Knowledge-Based Development In Sudan: Key Factors Affecting The Use Of K-BDSS Tools In Small And Medium-Sized Enterprises

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ABSTRACT:

This study identifies factors affecting the perceived use of Knowledge-Based Decision Support System (KBDSS) tools in small and medium-sized enterprises (SMEs) in Sudan. A questionnaire was distributed to 600 staff in three selected companies with a response rate of 45%. The study utilized quantitative data for ease of analysis and control of bias. Descriptive statistics, factor analysis, and multiple regressions revealed that four factors in particular, Technology Infrastructure, Top Management Support, User Satisfaction, and Staff Training, affect usage of K-BDSS tools in SMEs in Sudan. This finding supports those of Laszlo and Laszlo, and Ergazakis and colleagues. The results of this study are not applicable to all industries; however, they provide useful guidance for specific policy formulation in Sudan with regard to SMEs and the use of K-BDSS tools.

Keywords: Knowledge-based development, decision support system, K-BDSS tools, medium-sized company, Sudan

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1. Introduction

There is a general consensus in the literature that the challenges facing modern societies call for development strategies that are knowledge based. Much of the recent empirical literature emphasizes the importance of adopting such development strategies (Carrillo, 2004; Ergazakis et al, 2007; Ergazakis et al, 2006; Ovalle et al, 2004).

However, despite the fact that this view is widely held internationally, there are still a lot of issues which need to be addressed, especially in a growing economy such as that of Sudan, in order for today's companies to compete in the global market place. Sudanese companies need to implement a demarcation process through which knowledge can be created, stored, shared and used. This is very important in order to ensure that there is broad participation by all Sudan society in these knowledge management (KM) processes.

For a knowledge-based decision support system (K-BDSS) to be effective in the context of the knowledge-based economy it needs to operate in an environment that advances innovation and favours the acquisition of knowledge as well as learning (Laszlo & Laszlo, 2002).

Knowledge-based development (KBD) is essentially an infrastructure that enlarges the social collection of knowledge. It is a strategy that facilitates the flow of knowledge and it is also an improvement knowledge approach, based on the recognition, systematization and improvement of the social universe. Knowledge-based development is the process of using KM combined with a decision support system (DSS), thereby enhancing the DSS and helping decision makers to make 'good' decisions (Ovalle et al, 2004).

Many international organizations have adopted frameworks in their strategic plans concerning global development, which clearly indicates that there is a link between KM and knowledge-based development (Carrillo, 2004; Ergazakis et al, 2004; Komninos, 2002).

In the literature it is commonly accepted that knowledge and development are linked together. Research in urban development and urban studies and planning together with knowledge management and intellectual capital has created a favourable environment for the advent of a new concept in the scientific community, that is, the concept of the knowledge city (KC) (Carillo, 2004; Dvir & Pasher, 2004).

It is argued (Ergazakis et al, 2004) that the KC is a city that aims to achieve knowledge-based development by encouraging the continuous creation, sharing, evaluation, renewal and updating of knowledge. This can be achieved through continuous interaction between a city's citizens and interactions with other cities' citizens. The citizens' knowledge-sharing culture as well as the city's appropriate design, IT networks and infrastructures are envisaged to support these interactions.

Moreover, an artificial intelligence (AI)-based DSS has been developed for designing such interactions, by selecting and prioritizing the most appropriate interventions and actions (Ergazakis et al, 2007; Ergazakis et al, 2008). The system consists of two subsystems. The first (developed using the technology of expert systems) assesses the necessity of a particular intervention and proposes its most appropriate form. The second prioritizes the selected interventions based on multi-criteria decision making.

The DSS can be integrated with the KB to assist the user in selecting the appropriate decisions. K-BDSS tools derived from the field of (AI) have improved over the years and are characterized by their ability to represent heuristic knowledge and to work with large amounts of data in a systematic decision-making process (Turban & Aronson, 2005). In this context, (Jong, 2005) defines a K-BDSS as a combination between an expert system and an AI system which is designed to enhance the decision maker's ability to make good and efficient decisions. A K-BDSS is a set of procedures and approaches that maximizes the use and reuse of the knowledge decision assets within an organization. A K-BDSS should assist users in the planning process by presenting information and interpretations for a variety of options.

To the best of our knowledge, there are no studies on the use of the K-BDSS in Sudanese SMEs. Nevertheless, the extant literature does provide indications as to the likely factors that may affect the perceived use of K-BDSS tools in SMEs in Sudan, which evaluated in this research.

This study attempts to: evaluate how a KB is used in a developing country such as Sudan; investigate the possibilities of overcoming the prevailing limitations: and explore the factors that may influence the perceived use of a K-BDSS in medium-sized companies in Sudan.

For the purposes of this research, a medium-sized company is defined as a company that has between 50 and 249 employees and has either an annual turnover not exceeding €50m or an annual balance sheet total not exceeding €43m (Dictionary of Business and Management, 2006).

In Sudan there is a growing number of small and medium-sized companies due to the exploitation of petroleum and the prevailing peace. In the current economic and political climate, most people expect the economy to grow and competition to increase (Ministry of Investment, Sudan, 2006).

2. Background And Literature Review

2.1. Why Knowledge-Based Development?

Over the last few years, the attention of researchers has shifted toward investigating the adoption of KBD because the storehouse of human knowledge about the physical characteristics of our world has been steadily expanding. The accumulation of knowledge about the social characteristics of civilization is also accelerating. There is also a massive amount of new knowledge in other scientific fields such as health, biology, physics etc. (Ergazakis et al, 2007).

According to (Carillo, 2004) a knowledge-based society can lead the way to a global society in which all the basic human needs can be satisfied by future generations while maintaining a healthy, physically attractive, and biologically productive environment.

According to (Conley & Wei, 2009) organizations have created K-BDSS for sustained competitive advantage and to carry out consistent and efficient decisions and activities. Therefore, the K-BDSS is instrumental for the local and global success of organizations in Sudan and other developing countries.

2.2. The Use Of K-BDSS In Small And Medium-Sized Enterprises

According to (Hart & Porter, 2004; Turban & Aronson, 2005) a K-BDSS provides the user with ease of access to previous decisions and data in order to support decision-making tasks. KM systems, expert systems, artificial neural networks, hybrid DSS intelligence, all these aim to make the manager's decision an easy (or easier) and effective one. The key variables affecting the use of K-BDSS are outlined below. These are also tabulated together with the measures for each variable in (Table 1).

2.2.1. Key Factors Affecting The Use Of K-BDSS

Technology Infrastructure

The technology infrastructure necessary for K-BDSS is often perceived as expensive and hard to use. Feedback from employees to improve accuracy, efficiency and flexibility can nevertheless ensure the effective implementation and usage of a K-BDSS in a company (Conley, 2009).

However, it may be difficult for all employees to recognize the influence of the technology infrastructure on K-BDSS unless their job is related to technology infrastructure. In addition, in organizations that have just started to execute K-BDSS systems, technology infrastructure cannot play a significant function as the majority of the organizations do not have proper K-BDSS systems in place (Chong, 2005).

Knowledge Contents

It has been recommended by Barna (2003) and Jennex (2006) that the three KB projects to identify the type of knowledge contents needed to build a successful K-BDSS. They found that improvements could be made and recommend that a K-BDSS needs to have an organization-wide knowledge structure; a standard, flexible knowledge structure; and a common enterprise-wide knowledge structure that is clearly articulated and easily understood.

Staff Training

The role of training to facilitate software implementation is well documented in relation to K-BDSS (Nelson & Cheney, 2000). Furthermore, it is recommend (Barna, 2003; Jennex, 2006) that: users are trained on the use and content of the KB applications; clear demonstrations be provided on how to use an application; employees be trained on the new system; and that hands-on training should take place. In the same vein (Gordon, 1999) points out that training professional play an important role in the success of K-BDSS initiatives.

Organizational Culture

While the content of a K-BDSS is the knowledge itself, a general K-BDSS also includes details on the organization; processes, goals, strategies and culture (King, 2007). Organizational culture is a significant factor which is inextricably associated with K-BDSS within organizations. Organizations that encourage innovation and a willingness to attempt new things among their employees have been found to have better success with K-BDSS implementation (Ruppel & Harrington, 2001).

Top Management Support

The support and commitment of senior management is one of the important factors in the successful use of K-BDSS. Top management support includes: active support of K-BDSS; setting a personal example; communicating the company's KB values to staff; and giving formal and informal recognition to the importance of using the K-BDSS (Yeh et al, 2006).

Project Management

According to (Chan et al, 2002) project management perceives lack of user participation in the K-BDSS project as a failure factor which can result in misunderstanding the users' actual knowledge requirements. Many staff thinks that project management failure is an important factor in the failure of KM projects.

User Satisfaction

It has been widely accepted that user satisfaction with K-BDSS strategy has been more effective indicator of organizational performance (Lo & Chin, 2009).How ever evaluation of a K-BDSS can be done through project evaluations or through internal and external review, executing user satisfaction surveys and as well through benchmarking. In another development, it is suggested (Igbaria, 1998; Beijerse, 2000) that system quality, information quality, causes system use, and user satisfaction are also good evaluators of user satisfaction with K-BSS. Another line of it has been augmented by Conley & Wei (2009) that quality influences approach and performance in a KB system approach is also effective.

K-BDSS Benefits

According to (Chiasson, 2001) the quality of the KM system does not have a significant direct influence on users' perceived benefits. However, it is clear that a K-BDSS with system quality is necessary, but not sufficient, to provide benefits that ensure a K-BDSS is running normally.

Table 1: Variables And Measures

Variable	Measure	Researchers
The perceived use of K-BDSS tools in	▪ System Usage ▪ Perceived Ease of Use	(Chiasson, 2001; Turban & Aronson, 2005)
Technology Infrastructure	▪ Hardware and Software Availability ▪ Connectivity	(Alavi & Leidner, 1999; Barna, 2003; Chong, 2005; Cross & Baird, 2000; Jennex & Olfman, 2002; Mandviwalla et al, 1998; Sage & Rouse, 1999)
Knowledge Content	▪ Knowledge Coverage ▪ Knowledge Structure	(Barna, 2003; Chua & Lams, 2005; Ginsberg & Kambil,

	▪ Knowledge Relevance and Currency	1999; Guptara, 1999; Holsapple & Joshi, 2000; Jennex , 2006; Lucier, 2003; Mandviwalla et al, 1998; Sage & Rouse, 1999; Waltz, 2003)
Staff Training	▪ Training in KBS Human Resource Development ▪ Training in KBS Technological Development	(Alavi & Leidner, 1999; Barna, 2003; Cross & Baird, 2000; Ginsberg & Kambil, 1999; Jennex, 2006; Jennex & Olfman, 2002; Malhotra & Galletta, 2003)
Organizational Culture	▪ Knowledge Sharing ▪ Knowledge Acquisition ▪ Perceived Image ▪ Management Commitment	(Alavi & Leidner, 1999; Barna, 2003; Davenport et al, 1998; Jennex & Olfman, 2002; Sage & Rouse, 1999; Tanriverdi, 2005)
Top Management Support	▪ Leadership ▪ Strategic Planning ▪ Compensation and Reward	(Barna, 2003; Davenport et al, 1998; Holsapple & Joshi, 2000; Jennex & Olfman, 2002; Yeh et al, 2006)
Project Management	▪ User involvement ▪ Technical and Business Expertise ▪ Conflict Management ▪ Project Evaluation ▪ Project Cost	(Chua & Lams, 2005; Guptara, 1999; Lucier, 2003; Waltz, 2003; Zopounidis et al, 1997)
User Satisfaction	▪ Content ▪ Accuracy ▪ Format	(DeLone, 2003; Dennis, 2005; Gelderman, 1998; Holsapple & Joshi, 2000)
K-BDSS Benefits	▪ Knowledge and Information Quality ▪ System Quality ▪ User Satisfaction Index	(DeLone, 2003; Dennis, 2005; Gelderman, 1998; Holsapple 7 Goshi, 2000; Jennex, 2006; Poston & Speier, 2005)

3. The Problem

Despite international recognition of and a wealth of literature on the K-BDSS process, there are still a lot of issues that need to be addressed in this field. In particular, the process through which knowledge is created, stored, shared and used within SMEs in Sudan, which can be summarized by the following two important questions:

Why is effective application of the knowledge-based decision support system proceeding slowly in SMEs in Sudan despite the growth in this sector?

How can we create an enabling environment which will advance innovation and favour the acquisition and dissemination of knowledge as well as learning?

4. Research Model And Hypotheses

The following research model (Figure 1) was developed based on the factors identified in the literature in order to assist this study in answering the above questions.

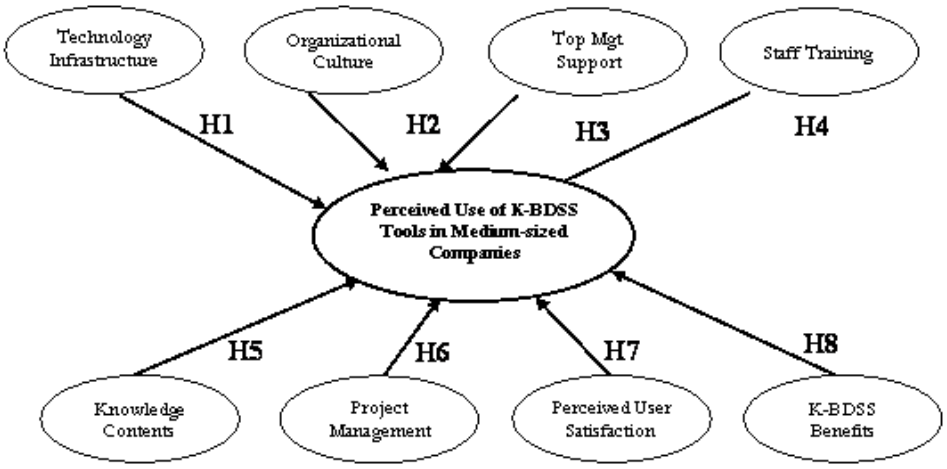

Figure 1: K-BDSS In Medium-Sized Companies As Derived From The Literature

According to the above model, the following hypotheses were tested:

Hypothesis 1

Technology infrastructure is indisputably a key enabler in the implementation of a K-BDSS and its perceived use (Alavi & Leidner, 1999; Cross & Baird, 2000; Lee & Hong, 2002).

> H1: There is a positive relationship between technology infrastructure and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

Hypothesis 2

The knowledge content tool helps developers build a K-BDSS (Barna, 2003; Elfaki et al, 2008; Jennex, 2006).

> H2: There is a positive relationship between knowledge content and the perceived use of K-BDSS tools in small and medium-sized in Sudan.

Hypothesis 3

The training of users in the use and content of the KB is considered essential to the successful implementation of a K-BDSS (Gordon, 1999; Jennex, 2002; Nelson & Cheney, 2000).

> H3: There is a positive relationship between staff training and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

Hypothesis 4

Organizational culture is seen as the main obstacle to using a K-BDSS (Chase, 1997; Gupta et al, 2000).

> H4: There is a positive relationship between organizational culture and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

Hypothesis 5

Top management support is increasingly recognizing the benefits of using a K-BDSS (Chard, 1999).

> H5: There is a positive relationship between top management support and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

Hypothesis 6

Project management of K-BDSS tools in a company depends on the support and involvement of users (Chan et al, 2002; Hoffer & Valacich, 1998).

> H6: There is a positive relationship between project management and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

Hypothesis 7

User satisfaction results from the feelings and attitudes about the total aggregate of benefits that a user hopes to receive from interaction with a K-BDSS (Beijerse, 2000).

> H7: There is a positive relationship between user satisfaction and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

Hypothesis 8

The knowledge or information quality of a K-BDSS has a higher total effect on perceived K-BDSS benefits (Chiasson, 2001).

> H8: The benefits of K-BDSS tools are associated positively with the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

5. Research Methods

A deductive method of research was used for the data analyses. The main purpose of employing this method was to provide a sound and straightforward way of analysing quantitative data, by using the Statistical Package for the Social Sciences (SPSS) to answer the research questions. A multiple field approach was conducted in three purposively selected companies (DAL Motors, SUTRAC, and SAYGA). The selection of these companies was based on two factors: (i) they use a DSS in their management operations more upon when compared with other companies in Sudan, and (ii) in terms of size they fulfilled the criteria of what constitutes a small and medium-sized company (Ministry of Investment Sudan, 2006).

The questionnaire technique of data collection was employed, which provided data on the specified variables in the model.

5.1. Instrumentation

The five-point Likert scale was used to identify the factors that influence the perceived use of K-BDSS tools in SMEs. All questions were formulated and developed to answer the research questions referring to all variables and their measurements. All factors were measured by using different item questions, as shown in Table 3.

5.2. Sampling Techniques

There are approximately 89 KB, SMEs in Sudan with a target population of approximately 21,600 staff. The sampling frame population for the paper was 704 staff. Appropriate usable sample sizes

collected were 268 staff. The purposive sampling method was used to select the field and the convenient sampling method (availability) was used to distribute the questionnaire.

According to (Sekaran, 2003), the sample size for a given population of 1300 is 297. Even though 600 questionnaires were distributed to staff, 200 to each company, only 314 questionnaires were successfully collected. Of the 314 (52.33%) questionnaires that were returned successfully, only 268 (44.66%) copies were completely answered. The remaining of 46 questionnaires could not be included in the study due to incomplete data or poor responses (see Figure 2).

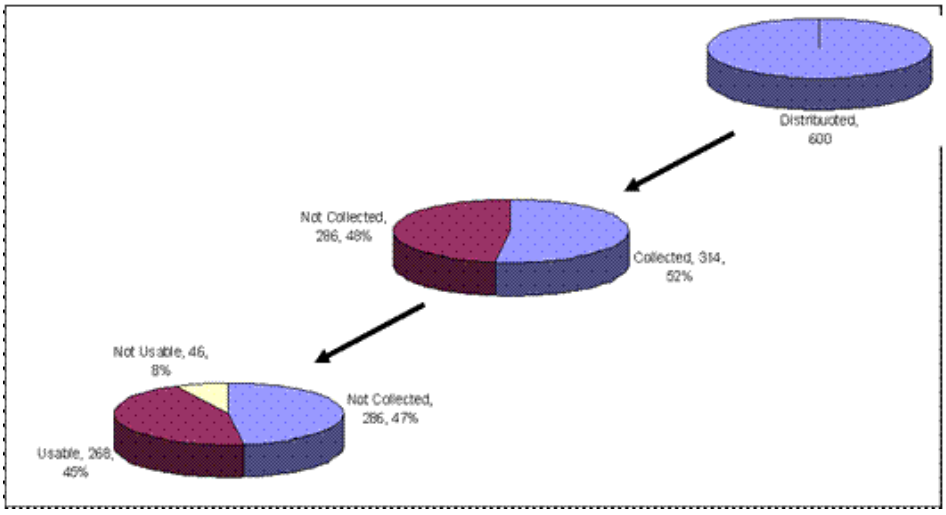

Figure 2: Staff Response Rate.

5.3. Questionnaire

A questionnaire is a set of questions given to a sample of people (Stake, 2005). In a questionnaire, the responses are collected in a standardized way, so questionnaires are more purposeful, than interviews and, generally, the questionnaire is a comparatively quicker means by which to collect data (Carter, 2000).

The questionnaire used in this study consisted of three parts. The first part collected data on each respondent to create a demographic profile. In the second part, there were five questions measuring each respondent's current usage of K-BDSS tools. In the third part, there were 70 questions measuring independent variables or factors that influence the perceived use of K-BDSS tools. As stated above, the five-point Likert scale was used to seek opinions; the respondents drawing a circle around one of five points from bad to good.

Prior to data entry to the software tools, one important step that must performed is data cleaning routines which try to removed unused data and dealt with missed data equally handled unrelated answers in the software's database. This is more related to the quantitative data collected through the questionnaire, with main purpose of testing, verification of the hypothesis. Thus it must be noted that during quantitative data analysis certain steps must be followed that combined the use of SPSS. This study however focused on hypothesis testing through rigorous statistical explanations following three approaches; Reliability, Validity and KMO Testing; Factor Analysis; and Multiple Regressions.

6. Data Analysis And Results

6.1. Demographic Profile Of The Respondents

The first part of the questionnaire collected information on gender, age, nationality, education level, length of service and current position in the company. Table 2 presents the demographic profile of the staff who responded to the questionnaire and the frequency distributions.

Table 2: Demographic Profile.

Category	Response(s)	Frequencies	Percentage %
Gender	Male	163	60.8
	Female	105	39.2
Age	21–35	132	49.3
	36–50	118	44.0
	Above 51	18	6.7
Nationality	Sudanese	202	75.4
	Other	66	24.6
Education level	Diploma	32	11.9
	Bachelor Degree	13 6	50.7
	Master	80	29.9
	PhD	20	7.5
Number of years of employment (length of service) with the company	1–2 Years	69	25.7
	3–5 Years	131	48.9
	> 6 Years	68	25.4
Current position in the company	Senior Manager	28	10.4
	Manager	36	13.4
	Assistant Manager	76	28.4
	Supervisor	104	38.8
	Technician	16	6.0
	Other	8	3.0

6.2. Reliability Testing

Reliability testing was undertaken to ensure that all areas of each construct's domain of interest were covered and that the items truly measured what they were supposed to measure (Cronbach, 1984).

Cronbach's Alpha ‘ ’ value of all factors was found to be greater than 0.7. Hence, each item correlates “adequately” within each construct; A Cronbach's Alpha value of 0.7 or higher suggests good reliability, and the indicators of this model's constructs' validity are good (Hair et al, 2006). Table 3 shows internal consistency reliability.

Table 3: Internal Consistency Reliability for K-BDSS Usage.

Factor	Number of Measured Items	Cronbach's Alpha
Usage of K-BDSS Tools	5	0.859
Technology Infrastructure	6	0.747
Organizational Culture	10	0.896
Top Management Support	6	0.720
Staff Training	7	0.765
Knowledge Contents	9	0.737
Project Management	9	0.721

User Satisfaction	9	0.813
K-BDSS Benefits	9	0.820
Overall	70	0.786

6.3. Data Suitability

The sampling adequacy measure generally indicates whether or not the variables can be grouped into a smaller set of underlying factors; it should be greater than 0.5 for a satisfactory factor analysis to proceed. It can be seen from Table 4 that the KMO measure is 0.794, which indicates good partial correlations.

Table 4 also shows that Bartlett's Test of Sphericity found a significance value of $p < 0.05$, further confirming that this data is suitable for factor analysis (Bartlett, 1937).

Table 4: KMO And Bartlett's Test.

Construct	KMO	Bartlett's Test of Sphericity
Usage of K-BDSS Tools	.755	.000
Technology Infrastructure	.669	.000
Organizational Culture	.839	.000
Top Management Support	.725	.000
Staff Training	.743	.000
Knowledge Contents	.714	.000
Project Management	.685	.000
User Satisfaction	.725	.000
K-BDSS Benefits	.793	.000

6.4. Validity Testing (Factor Analysis)

Factor analysis is a collection of methods used to examine how underlying constructs influence the responses to a number of measured variables; it is a mathematical tool which can be used to examine a wide range of data sets (DeCoster, 1998).

Based on (Hair et al, 2006) for a good construct the items must have adequate correlation with each other. Generally, a correlation value of less than 0.3 indicates a lack of convergence, whereas a value of more than 0.9 indicates a lack of discriminate validity. Loadings of components must be more than 0.450 to be acceptable. Items that do not load properly may be dropped from the instrument (Churchill, 1979; Hair et al, 2006).

7. K-Bdss

7.1. Current Usage Of K-Bdss

There were five items in construct 1, ‘Current Usage of K-BDSS Tools in the Organization (USAGE)’. The descriptive summary is provided in Table 5.

Cronbach's Alpha ‘ ’ value of USAGE = 0.859, which is more than 0.7. Hence, each item correlates “adequately” within the construct. Cronbach’s Alpha value of 0.7 or higher suggests good reliability and indicators of this model's constructs’ validity are good (Hair e al, 2006).

Table 5 shows the results of the factor analysis. As stated above, loadings of components must be more than .450 to be acceptable. In this study, all factor loadings (FA) were found to be greater than 0.450 and no items were dropped.

A KMO value of 0.755 indicates that a 'good' or a strong partial correlation is exhibited in the data for this study: this suggests that this data is suitable for factor analysis (Kaiser, 1974). The factor score was saved as USAGE to be used for further analysis. A single factor was extracted that explained 64% of the total variation in the five items.

7.2. Factors Influencing The Use of K-BDSS

Our literature review on K-BDSS found eight key factors which it was assumed might affect the perceived use of K-BDSS in SMEs in Sudan.

The Cronbach's Alpha ' ' values of all constructs (variables) are greater than 0.7, (See Table 3). Hence, each item correlates "adequately" within the construct. Cronbach's Alpha value of 0.7 or higher suggests good reliability and indicators of this model's constructs' validity are good (Hair et al, 2006).

Table 5 shows the results of the factor analysis, generally all factor loadings are greater than 0.450, and no items were dropped. Loadings of component must at least more than .450 to be acceptable. Items that do not load properly may be dropped from the instrument (Churchill, 1979; Hair et al, 2006). A single factor was extracted that explained are shown in the last column of the total variation in the all items.

Table 5: Factor Analysis Of Degree for Variables.

Construct	No. of Items	KMO	Mini F.L	Max F.L	Extract
USAGE K-BDSS	5	0.755	.690	.864	64%
Technology Infrastructure	6	0.699	.526	.800	45%
Organizational Culture	10	0.839	.602	.803	52%
Top Management Support	6	0.725	.512	.788	42%
Staff Training	7	0.743	.451	.856	43%
Knowledge Contents	9	0.714	.455	.856	35%
Project Management	9	0.685	.485	.652	31%
User Satisfaction	9	0.725	.454	.861	40%
K-BDSS Benefits	9	0.793	.530	.840	42%

8. The Relationship Between The Dependent Variable And The Independent Variables Using Regression.

Multiple linear regression analysis was used to test the research model, namely, the relationship between one dependent variable and more than one independent variable.

Table 6 shows the results of multiple regression analysis between factors and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan. The adjusted squared multiple correlation coefficient (adjusted R2) clearly explains 20 percent of the variance associated with the perceived use of K-BDSS (See Table 7). It can also be seen from table 7 that the F statistic is also significant (F = 8.120), which confirms that not all the variables make a significant contribution to the fit into regression model. Four independent variables, namely, Technology Infrastructure, Top Management Support, Staff Training and User Satisfaction, were found to be

significantly associated with the perceived use of K-BDSS tools in small and medium-sized companies in Sudan.

The term 'Multicollinearity' describes the situation where two or more independent variables are highly associated with each other. The last column in Table 6 shows that the highest VIF (Variance Inflation Factor) value is 1.365, which means that there is no problem of Multicollinearity (Hair et al, 2006).

Table 6: Results Of Regression Model Analysis Between The Dependent Variable (The Use Of K-BDSS Tools In SME's In Sudan) And The Independent Variables.

Variable	B	Std. Error	Beta	T	Sig.	VIF
Technology Infrastructure	.335	.059	.335	5.718	.000	1.111
Organizational Culture	-.003	.061	-.003	-.047	.962	1.193
Top Management Support	.221	.058	.221	3.799	.000	1.099
Staff Training	-.139	.059	-.139	-2.349	.020	1.126
Knowledge Contents	.075	.057	.075	1.307	.192	1.063
Project Management	-.011	.057	-.011	-.193	.847	1.037
User Satisfaction	.105	.062	.105	1.689	.029	1.249
K-BDSS Benefits	.071	.065	.071	1.092	.276	1.365

Table 7: ANOVA.

Source	Sum of Squares	Df	Mean Square	F	Sig.
Regression	53.541	8	6.693	8.120	.000(a)
Residual	213.459	259	.824		
Total	267.000	267			

R^2= .201, F = 8.120

8.1. Stepwise Regression

Stepwise regression was used to identify the predictors of the use of K-BDSS tools in small and medium-sized companies in Sudan. Table 8 shows the results (significant) of the regression model applied between the dependent variable (the use of K-BDSS) and the independent variables (Technology Infrastructure, Top Management Support, User Satisfaction, and Staff Training).

Table 8: Results Of The Stepwise Regression Model.

Model	B	Std. Error	Beta	T	Sig.
Technology Infrastructure	.327	.056	.327	5.851	.000
Top Management Support	.214	.058	.214	3.708	.000
User Satisfaction	.138	.057	.138	2.405	.017
Staff Training	-.134	.056	-.134	-2.389	.018

R^2= 0.190

The regression equation is:

Perceived use of K-BDSS = 0.327(TECH) + 0.214(MGT) + 0.138(SATS) – 0.134(STRN).

For every unit increase in TECH, USAGE is expected to increase by 0.327 units, provided MGT, SATS and STRN remain unchanged.

For every unit increase in MGT, USAGE is expected to increase by 0.214 units, provided TECH, SATS and STRN remain unchanged.

For every unit increase in SATS, USAGE is expected to increase by 0.138 units, provided TECH, MGT and STRN remain unchanged.

For every unit increase in STRN, USAGE is expected to decrease by 0.134 units, provided TECH, SATS and STRN remain unchanged.

8.2. The Stepwise Regression Using Association For Demographic Variables

Figure 3 and Table 9 shows the results of Univariate Analysis of Variance between demographic variables (Gender, Age, Nationality, Education Level, Length of Service and Position) and the perceived use of K-BDSS tools in small and medium-sized companies in Sudan. The F statistic is significant (F = 15.993), which confirms that not all the variables make a significant contribution to the fit into the model. Only one demographic variable, namely Age, is found to be significantly associated (Sig. =.036< .05) with the dependent variable, the perceived use of K-BDSS tools in small and medium-sized companies in Sudan (USAGE). Respondents aged 50 and below are

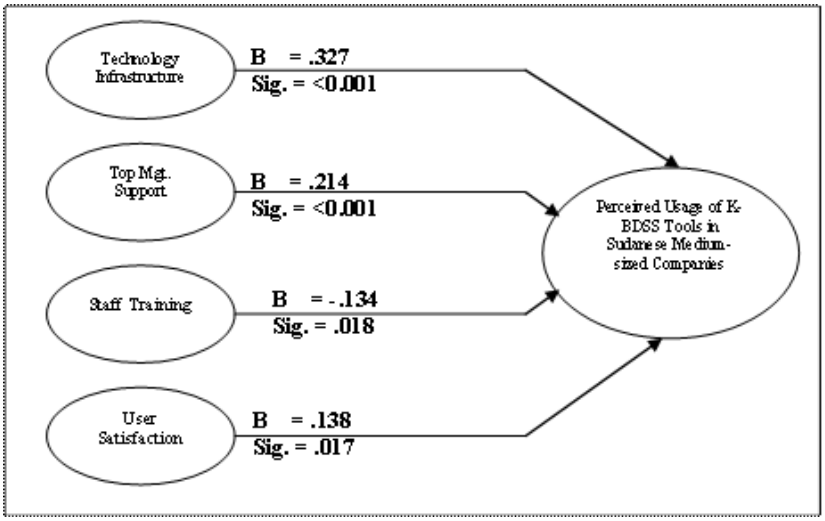

Figure 3: Results Of Stepwise Regression Model Using Association For Demographic Variables.

Table 9: Results Of Univariate Analysis Of Variance Between Demographic Variables And The Use Of K-BDSS Tools In SME's In Sudan.

Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
A.2 Age	4.267	1	4.267	4.444	.036

Dependent Variable: USAGE
Notes: F = 4.444 (p= .036), t=-.355, R Squared = .234

9. Overall Hypothesis Test

In conclusion, the quantitative analysis results provide statistically significant support for hypotheses H1, H3, H4 and H7, but not for hypotheses H2, H5, H6, and H8. Table 10 presents this conclusion.

The acceptance rule of factors (p< .05) and the significance value (p< 0.05) further confirm that this variable is suitable and significant with dependent variable (Bartlett, 1937).

Table 10: Overall Hypothesis.

No.	*t*-value	*p*-value	Result	Relationship
H1	5.718	.000	Supported	Positive
H2	-.047	.962	Not Supported	No relation
H3	3.799	.000	Supported	Positive
H4	-2.349	.020	Supported	Negative
H5	1.307	.192	Not Supported	No relation
H6	-.193	.847	Not Supported	No relation
H7	1.689	.029	Supported	Positive
H8	1.092	.276	Not Supported	No relation

10. Discussion And Conclusions

This study attempted to identify the key factors affecting use of K-BDSS tools in Sudanese small and medium-sized companies. The results of the analysis provided strong evidence to support some but not all of the proposed hypotheses.

Of the overall factors, Technology Infrastructure made the greatest statistically significant contribution to the perceived use of K-BDSS in Sudanese small and medium-sized companies. It is observed (Alavi, 1999; Hong, 2002; Cross & Baird, 2000) that technology infrastructure is indisputably a key enabler in the implementation and the perceived use of a K-BDSS. Basically, technology infrastructure is the driver of the K-BDSS. In relation to this matter, it has been stated by Lyytinen and Rose (2003) that having a K-BDSS and keeping up to speed with developments in technology infrastructure are critical to a company's success in sustaining competitive advantage; however, doing so is an ongoing challenge for many organizations.

Top Management Support is the second most important factor that is statistically significant to the perceived use of a K-BDSS. This result is compatible with (Chard, 1999) findings, which show that top management is increasingly recognizing the benefits of using a K-BDSS. Moreover, it mentioned (Turban & Aronson, 2005; Wilsey, 1999) that, for successful K-BDSS implementation, there needs to be visible leadership and commitment from senior management, which must be sustained throughout a KM effort. The leadership and commitment of top management are the most critical factors for successful K-BDSS projects in Sudan because the planning and control of knowledge-based activities is completely the responsibility of senior management.

The third factor that is significant is User Satisfaction. It is stated (Beijerse, 2000; DeLone, 2003; Lo & Chin, 2009) state that user satisfaction results from the feelings and attitudes derived from aggregating all the benefits that a user hopes to receive from interaction with the K-BDSS. In this

regard, it is founded (DeLone, 2003) that most of Sudanese staff are impressionistic in their work and performance. The core values of users are critical to the successful use of a K-BDSS.

The fourth factor that has a significant relationship with the use of K-BDSS in medium-sized companies is Staff Training, but in this case it is negative one. Many researchers have identified a positive relationship between them; it is mentioned (Schwarz, 2007; Nelson & Cheney, 2000; Davenport et al, 1998) that the role of training to facilitate software implementation is well documented in the K-BDSS field, and the lack of user training and failure to completely understand how enterprise applications change organizational processes frequently appear to be responsible for the problems during K-BDSS implementation. However, in Sudan, most staff undergoes irrelevant training and therefore is unable to take advantage of the specific training they have received and to apply it in their current job.

Further findings of association between demographic variables and the use of K-BDSS shows that only Age is significant (Sig. =.036< .05, B value is -.355). Staff who are 50 years and below are more likely to use a K-BDSS compared to those over 50 years old due to barriers in exploiting technology. Many researchers have indicated that age is one of the most significant factors influencing whether or not people engage with technology.

Organizational Culture, Knowledge Contents, Project Management, and K-BDSS Benefits were found not to be significant to the perceived use of K-BDSS tools in Sudanese small and medium-sized companies.

This study has identified the factors that influence the perceived use of K-BDSS tools in small and medium-sized companies in Sudan to be: Technology Infrastructure, Top Management Support, User Satisfaction, Staff Training (negative due to the type, period and time of training), and Age to a lesser extent.

To summarize, the results of our analysis provide significant support for hypotheses H1, H3, and H7, but not hypothesis H2, H5, H6, and H8. Only H4 is affected negatively.

It should be noted the data collected from some respondents may not totally accurate because some of them might feel the information requested should be kept confidential. The sample obtained for this research study consisted of more males (61%) than females (39%). Previous studies indicate that gender may have an impact on usage behaviour (Bandyopadhyay & Fraccastoro, 2007; Venkatesh et al, 2008).

It should also be noted that results may not be generalized to all other companies or to other countries. These results are specific to Sudan because the experience of Sudanese organizations in implementing and using K-BDSS is weak. It pointed (Fageer & Merghany, 2006) out those examples of the use of KM, KB, and DSS in Sudanese organizations are few and far between, and where they do exist, they tend to be of poor quality.

In order to have a highly effective K-BDSS, a company must be equipped with all four success factors, i.e. Technology Infrastructure, Top Management Support, User Satisfaction and Staff Training. Implementation of a K-BDSS is, however, well worth pursuing because effective usage can result in improved efficiency, increased income and better productivity.

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