KNOWLEDGE SHARING BEHAVIOR OF RESEARCH INSTITUTIONS IN SUDAN

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ABSTRACT
The aim of this study is to examine the factors that influence knowledge sharing behavior (KSB) in the context of research and development as one of the knowledge-oriented sectors in developing countries taking Sudan as an example. Based on the literature review, a valid instrument was adopted to collect the required data. 239valid questionnaires were collected from Sudanese research institutions using a stratified random sampling technique. The structural equation modeling (SEM)was used to assess the research model. The results showed that, while attitude, subjective norm, and self-efficacy had a positive effect on the intention to share knowledge, controllability did not show a significant relationship with this variable. In addition, the intention to share knowledge and controllability reflected a positive effect on KSB. Finally, significant relationships were found between the TPB elements. Since there is a lack of such research in the context of this study, particularly in developing economies, this paper can provide a theoretical basis for future research as well as practical implications for practitioners.

Keyword: Knowledge Sharing Behavior, Research Institutions, Theory of Planned Behavior, Sudan.

1. INTRODUCTION
In the era of knowledge economy, knowledge is considered as a crucial resource for organizations to obtain sustainable competitive advantage, which in turn, has driven several organizations to adopt knowledge management (KM) (Bernstein, 2018; Luo& Bu, 2016; Young, 2018). A crucial component of KM practices is the efforts undertaken by organizations to motivate knowledge sharing behaviour (KSB) among employees.
A key element of a knowledge economy is academic institutions, and R&D organizations that are engaged in the processes of both generating and disseminating knowledge (Jolaee*et al.,* 2014). KS is critical for KM initiatives in all organizations and particularly in knowledge-intensive organizations like research institutions (Cheng*et al*., 2009). KS is designed to facilitate processes within these organizations in order to transfer the appropriate knowledge and experiences, as well as assist the decision-making process which ultimately result in the effectiveness and efficiency of these organizations (Madonand Krishna, 2018; Paulinand Suneson, 2015).

In Sudan there are several research institutions in different disciplines such as electronics, materials, chemistry, biotechnology, information technology, and industrial engineering, social science, mechanical and manufacturing. Despite this huge and diversity of research institutions and centres we do not expect them to maintain a good environment for adopting KM initiative where KSB can take place. This could be approximated by the fact that Sudan appears to have a very weak performance in terms of knowledge creation, dissemination and utilization, as indicated by its global rankings regarding various indicators.

In the Global Innovation Index (GII) report for 2015, which covered 141 economies around the world, Sudan was ranked 140 and 141 (out of 141) in terms of Innovation Input/output Indices respectively with a position of 90 in R&D, 122 in scientific performance, 139 in creative performance, 136 in innovation efficiency, 132 in knowledge creation, and 127 in terms of scientific and technical publications (Dutta*et.al*., 2015). Sudan's poor output performance in knowledge creation, dissemination, and innovation is a big concern to the Sudanese government and represents a major barrier that prevents the country to thrive in global competition.

In R&D, cooperation and KS are vital in influencing output performance, identification of ideas, assimilation, implementation and innovation (Hu and Randel, 2014). Therefore, it is crucial to identify the factors that affect KSB, which may constitute the first step toward boosting the output performance of R&D sector of Sudan.

The aim of this paper is to examine the factors the influence KSB among researchers working in the research institutions in Sudan. The paper investigated the impact of individual factors: intention, attitude, subjective norms, knowledge self-efficacy, and controllability on the KSB in the research institutions based on the Theory of Planned Behavior (TPB). It is expected that the findings of this research will contribute to the development of deeper understanding of KSB in the context of knowledge-based organizations. Uncovering the perceptions and attitudes of researchers toward KS will help in recognizing what academic institutions must be conscious of in order to build an organizational culture that is conducive for KSB. The study also will contribute to the improvement of the quality of scientific research through motivating KSB at these organizations.

The rest of the paper is organized as follows: section two embodies the relevant literature review. Section three presents the research model and hypotheses development. Section four covers the research methodology. Section five presents the data analysis and results. The discussion of findings and implications are included in section six.

2. LITERATURE REVIEW
2.1. Knowledge Sharing: an Overview
Knowledge sharing is a set of behaviors that involve the exchange of information, sharing, and donating task-relevant ideas, information and suggestions between employees and team members (Elrehail*et al*., 2017). Several scholars consider KS as one of the most critical processes in KM as well as the cornerstone for its effectiveness. This is due to the fact that knowledge resources principally reside in individual' minds (Amayah, 2013) and organizations have to exploit this valuable resource to achieve sustainable competitive advantage. For that reason, organizations should leverage their employees' cooperation to share work-related knowledge.

Previous research has endeavoured to identify numerous explanatory factors that are believed to influence the KSB of individuals in different context. Much of these works have been

conceptual, or qualitative. Other researchers have utilized questionnaire surveys. Jointly, these studies have identified several factors that affect KSB, these factors span from "hard" issues such as technologies and tools to "soft" issues such as motivation, communication, environment, organizational culture, personal values and self-identities, national culture, and trust(e.g. Akhavan *et al*., 2015; Jarrah and Alkhazaleh, 2020; Wang, Yen and Tseng, 2015; Wasko and Faraj 2000; Zhen *et al.,* 2011).

1.2.Knowledge Sharing Research in Academia

KS is critical for KM initiatives in all organizations and particularly in knowledge-intensive organizations like research institutions (Cheng*et al.*, 2009). KS is designed to facilitate processes within these organizations in order to transfer the appropriate knowledge and experiences as well as assist the decision-making process which ultimately result in the effectiveness and efficiency of these organizations (Madonand Krishna, 2018). The knowledge-based economies employ ICT, innovation, scientific research, and human capital to create, disseminate, and apply knowledge for development and sustainability (Tong and Baslom, 2019).

Despite the critical role of academics as intellectual leaders and expert knowledge workers for the development of society, some prior studies have revealed that, researchers are more inclined to hide knowledge, and are attending to their individual accomplishment instead of attaining their organizations' goals. The tendency of knowledge hiding by academics can be attributed to several factors. (CharbandandNavimipour, 2018; Fullwoodand Rowley, 2017).

In the context of this research, previous studies (e.g. Jarrah and Alkhazaleh, 2020; Al-Kurdi*et al*., 2018; Al-Husseini, and Elbeltagi, 2018) examined the factors that influence KSB in the domain of research organizations, universities and higher education. The investigated factors are mostly categorized into individual, organizational, and technological factors (Tan, 2016).

Since KSB is performed by human operator, behavioral issues reasonably play a key role in the decision of individuals to share or not to share their knowledge. Individual factors considered by previous studies included: trust, personal attitude, motivation, affective commitment, subjective norms, personal expectation, and intention (e.g. Alotaibi*et al.,* 2014; Jolaee*et al*., 2014).

Organizational factors from the reviewed literature included: organizational culture, climate, subcultures, reward & incentive systems, and management support (e.gAl-Kurdia*et al.,* 2018;Elrehail*et al.,* 2017; Liou*et al*., 2016). The technological factors were investigated by few studies (Alotaibi*et al.,*2014). These technological factors included; the acceptance of IT as a tool for KS, general technology-related factors, and reluctance to use IT tools.

While there has been a large number of scholars who identified a list of determinants of KSB and addressed some of its obstacles among employees (e.g. Fullwood and Rowley 2017; Cacho, and Ribiere, 2018; Al-Kurdi*et al.,* 2018), however, limited research in developing countries has been focused on understanding KS in the context of knowledge-based organizations, (e.g. Goh and Sandhu, 2014; Howell and Annansingh, 2013). The literature has also shown that research on higher education institutions in Africa as overall is still at its initial phase (Thiong'o, 2020). Consequently, this study pursues to fill the research gap in this area.

1.3 Theoretical Model and Hypotheses Development

This research and its hypotheses are theoretically based on the Theory of Planned Behaviour (

TPB). The TPB developed by Ajzen (1991) is perhaps the most commonly used social-psychological model for explaining human behaviour in specific contexts. Accordingly, TPB is adopted as the theoretical base in this study.

According to TPB, the primary determinants of an individual's behavioural action are intention and perceived behavioral control (PBC). Intention is an indication of the individual's readiness to engage in certain behaviour. Intention in turn is a function of three antecedences: individual's attitude towards behaviour, subjective norm and PBC, with each determinant weighted for its significance in relation to the behaviour and population in question. Ajzen (1991) asserted that as a general rule, the more favorable the attitude and subjective norm with respect to behaviour, and the greater the PBC, the stronger should be an individual's intention to perform than behaviour.

Figure 1 shows the research model and hypotheses formulated on the basis of TPB. A dominant construct in TPB is individuals' intention to perform a given behaviour. In this study the Intention to Share Knowledge (ISK) measures the readiness of researcher to involve in KSB. Consistent with the TPB, it is expected that favorable ISK will lead to greater KSB. Thus it is hypothesized that:

H₁: ISK positively influences actual KSB.

TPB suggests that behavioural intention is collectively determined by the individual's Attitude (AT), Subjective Norm (SN) and Perceived Behavioural Control (PBC). Positive AT towards KS should increase ISK (Ajzen, 1991). Following the TPB a positive association between AT and ISK among research staffs in research institutions is expected to be found. Thus the following hypothesis is developed.

H₂: A favorable AT toward KSB positively influences ISK.

The second determinant of ISK is the SN of the individual. In this study, SN refers to the social pressure created by top management to encourage or discourage KSB among researchers. The perceived social pressure is formed by evaluating expectations of relevant referents. People are likely to behave in accordance with the prevailing norms in the working environment. In research institutions, if a person perceives that KSB is reinforced and valued by important members such as peer groups and managers, he/she would have a greater ISK. Thus:

H₃: SN supportive of KSB positively influences ISK.

The last determinant of ISK is the PBC. TPB suggests that PBC boosts intention because individuals are only motivated to undertake tasks at which they succeed. When people lack the necessary self-efficacy, opportunities or resources, are less likely to have ISK even if they enjoy a favorable AT towards KS and a positive SN (Akhavan *et al*., 2015).Thus it is hypothesized that:

H₄: PBC towards KSB positively influences ISK.

Consistent with the TPB and previous research(e.g. Ajzen, 1991), in this study, PBC is conceptualized as two dimensional construct; (Self-Efficacy, Controllability).

Self-Efficacy(SE) refers to an individual's self-assessment that his orher own contribution will make a difference in the success of a collective action (Oliver, 1993). The literature suggests that individuals will be more motivated to share knowledge when they think they have the competence toprovidea knowledge that is valuable and relevant to others. Hence:

H₄ₐ: Knowledge SE positively influences ISK.

Controllability (CON) refers to beliefs about the extent to which performing a behavior is controlled by the knowledge proprietor. Compared with SE which reflects internal features regarding people's confidence, CONis assumed to deal with external features such as time and

external resources (Ajzen, 1991). Hence, it is expected that CON and ISK will be positivelylinked in research institutions. Thus:

H$_{4b}$: CONpositively influencesISK in research institutions.

Ajzen's (1991) TPB proposes that PBC not only affects an individual's intention to perform a given behavior but also influences the individual's actual performance of that behaviour. Ajzen (1991) presented two justifications forthe direct link from PBC to actual behavior construct. First, keeping intention constant, the probability of performing actual behavior is likely to increase with PBC. Second, PBCis often operated as a measure of actual control. Actual control over behaviourincludes all non-motivational factors as availability of the requisite opportunities, time, and resources.
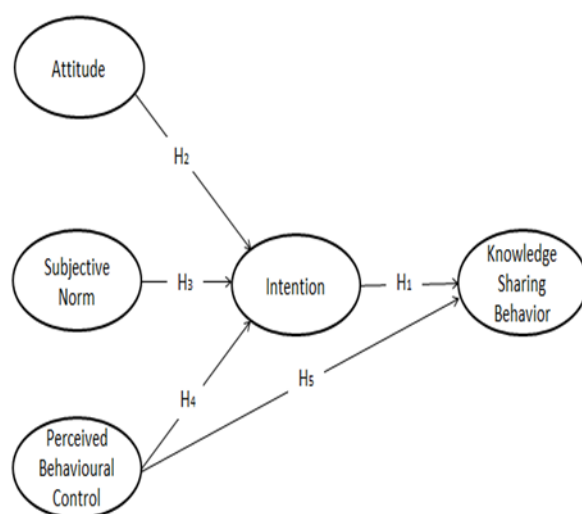
H$_5$: Individuals' PBCover KSB positively influences actual KSB.

This general hypothesis is further breakdown into two sub-hypotheses as follows:

H$_{5a}$: Knowledge SE positively influences KSB in research institutions.

H$_{5b}$: CON positively influences KSB in research institutions

Figure 1: The Research Model

Note: the sub-hypotheses of H4 (a-b) and H5 (a-b) related to the two dimensions of PBC (i.e. controllability and self-efficacy) are not depicted in this figure.

4. MATERIALS AND METHODS

4.1. Research Design

Given the pre-stated research objectives, this study adopted the explanatory quantitative approach of research for testing the hypotheses using correlational type of investigation. The study is carried out on a cross-sectional basis using a field study in which the data is gathered in one-time from the sample. The main instrument to collect the primary data is a survey method using a self-administered questionnaire designed and distributed to a sample of respondents.

4.2. Measurement Development

The measurement items employed in this study to operationalize the constructs were adopted from previously validated instruments (Bock*et al*.,2005; Taylor and Todd, 1995; Lin, 2007). The reliabilities reported by these previous studies exceed the recommended level of (0.70) suggesting that the measures are valid and reliable. All constructs were measured using five-point Likert-scale (ranging from 1= strongly disagree to 5= strongly agree).

4.3. Reliability of the Instrument

The Cronbach's alphas for the study constructs are shown in table 1 below, along with their labels and number of items. According to Hair*et al*,(2010), the minimum acceptable level for Cronbach's alpha is 0.70. The findings of the reliability analysis summarized in table (1) showed that all Cronbach's alphas of the constructs involved in this study were above the recommended threshold for the fulfillment of construct reliability, indicating that the measures used for collecting data were internally consistent and highly reliable.

Table 1: Constructs' Reliability

Construct	Number of Items	Cronbach's Alpha
AT	4	0.834
SN	2	0.898
SE	3	0.869
CON	3	0.886
ISK	6	0.894
KSB	4	0.808

4.4. Sampling and Data Collection

The population of this study encompasses the research staff members in 62 research institutions, comprising 37 institutions belong to universities and 25 institutions belong to federal ministries in Sudan. The study unit is the individual researcher and/or research assistant. The members of the sampling frame are identified with two eligibility criteria:

-   Research centres/ institutes with five or more researchers and/or research assistants currently enrolled in the centre/institute.

-   Research centres/ institutes with more than one year operating in the field of scientific research.

Moreover, the study only considered permanent staff members. The visiting and voluntary members were not considered as part of the studied population due to the temporary nature of their involvement with the research organizations.
The institutions in the sampling frame are stratified according to their affiliation (university or ministry), in addition to this, the professional status (researcher or research assistant) is used as

another stratification variable. This leads ultimately to the following four strata.

	Universities	Ministries
Researchers	281	860
Research Assistants	59	379

Given this structure the appropriate sample design is stratified random sampling. The overall sample size is given by:

$$n = \frac{z^2_{\frac{\alpha}{2}} \, P(1-P)}{d^2} * \text{deff} * f_{nr}$$

Where:

$z_{\alpha/2}$ = The confidence coefficient (for 95% confidence $z_{\alpha/2}$ =1.96), P = the proportion of researchers or research assistants who share their knowledge (Taken as P = 0.5), d = Error margin = 0.06, $deff$ = Design effect (0.9), f_{nr} = Nonresponse inflation factor = 30% (obtained from the pilot study). Accordingly;

$$n = \frac{0.9604 \times 0.9}{0.0036} \times 1.3 = 312$$

These are allocated proportionately to the four strata using the formula:

$$n_h = n \, \frac{N_h}{N}$$

Where: N_h = size of study units in stratum h, N = Total of study units, n_h = size of sample from h^{th} stratum. Accordingly;

$$n_1 = \frac{312 * 281}{1579} \approx 56$$

$$n_2 = \frac{312 * 860}{1579} \approx 170$$

$$n_3 = \frac{312 * 379}{1579} \approx 75$$

$$n_4 = \frac{312 * 59}{1579} \approx 12$$

The allocation of the overall sample is illustrated as follows:

	Universities	Ministries
Researchers	56	170
Research Assistants	12	75

Selection of samples from each of the four strata is done by simple random sampling. A self-administrated questionnaire was used as primary data collection instrument. Out of 312questionnaires, 239 valid responses were obtained, resulting in an effective (76.60) per cent response rate. Table 2 summarizes the demographic information of respondents.

Table 2: Profile of Respondents

Item	Categories	Frequency	%
Sex	Male	150	62.8
	Female	89	37.2
Age	21 to 30	40	16.8
	31 to 40	97	40.6
	41 to 50	49	20.5
	51 to 60	35	14.6
	61& Above	18	7.5
Tenure	Under 1	6	2.5
	1 to 10	108	45.2
	11 to 20	70	29.3
	21 to 30	36	15.1
	above 30	19	7.9
Education	Bachelor	66	27.6
	Master	65	27.2
	Doctorate	108	45.2

Academic Rank			
	Professor	6	2.5
	Associate Prof	10	4.2
	Assistant Prof	12	5.0
	Research Prof	9	3.8
	Associate Research Prof	31	13.0
		40	16.7
	Assistant Research Prof	55	23.0
	Researcher	35	14.6
	Research Assistant	23	9.6
	Senior Research Assistant	10	4.3
	Lecturer	8	3.3
	Teaching Assistant		

4.5. Statistical Analysis

The research model shown in Figure 1 was analyzed primarily using SEM, supported by analysis of moment structure (AMOS) software.

5. DATA ANALYSIS AND RESULTS

5.1. Measurement model

Following previous studies, a two stages strategy was used to assess the measurement model: Model reliability is first assessed by Cronbach's alpha. Table 1has shown that all the alpha values exceed the threshold of 0.7 recommended by Nunnally (1978).

Confirmatory factor analysis (CFA) is then used to evaluate construct validity and test the model fit. In order to evaluate the validity, both convergent and discriminant validity were assessed. Convergent validity was assessed by examining factor loadings of indicators; which should be significant and exceed 0.6. Composite reliability (CR);should exceed the cut-off level of 0.7 suggested by Hair *et al*. (2010).Average variance extracted (AVE); should be more than 0.5 for all constructs (Fornell and Larcker, 1981). Findings of the analysis revealed that, all the factor loadings achieved the acceptable level. Factor loadings range from .64 to .99 and were all significant at 0.01, CR for all variables was above 0.7. Moreover, the AVE ranges from 0.530 to 0.802. Therefore, it is safe to conclude that the measurement model satisfies all the convergent validity criteria. Table 3 shows factor loadings, CR, and AVE of all constructs in the measurement model.

Table 3: Convergent Validity Results

Construct	Item	Factors loading	CR	AVE

AT	at1 at2 at3 at4	.742 .750 .777 .697	.830	.551
SN	sn1 sn2	.791 .989	.889	.802
CON	con1 con2 con3	.712 .882 .784	.861	.675
SE	se1 se2 se3	.713 .908 .846	.837	.634
ISK	isk1 isk2 isk3 isk4 isk5 isk6	.663 .709 .798 .833 .789 .729	.888	.571
KSB	ksb1 ksb2 ksb3 ksb4	.635 .685 .808 .772	.817	.530

To assess the discriminant validity, the researchers compared the square root of AVE for each construct to all inter-factor correlations shown in Table 4. As a rule of thumb, the square root of the AVE for an individual construct should be much larger than the variance shared between the construct and other constructs in the model and should be greater than 0.5 recommended values (Fornell and Larcker, 1981). All factors demonstrated adequate discriminant validity since all the square roots of AVE values were greater than variables correlation.

Table 4: Discriminant Validity Results

	CON	AT	SN	SE	ISK	KSB
CON	**.822**					
AT	.180	**.742**				
SN	.172	.182	**.895**			
SE	.215	.184	.175	**.796**		
ISK	.159	.334	.240	.393	**.756**	
KSB	.255	.428	.203	.280	.536	**.728**

The overall measurement model fit is assessed by three types of measures recommended by Hair *et al.* (2010): First, the absolute fit measures (e.g. Chi-square, Goodness of Fit Index (GFI), Root

Mean Square Residual (RMR), and Root Mean Square Error of Approximation (RMSEA). Second, incremental fit measures (e.g.Comparative Fit Index (CFI), Turker–Lewis Index (TLI) and incremental fit index (IFI). Finally, parsimony fit measures (e.g. parsimonious comparative fit index (PCFI) and parsimonious normed fit index (PNFI). Table 5 shows that all the goodness-of fit indices achieve desired levels of values, suggesting that the model fits the data well.

Table 5: Model Fit -Measurement Model

Model-fit index	Criteria	Scores
Chi^2/df	< 5	279.209/192=1.454
GFI	$> .80$	.904
RMR	$< .09$	.017
RMSEA	$< .05$	.045
TLI	$> .90$	.955
CFI	$> .90$	.963
IFI	$> .90$	.963
PCFI	$> .50$	.800
PNFI	$> .50$	.741

5.2.Structural model

To test the research hypotheses, a structural model is developed as shown in Figure 2.Model testing was first based on estimating the overall fit indices of the structural model, as shown in Table 6. All the model-fit indices exceeded their respective recommended levels, suggesting that the model presented fitted the data well.

Figure 2: Structural Model
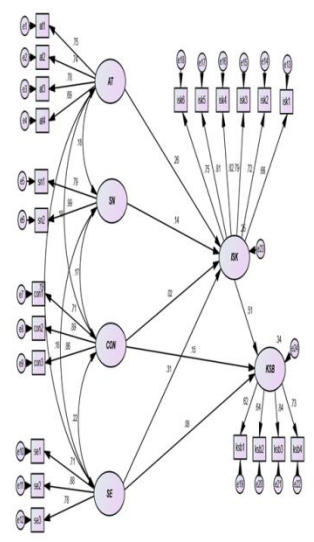
Table 6: Model Fit- Structural Model

Model-fit index	Criteria	Scores
Chi^2/df	< 5	273.388/190=1.439
GFI	> .80	.906
RMR	< .09	.019
RMSEA	< .05	.044
TLI	> .90	.957
CFI	> .90	.964
IFI	> .90	.965
PCFI	> .50	.793
PNFI	> .50	.735

The second step in the structural model testing was to examine the significance of each hypothesized path between the latent variables. Table 7 summarizes the results of hypotheses testing.

Table7: Hypotheses Test Results

H	S.E	C.R	P	Remarks
H_1	.098	5.420**	**	Supported
H_2	.064	3.388	**	Supported
H_3	.038	2.025*	.04	Supported
H_{4a}	.065	4.203**	**	Supported
H_{4b}	.041	.351	.72	Not Supported
H_{5a}	.071	.871	.38	Not Supported
$H5_b$	.044	2.334*	.02	Supported

*Significant at t. value ≥1.96 with p ≤ 0.05, **Significant at t. value ≥ 2.59 with p ≤ 0.01*

The results of the first set of hypotheses (i.e. H2, H3, and H4a) revealed that of the two sub-constructs of PBC construct, SE has the most significant impact on ISK (H_{4a}: *t-value* is4.203;p < 0.001), reaching the statistical significance. The results indicated that SE has a positive and direct influence on ISK. The second sub-construct i.e. CON however, has no such significant influence (H_{4b}: *t-value* is 0.351, p value 0.725). H3 is therefore partially supported as only H3a was significant. The next significant factor influencing ISK was AT (H_2: *t-value* is3.388; p < 0.001) which also reached the statistical significance. These statistics suggest that the AT factor also has a positive and direct influence on ISK. Moreover, SNhas also significant influence on ISK (H_3: *t-value* is 2.025; p value 0.043).

It is noted from the above findings that, although, the estimated coefficient of CON (0.014) revealed a small positive direct effect on ISK, their path coefficients, however, were not significant at p. 0.05 levels, indicating that the hypotheses were only "partially" supported. This means that, although the relationship between and CON and ISK was found to be positive as the TPB suggested, the results for CONcould only be characterized as inconclusive. In summary, among four constructs that were hypothesized as predictors of research staff member's ISK, only positive AT toward KSB and SE were supported.

The second set of hypotheses (i.e. H1 and H4) showed that, ISK emerged as a significant predictor of KSB (H$_1$: *t-value* is 5.420; p < 0.001). CON was also found to be significant determinant of KSB (H$_{5b}$: *t-value* is 2.334, p < 0.05). However the direct effect of SE is proved to be a poor direct predictor of actual KSB (H$_{5a}$: *t-value* is .871; p value 0.381). This result reveals that SE exerts indirect influence on actual KSB through its direct influence on ISK. Thus, H$_5$ is only partially supported. The percentage of variance explained for KSB was 34%.

6. DISCUSSION

The findings of this research provide support for the proposed research model and for most of the hypotheses. The results offered partial support for a TPB-based research model of KS. In short, most of the hypothesized paths among the central constructs of TPB were significant. More specifically, this study found that AT toward KSB has a strong positive effect on ISK among researchers. This result is consistent with the results of prior studies on KSB, using the TRA and TPB, (e.g. Daud*et al.*, 2015; Huang *et al.,* 2008; Zhang*et al.,* 2012; Akhavan *et al.,* 2015) who have found that positive behavioural attitude to KS, greatly elevate the individuals' intention toward KSB. The significant positive influence of AT towards KSB suggests that researchers and research assistants in research institutions in Sudan are more likely to engage in KSB. This may resulted from a variety of extrinsic and intrinsic motivational drivers such as perceived organizational incentives, perceived reciprocal benefits, perceived reputation enhancement, and perceived enjoyment in helping others as antecedents to AT.

Moreover, in accordance with the TPB,SN also demonstrated a relatively significant relationship with ISK. This result is consistent with previous research (e.g. Bock *et al*., 2005; ChatzoglouandVraimaki, 2009).

Furthermore, the results showed that, of the two sub-constructs of PBC, namely, SE and CON, knowledge SE emerged as significant determinant of ISK. Consistent with previous research (e.g. Cho*et al*.,2010; Othman, and Skaik, 2014), this finding showed that individuals are more inclined to share knowledge when they are confident that they have knowledge useful to the organization and that their contributions are likely to make a positive difference to their organization. Additionally, individuals with high levels of knowledge SE often have solid self-motivation, whereas individuals who have no confidence in their ability to share knowledge are unlikely to engage in KSB. In a R&D environment with members mostly holding academic profiles, individual confidence toward their own knowledge level and their capability to contribute to others largely determine their ISK with others.

Contrary to the TPB, the results also found that CON had insignificant influence on ISK. It can be argued that the justification of this result is that individuals' intention to perform or not to perform certain behaviour depends somehow on non-motivational factors such as availability of requisite opportunities and resources (Ajzen, 1991).

The insignificant path between CON and ISK is remarkable. The finding suggests that,SE plays a more principal role than CON in explaining ISK. In fact, a literature review on PBC (Cheung and Chan, 2000) indicated that only a small number of studies testing TPB used questions related to CON. Most studies employed SE only, assuming that it alone could well represent the effect of control beliefs on behaviour. Among the existing studies that have encompassed the two sub-constructs of PBC, some have claimed that SE is superior to CON in predicting intention and behaviour (e.g. Sheeran , 2002), whereas others have shown the opposite (e.g. Rhodes andCourneya, 2003). Ajzen (1991) assumed that the mixed findings might be the result of different context across different studies.

The findings also revealed that, ISKis a significant predictor of KSB. This finding coincides with the TPB and with previous studies (e.g. Othman, andSkaik, 2014; Daud*et al.,* 2015). The research findings also showed that, PBC exerted very weak direct influence on KSB compared to the effect of ISK. This result implies that when considering KSB, people in research organizations have more concerns about their personal psychological interests (i.e. intention) than actual behavioural control, More specifically, although the first sub-dimension of PBC i.e. CON had no direct effect on ISK, it exerted moderately significant influence onKSB. The significant impact of CON on KSB suggests that KSB is not largely under the control of the individual in these organizations. Research members are motivated to engage in KSB to the extent they believe they have the time, resources and opportunities to do so.

7. IMPLICATIONS FOR THEORY AND PRACTICE

Theoretically, this research contributes to the existing body of knowledge in the field of KS in terms of narrowing the research gap by investigating the KSB of research staffs in public research centres and institutes in the context of Sudan, which has received relatively little attention to date by the existing researchers.

Additionally, the study offers managerial implications for decision makers in research institutions: First, research institutions managers must promote KSB by introducing adequate policies and procedures to encourage and reinforce KS culture. Moreover, research institutions leaders should promote favorable and positive AT toward KSB by addressing some researcher's concern of losing their knowledge power and by comforting their value in the institution. Employees' AT towards KSB could also be driven by organizational extrinsic reward, anticipated reciprocal relationships and social networks and shared goals. Finally, as the results revealed that, PBC in term of SE and CON positively influences ISK and KSB respectively, thisimplies that, KS is a resource overwhelming behaviour. Organizations should ensure that workers have time, resources and opportunities to engage in KSB.

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