ABSTRACT

Technologies today play major role in solving many kinds of problems such as decision supporting systems. A survey was conducted to several bankers in Bahrain banks to identify the factors that significantly affect the DSS success or failure. Four factors were set which are Technology, People, Communication and Rules and procedures. The result showed that the first three factors mentioned above have a great effect on the success of a decision support system while the more restrictions, rules and procedure will lead to a weak decision support system.

Impacts of Decision Supporting Systems on Decision Making

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KEYWORDS

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PREAMBLE

Decision support systems (DSS) are information systems – computer based - that support business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization and help to make decisions which may be rapidly changing and not easily specified in advance.
Decision making is becoming more and more complex over time with the huge change of customer base, competitors, regulations and unstable business environments. Therefore the need of a decision support system is rapidly increasing to enhance the level of accuracy in decision making for management.
DSSs include knowledge-based systems. A properly designed DSS is an interactive software-based system intended to help decision makers analyze useful information from raw data, documents, personal knowledge, or business models to identify and solve problems and make decisions.
In more details, decision support systems can be categorized into two categories, in one hand there is the one which needs the supervision of decision maker directly, these are the unorganized, not well defined decisions and more critical and complex. On the other hand there are the simple decision situations where there is no need for the decision maker direct supervision and the decision can be made automatically by the decision support system (DSS) after setting all the attributes according to the business need. [Figueira et al, 2005] stated that "Multi-criteria analysis offers a variety of methodologies and tools to solve sorting and classification problems" while George Rigopoulos 2008 make it clearer that "all existing methodologies of decision support systems focuses on ordered categories" were the need is becoming more critical of handling ordered and not ordered categories of decision support systems which is called Intelligent Decision Support Systems.

CHALLENGES AND PROBLEMS

DSS failure can lead to more than just expensive in terms of productivity, money or redesign of later processes, but in some cases can cause losses of life.
Unfortunately, the history is filled up with examples of how misunderstanding of decision support problems can lead to disasters. To give a clear image sees the following example. In 1988, U.S. Navy warship accidentally shot down an Iranian commercial passenger due to a poorly designed weapons control system. The deep down investigation says nothing was wrong in the system software and hardware, but that the problem was caused by insufficient and complex display of information to the controllers (van den Hoven, 1994). In details, the problem leading to the decision to shoot down the Iranian was the observation that he was descending towards the ship, when in fact it was climbing from the ship. The display tracking the airliner was not designed properly which required controllers to "compare data taken at different times and make the calculation in their heads, on scratch pads, or on a calculator - and all this during combat (Lerner, 1989)."
The main objective of this paper is to study the effect of DSSs on the Business sector and the potential uses of such systems, as an example this paper will focus on the use of DSS to make strategic decisions and their impact on planning for the future of the organization.
The paper is organized in six sections, including this introduction. Followed by general literature review. Next chapter introduced the research methodology. Then a discussion section of the challenges of using DSS in details will brief the major challenges faced. Finally, concluded with which parts really affect the success of a decision support system.

LITERATURE REVIEW

In the early years of computers the main concern was to build programs that will help businesses in performing clerical works, a little after that people started to think about the potentials of manipulating the gathered data in order to have a more efficient business procedures, some of the areas that caught the business owners was cost reduction, locating target audience for marketing and other operational tasks.
After that when the management faced obstacles in making decisions regarding the future and was not able to easily come to those decisions, the need for an assisting decision support system was raised , some systems were made to predict the probability of some events to occur based on some assumptions to form a perception.

DSS DEFINITIONS

Decision support system is a computer-based information system which includes knowledge based systems to support decision making activities. The decision is mode upon a choice of alternatives based on estimation of the values of those alternatives (Manpreet, Parvinder, and Sumitter Bir Singh 2008).

The idea behind decision supporting is helping managers to work alone or in a group to make better choices. In practice, references to DSS are usually references to computer applications that perform such a supporting role. DSS are "interactive computer-based systems that help decision makers utilize data and models to solve unstructured problems" (V. S. Janakiraman and K. Sarukeshi, 2001).
"DSS are computer-based systems that assist business and organizational in complex decision-making environment" (Rosmayati Mohammed)
Some authors said that, the DSS does not specify an optimum decision [Samson,' 88], but rather helps a decision maker to clarify options. A DSS includes applications used by decision makers which specifically assist in understanding or structuring the decision. These researchers look at the ability of an application to generate stochastic measures and to implement sensitivity analyses on data. Others [L.e Blanc et al, '89; Beau Clair, 1985] have defined DSS more broadly and have included any computer based application or group of applications that can be used by decision makers to help them to clarify and analyze their options. A word processor, spreadsheet, or database is designated as a DSS tool by this group.
Ayati [1987] presents one model of the use of a DSS. The Decision maker accesses a database or previous (individual) knowledge and draws information. Utility of that information is analyzed and future probable scenarios are reviewed using the DSS.
George Rigpoulos [2008] found that the DSS supports assignment of actions (numbers, projects, people etc.) into predefined categories according to their score on evaluation criteria.

"Various forms of decision making occur at various levels". Hillier and Lieberman ['2002], for Example, consultants and people related to operation research will effect the structure of the database and it's optimization more than the formulation of tactical or strategic plans on the other hand Orr (2002) indicates that managing the interests of stakeholders requires current and accurate information about changing needs, concerns, requirements, best practices, and trends in affiliations and cost tradeoffs which shows the urgent need for a decision support system . Holsapple viewed DSS as a computerized system with knowledge representation and knowledge processing in order to strengthen decision making to be more productive, agile, innovative and reputable.
This study identifies a DSS as any application that helps the decision maker to identify or solve a problem by providing estimations, calculations about the choices available. It is the decision maker's use of the application rather than the technology itself which identifies a DSS.

DSS BENEFITS

There are many benefits of DSS both for the management and the organization as a whole. These benefits include: help to reduce decision cycle time for an organization and offering the managers enough time to be creative in more complex areas. Another advantage of the decision support systems is that the use of decision support system in an organization provides a competitive advantage over other organizations which do not use DSS. Also, DSS provide High satisfaction among decision makers and enhance organizational control. Typical intelligence activities that a DSS supports include accessing all information assets, including legacy and relational data sources, comparative data figures, projected figures based on new data or assumptions, consequences of different decision alternatives, given past experience in a specific context. Ion ISTUDOR, Luminita DUTA [2010]. Further more, James R. Marsden [2008] found that the E-retailers can use DSSs to make dynamic price adjustment decisions as the market landscape shifts or competitors alter their pricing structure
As described below, this study will focus on the importance of DSS in making decision in the financial companies. For example, DSS provide an environment that allows the cash manager to explore decisions concerning the less structured cash management tasks, the model is mathematical along with graphical representations to be the primary tool to preview high volume of information provided. A complete description of the methodology used to build such system presented by Parker and Bill in 1985. The outcome was a Decision Supporting System that user friendly and interactive with the formal cash management model. Moreover, the result was giving the ability to the system to provide direct recommendations about simple and structured tasks which on the other hand, allowing the manager to focus on the unstructured tasks, which indeed need more thinking, intelligence and experience. With both numerical results alongside with graphical representations on the huge volume of the information the system is now capable of doing the "What If" analysis which is a very powerful tool which helps the

manager predict the future and be aware of the results of his decisions.

METHODS AND HYPOTHESIS

This paper will identify the effect of new intelligent decision support systems on the business sectors. This paper will follow the empirical method to study the effects of our below listed variables on the success of the intelligent decision support system.

Figure 1: Research Model

a. Dependent Variable:
This papers dependent variable is "Success of Intelligent Decision Support System" and we will study the effects of the below independent variable
b. Independent Variables: **A. User Training** **B. Experience**

A. TECHNOLOGY

Does the technology really affect the decision making process? Does the managerial training for the system affect the success of decision making process?

The following hypothesis has been set to answer the previous questions.
H1(1): More investment in technology will increase the probability of DSS success.
H1(0): More investment in technology will not increase the probability of DSS success.

B. PEOPLE

Ein-Dor ef ai. found that system use increases over a period of time and then declines as a user becomes familiar with the system. Contrary to
that research, Fuerst found no relationship among implementation success and the length of time the system has been in use and top management support. This leads us to a controversy that will be solved by the following hypothesis.

H2(1): DSS success will increase as a user becomes familiar with the system and become more expert in the company needs and activities.

H2(0): DSS success will not increase as a user becomes familiar with the system and become more expert in the company needs and activities

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C. COMMUNICATION AND RULES

Communication between decision makers is a key role as many authors stated and this paper will set the light on the effect of communication level on the success of decision support system.

H3(1): The high level of communication between the decision makers will increase the ability of getting best result from DSS.

H3(0): The high level of communication between the decision makers will not increase the ability of getting best result from DSS.

D. RULES AND PROCEDURE

The decision making process depends on two factors generally as mentioned above, the level of difficulty of the problem and the constraints on the decision makers prior of making a decision. To find out the level of effect, see the below hypothesis.
H4(1): It is assumed that the more strict rules and procedures in the company open more opportunities in success of DSS.
H4(0): It is assumed that the more strict rules and procedures in the company will not open more opportunities in success of DSS.

DATA GATHERING

The process of distribution of the survey was very difficult and managers refused to cooperate but with the hard work and with help of some friends the job was done. After distributing one hundred fifty electronic questionnaires, it's received fifty nine replies from bankers in different positions in several Banks in Bahrain.

RESULTS AND FINDINGS

After analyzing the results gathered in SPSS and with the use of regression it'd found out the following:

H1(1): More investment in technology will increase the probability of DSS success.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.057-	.226		-.251-	.802
	Technology	1.019	.056	.923	18.167	.000

a. Dependent Variable: How do rate the role DSS systems play in decision making process

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	S
1	Regression	89.464	1	89.464	330.032	.0

Analysis says that on average 79.66% agrees that technology play major role in the success of a decision support system and can provide very valuable, accurate and critical information. Everyday passes technology is becoming able to do very complex analysis on huge amount of data. As the figure shows above that the F value is very big which indicates a very strong relationship between the technology variable and the success of the decision support systems. Also when considering the coefficients it's found that beta is very close to 1.00 which leads us to accept the alternative hypothesis.

H2(1): DSS success will increase as a user becomes familiar with the system and become more expert in the company needs and activities.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.189-	.331		-.570-	.571
	People	1.115	.088	.860	12.718	.000

a. Dependent Variable: How do rate the role DSS systems play in decision making process

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	77.578	1	77.578	161.754	.000[a]
	Residual	27.337	57	.480		
	Total	104.915	58			

a. Predictors: (Constant), People

b. Dependent Variable: How do rate the role DSS systems play in decision making process

Analysis shows 70% of the bankers from different levels of positions in Bahraini banks see that the level of experience on the system increase the understanding of the critical points managers require to focus on to achieve the goal of success of the decision support system. Another question was about the level of training a decision maker has on the system and they also believe that user training can improve the process even without experience on the decision support system DSS. While the SPSS results shows clearly that F value is too big in the above figure which shows the relationship between the variables. On the other hand, the beta variable is 0.860 on the coefficients table which is less than technology variable but still the relationship is strong which means that the variable against the alternative hypothesis is accepted as many bankers stated in the survey.

H3(1): The high level of communication between the decision makers will increase the ability of getting best result from DSS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.022-	.287		-.078-	.938
	Communication	1.012	.071	.883	14.169	.000

a. Dependent Variable: How do rate the role DSS systems play in decision making process

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81.716	1	81.716	200.771	.000[a]

a. Predictors: (Constant), Communication

b. Dependent Variable: How do rate the role DSS systems play in decision making process

For this hypothesis two questions in the questionnaire was set. The first one was about the way decision makers communicate and the behaviors of them and the second was about the level of support of top management. The result for this hypothesis is amazing; as average 93% shows that the level of communication between decision makers and the support of top management is a key variable in this equation for the success of a decision support system, some managers stated that top management support and giving them the space of creative thinking can definitely enhance decision making. After all these facts and results it's finally can be declared that this hypothesis is accepted specially when the result supported by the result of SPSS linear regression which shows value of F is equal to (200.771) and value of sig is equal to (0.000) in the ANOVA table and the value of the beta is 0.883.

H4(0): It is assumed that the more strict rules and procedures in the company will not open more opportunities in success of DSS.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.864	1	1.864	1.850	.097[a]
	Residual	57.272	57	1.005		
	Total	60.136	58			

a. Predictors: (Constant), Rules

b. Dependent Variable: How do rate the role DSS systems play in decision making process

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.542	.216		25.669	.097[a]
	Rules	-.741-	.081	-.770-	-9.109-	.097[a]

a. Dependent Variable: How do rate the role DSS systems play in decision making process

It's very obvious from the survey that decision makers reject this hypothesis since averages of 84% disagree with the hypothesis as the survey shows. Although some of the bankers accepted that more rules means more organized work but the majority thought that more rules means more obstacles against change and success.
The result is SPSS shows that the sig value is grater that 0.05 and the beta variable is -0.770 which is far beyond 1.00 then the alternative hypothesis is rejected and null hypothesis is accepted.

5. Discussion

This study has explored many variables that may affect the success of decision support system. For example, the support of top management is a critical key in success of decision support systems as many decision makers think while providing the managers with some space of creativity can significantly affect the equation. Moreover, it's found that the more advanced technology the organization has the more percentage of success to the DSS since technology can provide massive productivity assistance to the managers in organizations. While experience can play major role of the success of the system, decision makers do believe that more training on the system will improve the process since some decisions can be made wrongly due to lack of proper training and might lead to catastrophic results. On the other hand they are totally convinced that experience play more role than training in leading towards success of Decision Support Systems.
This research spot the light on other factors also like the level and way of communications between decision makers which seems to be the most important factor.
It's really confusing and surprising knowing that organizing the procedures and putting more restrictions, rules may lead to weak decision support system as found from the survey to decision makers. Although some of the decision makers think that organizing the work by setting rules and restrictions can enhance the professionalism and productivity within an organization.
After combining all the variables together and make a regression with the DSS Success variables it's concluded that the combined alternative hypothesis is accepted meaning overall variables make a huge affect on DSS success. See the below table, which clearly agrees with Janakiraman.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.286	1	80.286	185.810	.000[a]
	Residual	24.629	57	.432		
	Total	104.915	58			

a. Predictors: (Constant), AllVariables

b. Dependent Variable: How do rate the role DSS systems play in decision making process

REFERENCES

i. Figueria, J. ,S. Greco and M. Ehrgott,2005,Multiple Criteria Decision Analysis: State of the Art Surveys.

ii. Van den Hoven, M. J. (1994). "Towards ethical principles for designing politicoadministrative information systems." Informatization and the Public Sector, 3, 353-373.

iii. V. S. Janakiraman and K. Sarukeshi "Decision Support Systems" Prentice-Hall of India Private Limited, New Delhi, 2001, pp.26-77

iv. Samson, Danny, Managerial Decision Analysis, D. Irwin, Homewood, Ill., 1988

v. Le Blanc, A. ;Jelassi, M. Tawfik; DSS Software Selection: A Multiple Criteria Decision Methodology, Information & Management, vol.17, no 1 , August, 1989

vi. Beauclair, Renee A., The Computer as Communication Tool: The Case of Computer Facilitated Group Decision Making, Indianapolis, In., April 4-6,1985

vii. Lerner, E.J. (1989,April) "Lessons of flight 655". AEROSpace America, 18-26

viii. Ayati, M. B., A Unified Perspective on Decision Making and Decision Support Systems, Information Processing & Management, vol. 23 no. , 1987

ix. Hillier, Frederick S.; Lieberman, Gerald J., Introduction to Stochastic Models in Operations Research, McGraw Hill Publishing, New York, 1990

x. Orr, R. (2000). "The Timing of Medical Technology Acquisition: Strategic Decision Making ofTurbulent Environments," Journal of Healthcare Management, Vol. 445, No.5, pp. 330-331.

xi. Loebecke, C, P.C. Van Fenema, and P. Powell (1999)."Co-Opetition and Knowledge Transfer," DataBase for Advanced in Information Systems, Vol. 30,pp.14-25.

xii. Salmela, H., Lederer, A.L., and Reponen, T(2000). "Information Systems Planning in a Turbulent Enviroment European Journal of Information Systems, Vol.9, pp.3-15.

xiii. Dauten, D.(1999). The Gifted Boss, New York: William Morrow & Co.

xiv. Parker, D.C. and P.C. BeU (1985) "Developing a Visual Interactive Model for Corporate Cash Management," Journal of The Operational Research Society, Vol. 36, No. 9.

xv. Ein-Dor, P. and Segev, E."Organizational CcvvCo Context and the Success of Management Information Systems, Volume 24, Number 6,1978,pp. 1064-1077

xvi. Furest, WL. An Investigation Into the Factors that may affect Perceived Utilization of Computer Based Decision Support Vol 9.

xvii. Decision Support Systems (DSS) in Construction Tendering Process Rosmayati MOHEMAD1, Abdul Razak HAMDAN2, Zulaiha ALI OTHMAN2 and Noor Maizura MOHAMAD NOOR1, IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 2, No 1, March 2010

xviii. C. W. Holsapple, "Decisions and Knowledge," Handbook on Decision Support Systems1, International Handbook on Information Systems F. Burstein and C. W. Holsapple, eds., pp. 21-53: Springer Berlin Heidelberg, 2008.

xix. Ion ISTUDOR, Luminita DUTA , "Web-Based Group Decision Support System: an Economic Application", Valahia University, Targoviste, Romania, Information Economic vol. 14, no. 1/2010

xx. Manpreet Singh, Parvinder Singh, and Sumitter Bir Singh, Decision Support System for Farm Management World Academy of Science, Engineering and Technology 39 2008, vol 4, p.1,

xxi. George Rigopoulos, John Psarras and Dimitrios Th. Askounis, School of Electrical and Computer Engineering, National Technical University of Athens, Journal of Applied Sciences 8 vol 3 , P. 443-452,2008

xxii. James R. Marsden, The Internet and DSS: massive, real-time data availability is changing the DSS landscape, Information Systems & e-Business Management; Apr2008, Vol. 6 Issue 2, p193-203, 11p