stages of decision-making.

- Have the flexibility and adaptability and ease of use.

- Have the ability to contain the modeling and the different models and the ability to run it.

- Can support all categories of decision makers.

- Enormous power to choose and test how much of alternative policies.

- The speed of interaction with the decision makers.

- Reduce costs in the organization.

Decision support system has four main components (Turban, 2015):

- Data Management Subsystem

- Model Management subsystem

- Knowledge Management Subsystem

- Graphical User Interface

Business intelligence is a broad category of applications and technologies for gathering, providing access to, and analyzing data for the purpose of helping enterprise users make better business decisions (Ranjan, 2009), it is a set of hardware and tools, databases and analytical tools and methodologies designed to facilitate access to the data by conducting various analysis, it is a converting of data into knowledge and then to decisions and ultimately to actions in the real work. BI also known as a variety of processes, perceptions, tools and methods to improve administrative decisions, and the use of multiple sources of information, expertise application, and addition of hypotheses to develop a correct understanding of the business processes in order to collect, analyze, and manage data to generate information to decision makers in the organization for taking decisions and implementation plans (Ali, 2014).

On the other hand Shaheen defined BI as "the language of valuable interaction, uses multiple techniques of an independent mechanism of action to offer cognitive format reports or descriptive graphics through restructuring, cleaning, analysis and integration data relevant to the subject of interest and spread across systems and applications and various databases to provide valuable information for business managers, leading thinkers, simplest employees and users in a form of analytical processing of business inquiries on time " (Shaheen, 2007), so organizations need Business intelligence to keep their competitive position, so organizations should work on the information using business intelligence to make better decisions, because Business intelligence captures all activities concerning workers in the organization, suppliers and consumers.

Recognizing the importance of business intelligence in the organization is the first need to determine a common vision for these systems, business intelligence is clearly linked to the objectives of the business, this stage includes identifying business needs of the organization, and attention to information technology (Chadhary, 2004) so Business intelligence systems must cope with the objectives of the organization, and according to Ali the greatest motivation for the application of business intelligence in organizations includes (Ali, 2014):

- A transition from talent and intuition in taking initial decisions to the subjective method based on analysis of facts and evidence.

- Keep operating Activities with realistic goals and monitor the effectiveness of business processes.

- Predict the development of the organization with customers and suppliers behavior.

- Delivery of data in order to make them more transparent and direct individuals to perform their roles in the decision-making process.

- Reduce the time needed to analyze information.

- Automated and fast reports and build plans and forecasts.

Business intelligence systems have four main components (Al Samerai& Al Akeedi, 2012) (Turban, 2015):

- Data warehouse which is a repository of historical data stored in an orderly manner.

- Business Analytics represent tools that work to transform data into information and then into knowledge.

- Business performance Management, it works on the control of the organization's performance and measurement compared with key approved performance indicators.

- Graphical User Interface works to facilitate communication with the system and use it like plates Dashboards control.

Business intelligence system execute functions by providing various reports for those involved, reporting at the corporate level (the project), such as control panels (Dashboards reports), analysis of data in data warehouses (Cube Analysis), private queries, data mining and statistical analysis (Turban, 2015).

Business organizations use the decision-making process for dealing with list of problems or to meet the particular situations or positions of a possible fall, or to achieve the objectives drawn. Existing problems has to be clear and well-known dimensions and aspects, or may be vague for the depth and dimensions and causes its constituent, or may be non-existent, but the willingness of top management and exploring the circumstances make it expects to occur, so top management is working to provide all the necessary data, information, analysis and different factors of the problems to help them reach the right decisions to achieve objectives which was adopted for, the decision-making process has many stages need to be taken into account by the decision maker, according to Simon these stages are (Turban, 2015):

1. Intelligence Phase at this stage decision makers conduct environmental scanning the internal and external environment (data collection) SWOT analysis, identify opportunities and threats, rating and adoption the problem or opportunity.

2. Design Phase at this stage decision makers identify and analyze possible businesses, build and verified a decision model, modeling the problem formula quantitative or qualitative function, determine the principles of choice between alternatives, development of different alternatives, the order alternatives according to preference. It could be argued that in this phase and previous phase is to identify and diagnose the problem, where is the distinction between the symptoms of the problem and the real problem, and the most important things that should be realized by the decision-maker; in the process of identifying the problem and its dimensions is determined the nature of the situation that created the problem, and the degree of importance, and not to confuse the symptoms and causes of the problem, because it is what helps in making the right decision (Hijazi, 2002).

3. Selection phase, it represents the real stage of decision-making where it is the choice of the appropriate alternative and committing to it.

4. The implementation phase, it represents an alternative that was chosen is put into practice, and the implementation phase represents a real solution to the problem.

Decision support systems and business intelligence contribute with their different tools in supporting all phases of the decision-making process, both in data collection and analysis, or in the development and construction of models and the implementation of various systems solutions. In spite of the multiplicity of decisions that may be taken by the managers in one day, the factors influencing the decision-making process increase difficulties and cost of this process, and if these factors interacted strongly, it sometimes leads to wrong decisions (decisions irrational), so to take any decision whatsoever simple and its effects is limited; it requires from the administration to think of a number of different factors influence decision, some within the organization (internal factors) and some from outside the organization (external factors) and others behavioral or humanist, in addition to the amount linked to expected cost and revenue factors (Mansour,2006).

Yang& Thompson (2016), "Capturing judgment strategies in risk assessments with improved quality of clinical information: How nurses' strategies differ from the ecological model", This study tested the hypothesis that nurses' judgment strategies and policies change as the quality of information used by nurses in simulation changes. Results of study indicated that improving the quality of information by clinical simulations significantly impacted on nurses' judgment policies of risk assessments. Data mining EEG signals in depression for their diagnostic value", This paper uses a data mining methodology- Quantitative electroencephalogram (EEG)- in depression for their diagnostic value and to differentiate patients, the study found an important role of quantitative electroencephalogram (EEG) data mining on diagnostic value and differentiate patients in clinical practice. Sun, & Chan (2015) investigated the efficacy of a CDS tool to screen health records for contraindications to intravenous stroke thrombolysis. The study found that by using clinical decision support tools, the test time was reduced from 14.6?±?7.4 to 7.3?±?5.2 min. In a total of 54 contraindications, the number of missed contraindications was reduced from 23 (42.6 %) to seven (13.0 %). Bhandari et al., (2008) study Debiasing investors with decision support systems An experimental investigation ".This study aimed to investigate the role of decision support systems to help investors to meet the challenges, and demonstrated the existence of a strong role for decision support systems in providing knowledge to decisions makers in making their decisions, also showed the role of these systems in reducing the negative effects of these decisions and therefore the integrity of the decision.

Petkov et al., (2007) "Mixing Multiple Criteria Decision Making with soft systems thinking techniques for decision support in complex situations" The study aimed to present a summary researcher expertise to the decision-making criteria and techniques used in decision support at various stages to solve complex problems, the study showed a significant role for the integration of information, software and communications in support of the various stages of the decision support process. Abu Sabet, (2005) study entitled "The process of administrative decision-making in the Palestinian university in the Gaza Strip" The study aimed to assess the role of decision support systems in decision-making process among decision makers in the Palestinian universities in the Gaza Strip, the study found a strong correlation between the organizational level of the department of information and the quality and use of information systems In the decision-making process, Also it showed the presence of new technologies in general in information systems components in these universities have made the users of these systems rely on them heavily in the decision-making, and have shown that there is a strong positive relationship between the quality of information and use of information systems in the decision-making process, and recommended the need to develop the role of the Management Information Systems in decision-making in Palestine universities in the Gaza Strip process.

Ranjan (2009) aimed to assess the role of administrative computerized information systems in decision-making in the municipalities of the Gaza Strip, and concluded that the administration rely in making its decisions on the

current system as an effective system, and that the information provided by the current system, which corresponds to the decision-maker requirements, also showed a positive relationship between infrastructure availability for decision support systems and between production and use of necessary decision-making information, and recommended the need to strengthen the role of management information systems in the process of decision-making in the municipal sector Gaza.

Petkov et al., (2007) aimed to analyze the impact of the decision-making efficiency of management information systems at the effectiveness in the Customs Department, the study found that, perceptions of the respondents to the efficiency of information systems and the efficiency of the decision-making process are high, also showed the presence of statistically significant effect for efficient management information systems in the effectiveness of the decision-making process. The study recommended the creation of an atmosphere of active participation between those in charge of these systems and users have in order to develop and enhance their effectiveness. Bouchet et al., (1998) "The Impact Of Information Use Industry On Decision Making In The Pharmaceutical" The study aimed to measure the impact of the use of information in decision-making in the pharmaceutical industry companies in the United Kingdom, and concluded that the information and knowledge offered by the regimes in those companies that have strengthened existing knowledge of managers and enabled them to take many important decisions and strengthened organizational memory of the Organization, also reduced the time required to develop the project, the study also found that the information contributed to improve the relationship with customers and improve the company's image.

3. METHODOLOGY

The decision-making process in developing countries organizations in general and Jordanian organizations in particular; still based on intuition, experience and trial and error, and lack the foundations of knowledge, quantitative and symbolic analysis, and lacks the use of modern technology, this study shed light on this vital and important subject in one of the dynamic and highly competitive sectors, a hospitals in Jordan. So the problem of the study lies in answering the following question:

How to improve decision-making process through decision support systems and business intelligence at Jordan University Hospital?

The study could show the problem clearly by raising the following questions:

1. What level of availability of decision support systems and business intelligence used at Jordan University Hospital?

2. Is there a significant correlation and impact between decision support and business intelligence with decision-making process at Jordan University Hospital?

Emanate importance of the study from the role of decision support systems and business intelligence in modern business organizations, their impact on the quality of the decisions that are made, and its impact on the overall administrative and technical work in, where it became a reliance on traditional means of dealing with data, information, knowledge and analysis does not meet the requirements of work in the current era, and it became necessary for all organizations to use decision support and business intelligence systems to provide data, information and knowledge in a good quality to decision-makers, which improves the decision-making process. Therefore, the study of the role of these systems in improving decision-making process at Jordan University Hospital; and the resulting benefits is a matter of critical importance worthy of research and study.

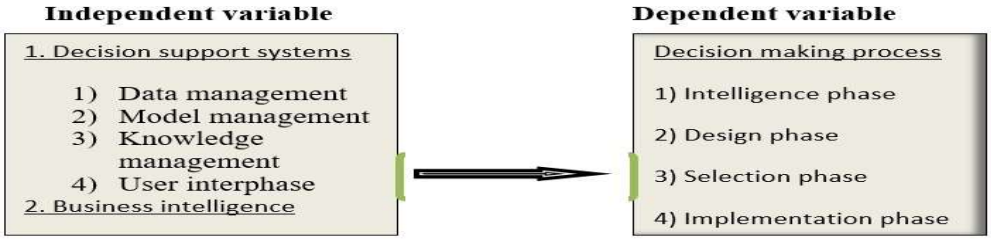

Figure 1.
Study Model

Figure (1) indicates the study variables which is based on a model used by Malkawi (2014). The general purpose of this study is to find out the effect of decision support systems and business intelligence on decision making process at Jordan University Hospital. Based on the literature and conceptual model that mentioned above, the research hypothses are proposing below:

General hypothesis of the study is:

H1: There is a significant positive impact of decision support systems and business intelligence on decision making process at Jordan University Hospital.

H2: There is a significant positive impact of decision support systems and business intelligence on intelligence phase at Jordan University Hospital.

H3: There is a significant positive impact of decision support systems and business intelligence on design phase at Jordan University Hospital.

H4: There is a significant positive impact of decision support systems and business intelligence on selection phase at Jordan University Hospital.

H5: There is a significant positive impact of decision support systems and business intelligence on implementation phase at Jordan University Hospital.

A random sample was selected for data collection. To add more transparency to our study only employees at middle and top management selected who are related directly to decisions, 76 questionnaires was completed and valid. 71% of the participants were male, ages ranging from 25-65. 64% were at administrative position and the rest at medical position. All respondents were familiar with decision making process.

Reliability defined as the consistency of the measures of a variable. To what extent the measures are free from error and therefore procedures stable and consistent coefficient; the internal consistency tested by using Cronbach's Alpha, the result for the instrument was (84%). The study considered the mean (1- 2, 5) low level, (greater than 2.5- 3, 5) moderate, and greater than (3.5) high.

Table 1 shows Level of decision support systems, business intelligence decision making process at Jordan University Hospital and details at appendix A.

Table 1. Arithmetic Means and Standard Deviations

number	Area	Average	level
1	Data management system	3.96	high
2	Model management system	3.72	high
3	Knowledge management system	3.90	high
4	Business Intelligence	3.44	moderate
Decision support systems and Business Intelligence		3.65	high
4	Intelligence Phase	3.85	high
5	Design Phase	3.91	high
6	Selection Phase	4.07	high
7	Implementation Phase	3.92	high
Decision making process		3.94	high

We can see from the above table that the averages for all areas of study are high except business intelligence in moderate level. The highest arithmetic average for - Implementation Phase with a mean (4.07), while in last place was the area came the Business Intelligence with an arithmetic mean (3.44).

4. RESULTS AND DISCUSSION

Results of simple linear regression analysis are seen in Table (2). The R2 = 0.487, which means that the model explicated 49% of the variance in decision making process interpreted by adoption DSS and BI. The whole model was significant based on calculations of F = 7.802 and P = 0.01.

Moreover, each variable was tested for significance. Depending on this test, all four minor hypotheses are supported in general. Table (2) shows the significance of constructs and supported hypotheses.

Table 2. Results of Simple Regression

dependent variables	Beta	T	R	R^2	F	Sig.	Acceptance
H1: Intelligence Phase	0.381	2.383	0.721	0.519	8.404	0.00	Accepted
H2: Design Phase	0.248	2.426	0.642	0.412	6.846	0.00	Accepted
H3: Selection Phase	0.327	2.454	0.632	0.399	4.940	0.02	Accepted
H4: Implementation Phase	0.301	2.336	0.621	0.385	6.745	0.01	Accepted
H; Decision making process (Total)	0.356	2.871	0.698	0.487	7.802	0.01	Accepted

Independent: Decision support systems and Business Intelligence

The Table above highlights the F score and sig. value obtained by SLR performed for intelligence, design, selection, and implementation phases. This table represents the sig. values and acceptance of the research hypotheses indicated by H2, H3, H4, and H5.

Decision support systems and business intelligence in their various components are considered the most important tools for business organizations in general and hospitals in particular, particularly in the process of making and taking decisions, this importance return to the information, knowledge, and analysis provided by these systems for various administrative levels, surpassing traditional methods, random and improvised in the decision-making process, decision-making needs at all stages (intelligence, design, selection, and implementation) information, knowledge and different analysis, this is offered by decision support systems and business intelligence.

5. CONCLUSION

This study examined the effect of independent variables (Decision support systems and business intelligence) on the dependent variable (decision making process). Based on the analysis of field study data and test hypotheses, the study found the following results:

1. Decision support systems indicated highly availability while Business Intelligence in a moderate level at Jordan University Hospital.

2. Results showed a high positive correlation somewhat between decision support systems and business intelligence with decision-making process.

3. There is a significant effect of decision support systems and business intelligence on the decision-making process at all phases (intelligence, design, selection, and implementation).

4. Hospital focuses on the organizational and scientific knowledge in resolving various problems.

5. Hospital cares about data, knowledge, and model management processes and a high importance to decisions implementation.

From all of the above this study indicated a statistically significant positive effect at ($\alpha \leq 0.05$) level of decision support systems and business intelligence on the decision-making process.

The initial findings of this study suggest that decision support systems and business intelligence are important for making decisions in the hospital, because they have effect on decision making process and it will be effective depending on them. So following our study model, future research can be conducted on the same sector (hospitals) after a while to determine their developments in adoption of DSS & BI. For organizational compatibility, future research may use different indicators with more clarification to investigate the real effect on compatibility. Also, future research may use many different factors as moderators.

Recommendations

1. Focus on the development of decision support systems and business intelligence and follow up everything new in its field of hardware and software and other systems.

2. Increase the exploitation of the great potential for decision support systems, information technology and business intelligence available in the hospital, and motivate users to adopt it.

3. Increase the focus on improving decision-making process in all phases depending on decision support systems and business intelligence.

4. Conduct further research in this sector and different sectors.

From all of the above we can say that information technology infrastructure of (DSS& BI) at Jordan University Hospital; is the key to success in: Serving decision making process at different functional areas, providing more flexibility to the hospital, and increasing the hospital's ability to satisfy all their stakeholders, because of competitive pressure, and quality assurance requirements managers in the hospital should take into consideration that DSS& BI adoption will give them a competitive advantage. In order to exploit this opportunity, they have to move forward to implement changes in work procedures, and reinforce using tools of DSS& BI.

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APPENDIX A

Survey Questionnaire Items Arithmetic means and standard deviations for study variables (n=76)

No.	Paragraph	Ave	Stnd Deviation	level
1	A comprehensive database available in the hospital	4.10	0.76	high
2	The software needed to manage the database available	4.06	0.88	high
3	Effective system for the management of the database is available in the hospital	4.12	0.72	high
4	The necessary facilities for queries from the database available	3.92	0.67	high
5	Interface to use and deal with and use data available	3.87	0.75	high
6	Data Dictionary to explains the meanings of terms used is available in the hospital	3.71	0.89	high
Data management		3.96		high
1	Models base contribute to the decision-making is available in the hospital	4.10	0.86	high
2	Models base management system available	3.67	0.62	high
3	The possibility of dealing with these models and their integration and implementation	3.68	0.73	high
4	The possibility of dealing with these models in a natural language	3.51	0.84	high
5	Models dictionary is available in the hospital	3.64	0.91	high
Models management		3.72		high
1	A comprehensive and integrated knowledge base is available in the hospital	4.04	0.78	high
2	The hospital relies on scientific and structural knowledge and in resolving various issues	3.64	0.76	high
3	Intelligent systems for knowledge generation and handling is available in the hospital	3.84	0.71	high
Knowledge management		3.90		high
Decision support systems		3.86		high
1	Orderly repository of historical data is available in the hospital	3.37	0.97	moderate
2	Appropriate analysis tools available to deal with the data warehouse (intelligent systems)	3.24	0.92	moderate
3	intelligent systems to manage the performance of the organization, such as the dashboard or control are available in the hospital	3.73	1.04	high
Business intelligence		3.44		moderate
Decision support systems& Business intelligence		3.65		high
1	Decision support systems and Business intelligence contribute in required data collection	3.92	0.83	high
2	Decision-support systems and Business intelligence contribute in organizational goals analysis	3.80	0.76	high
3	Decision support systems and Business intelligence contribute in identifying different problems	3.75	0.74	high
4	Decision support systems and Business intelligence contribute to provide alternatives different solutions	3.62	0.91	high
5	Decision support systems and Business intelligence contribute in the environmental scanning.	4.20	0.83	high
Intelligence phase		3.85		high
1	Decision support systems and Business intelligence contribute in the verification of the results	4.06	0.82	high
2	Decision support systems and Business intelligence Contribute in designing various solution models	3.85	0.87	high

3	Decision support systems and Business intelligence contribute to study the feasibility of various solutions	3.82	0.77	high
4	Decision support systems and Business intelligence contribute to analyze possible solutions	3.93	0.83	high
Design phase		3.91		high
1	Decision support systems and Business intelligence help in choosing the best solution	4.12	0.81	high
2	Decision support systems and Business intelligence contribute in determining the solution capabilities	4.21	0.85	high
3	Decision support systems and Business intelligence contribute in decision-making and commitment to implement it.	4.06	0.97	high
4	Different models used to generate different alternative solutions (simulation, restructuring ..... etc.)	3.90	0.71	high
	Selection phase	4.07		high
1	Users are trained to use the system and implementation of decisions	4.06	0.87	high
2	Information remains accurate and reliable despite the increasing workload	3.94	1.07	high
3	Hospital dealing with resistance to change when implementing the decision	3.82	0.74	high
4	Senior management supports the use of decision support systems and Business intelligence in various decisions	4.00	0.96	high
5	Decision support systems and Business intelligence contribute in the implementation of decision	3.92	0.91	high
6	Decision support Systems and Business intelligence contribute to identify courses of action to implement the decisions	3.81	0.93	high
	Implementation phase	3.92		high
Decision making process		3.94		high