ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES
ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

Publisher
http://jssidoi.org/esc/home

ADAPTATION OF BIG DATA: AN EMPIRICAL INVESTIGATION FOR SUSTAINABILITY OF EDUCATION

Omar A. Alismaiel

King Faisal University, Alhasa, P.O.BOX. 55024, Alhasa 31982, Saudi Arabia

E-mail: oalismaeel@kfu.edu.sa

Received 14 July 2021; accepted 31 August 2021; published 30 September 2021

Abstract. The current study aims at developing a framework to assess big data use for education and encompassing the theoretical background of knowledge sharing and diffusion of innovations in the educational environment. This study hypothesizes that age and cultural diversity, and motivators can influence knowledge sharing, whereas the constructs of relative advantage, trialability, complexity, observability would impact innovations. Thus, innovations influence knowledge sharing and would be positively associated with behavioural intention to use big data and sustainability for education. This study utilized a version of knowledge sharing model and Diffusion of Innovations (DOI) theory as the study framework and implemented quantitative approach for data analysis by collecting 494 responses from university students who were elected using stratified random sampling technique. The data were processed using eleven factors to unveil and understand the predictors of big data use for education sustainability. The study adopts the quantitative approach and employs structure equation modelling (SEM) to data analysis. According to the study's findings, age and cultural diversity and motivators significantly determine knowledge management sharing, while relative advantage, trialability, complexity, and observability have a positive impact on innovations. The adoption of innovations, knowledge sharing, and big data are able to capture 78.9% of sustainability phenomenon on education. Further, the study concludes by reporting findings and implications for research and practitioners.

Keywords: application of Big Data; sustainability; knowledge sharing; behavioural intention to use Big Data

Reference to this paper should be made as follows: Alismaiel, O.A. 2021. Adaptation of Big Data: an empirical investigation for sustainability of education. *Entrepreneurship and Sustainability Issues*, 9(1), 590-611. http://doi.org/10.9770/jesi.2021.9.1(37)

JEL Classifications: A29, I21, O33

1. Introduction

It is of great importance to know what motivates organizations' team members in order to enhance the sharing of knowledge (Lam and Lambermont-Ford, 2010). In spite of this, it is noticed that such motivations are not properly addressed in previous research and more inclusive results are needed. Nowadays, knowledge and information are becoming the new source of power rather than finance, land, and capital (Ishikawa and Nakagawa, 2013). Therefore, having more studies on big data is very important. Limited success has been reported through the use of big data, and that was seen in the limited outcomes that organizations achieved by

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

using big data. The investigation of such failure has received little attention from researchers and scholars (Ishikawa and Nakagawa, 2013). In order to address this gap, there is a need for more research investigating the assessment tools of the organizations' willingness to adopt big data. Organizations' capacity of managing big data and knowledge management sharing is a determinant of sustainable competitive advantage and development. Elias and Ghaziri (2007) highlight that knowledge, unlike data or information, cannot be captured and it is also broader and richer. They also refer to it as the abstraction that is located in the minds of people. Researchers and scholars have given the term knowledge management different definitions. Nonaka and Konno (1998) add that knowledge management works to improve and simplify the sharing of knowledge, its distribution, and creation. The concept of knowledge management includes the process of knowledge sharing as one of the most important elements. This process is known as the process of identification that includes the outflow, transmission, and the inflow of knowledge. It refers to the transmission of knowledge among people, groups, and organizations (Gupta and Govindarajan, 2007). Knowledge sharing includes the inflow of facts, suggestions, ideas, and expertise among people (Srivastava et al., 2006). The adoption of any innovation is important for it to be useful. Thus, a high level of adoption is very important for those who are in charge of innovation. Thus, those in charge of innovation pay much attention to the factors that influence its adoption among clients. This adoption of technological innovations has been addressed by many theories. Therefore, this research is aimed to develop a framework that measures the sustainability for education as a consequence of big data acceptance and diffusion of innovations. The high level of innovation underperformance and low adoption of innovations by most of the intended users has become a cause for concern to researchers and practitioners (Tolba and Mourad, 2011), who further attribute this to lack of appropriate use of diffusion of innovation models and problems associated with challenges in evaluating factors that accelerate the rate of diffusion. Ahmer (2013) explains that new innovations should first try to change top management attitude and understanding of the system since they can influence others when they are positively involved in the adoption process because they have control of the resources and can provide a favourable climate in order to implement new technology. The role played by big data nowadays is very important especially since data is the major part of digital evolution. The investigation of the various factors that might influence the adoption of big data is essential in universities, which are still in the early stages in terms of using big data. In general, the understanding of such factors is essential and of great importance to organizations, bearing in mind that more than three-quarters of these organizations are investing or planning to invest in big data (Gartner, 2016). Moreover, these factors have received little attention from researchers, which has been reported in a study that reviewed more than 200 journals (Salleh and Janczewski, 2016; Chen et al., 2016). There is a need for comprehensive frameworks, which explain how they can be used within organizations (Olszak and Mach-Król, 2018). The problem with the current models is that they are limited in focus on technical issues (Kayser et al., 2018). Moreover, frameworks that combine and address the issues of big data adoption in terms of the temporal dimension and the implications of such adoption for organizations' sustainable development are not available yet. Kwon et al. (2015) confirm that the main focus of big data studies is centred mainly around technical factors (such as machine learning or technical algorithms) and improving systems. However, examining the literature indicates that there is a lack in research addressing the core elements that impact big data acceptance or the obstacles confront during adoption. In more details in the theoretical domain, there are few studies have addressed the links between knowledge management sharing, innovations and behavioural intention to employ big data. Therefore, this research is aimed to empirically investigate behavioural intention to use big data for education by including eleven factors, as no study has been found which has exploited these determinants empirically to enhance a successful acceptance of big data by governmental organizations in education.

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

2. Theoretical Model

Several adoption models have been produced by the research on innovation adoption, especially in two areas, information technology (IT) and information systems (IS). Looking at the available literature in the field of innovation adoption, it can be noticed that two models, in particular, received the highest attention by researchers to investigate the acceptance of a number of technological innovations (Hameed et al., 2012). These models are Davis' (1989) Technology Acceptance Model (TAM) and the Diffusion of Innovations (DOI). Hameed et al. (2012) and Puklavec et al. (2014) point out that the majority of IT adoption research has focused on the characteristics of innovation. The adopters' perceptions of innovation characteristics determine their evaluations of these innovations as assumed in both knowledge management sharing and DOI. These adopters tend to adopt those innovations with more advanced characteristics (Rogers, 1983; Davis, 1989). The adoption of innovation is considered to be highly impacted by a number of determents such as effort-oriented characteristics including perceived ease of use (Davis, 1989), relative advantage (Rogers, 1995) and complexity (Rogers, 1983), and compatibility (Rogers, 1983) (Li et al., 2011). Research model and hypotheses are presented below in Figure 1.

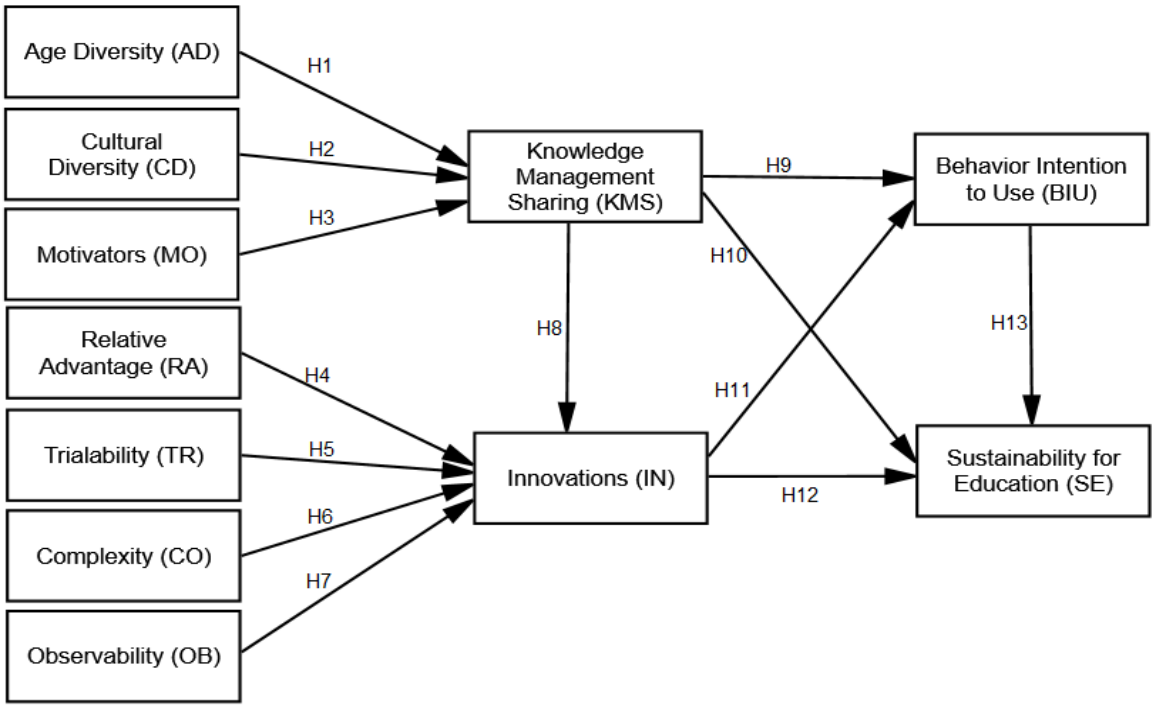

Figure 1. Research Model and Hypotheses
Source: Author

2.1 Research Flowchart and Data Analysis Process

The aim of empirical analysis of the current study is to examine the interrelationships of multiple independent and dependent variables relating to application of big data for sustained education. In Figure 2, we show the flowchart of the regression analysis of this research.

- Independent variables are age and cultural diversity, and motivators influence knowledge management sharing. As well as, relative advantage, trialability, complexity, observability should influence innovations.

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

- Mediating variables are knowledge management sharing and innovations impact behaviour intention to employ big data and sustainability for education.
- Dependent variables are behaviour intention to employ big data and sustainability for education.

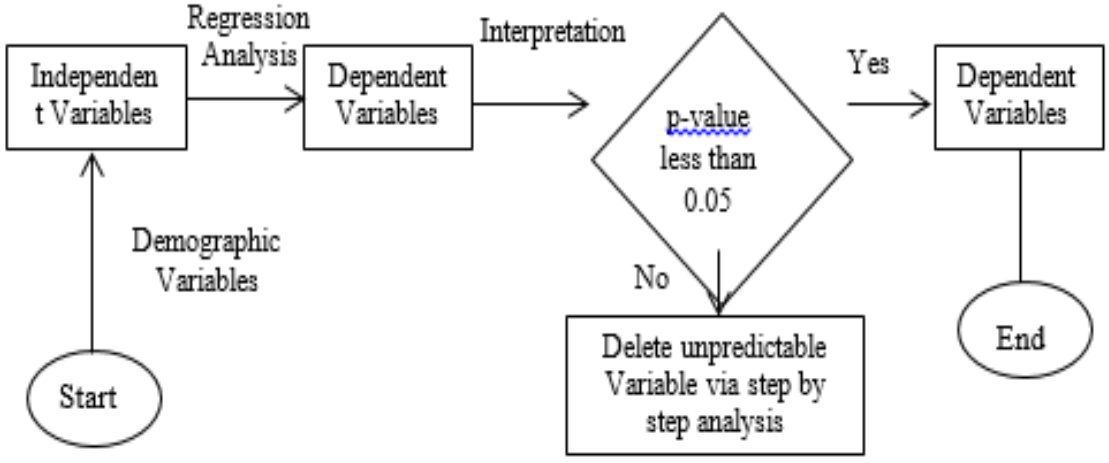

Figure 2. Flowchart of the regression analysis of this research
Source: Author

The model produced in this study used both knowledge management sharing factors and innovation diffusion theory. The model aims at measuring the sustained education through big data, sharing innovation, and knowledge management. The related theories are illustrated in the following sections.

2.2 Knowledge Management Sharing

The processes of acquisition, creation, knowledge sharing, and capturing are closely linked to knowledge management (Cockrell and Stone, 2010). In the field of knowledge sharing, big data text analytics is considered one of the basic terms (Chen et al., 2012; King, 2009). The aim of switching individual knowledge into institution knowledge through transferring and creating knowledge is known as knowledge management. Therefore, knowledge sharing has been defined as the communication of knowledge that can lead to having more understandings and more insights (Sohail and Daud, 2009). The different motivators of knowledge sharing determine the nature of knowledge management (Oye et al., 2011). Based on this, it is important to know the different factors that motivate individuals and organizations to share knowledge in order to improve knowledge sharing (Bartol and Srivastava, 2002; Oye et al., 2011).

Age Diversity: Those countries are witnessing an increasing percentage of people over the age of 60 and that is due to many reasons such as increased prosperity, lower birth rates and the improvement of health systems (Sluiter, 2006). Nelson (2005) adds that western societies are witnessing age prejudices and ageism pointing to the influence of age diversity by bringing forward the stereotyped image the competence of specific age cohorts. Knowing the impact of age diversity is essential for organizations so that they can assess and evaluate the risks. Varying results were revealed as researchers investigated the relation between team outcomes and age diversity (Bunderson and Sutcliffe, 2002). The relation between the team outcomes and age diversity is still vague despite the meta-analysis attempts by researchers (Joshi and Roh, 2009). This is because research included different diversity criteria such as age, ethnicity, and gender and used them to calculate team outcomes (Bell et al., 2011). The social categorization processes were stimulated by age diversity which makes it a difficult task to illustrate task-relevant information and viewpoints (Van Knippenberg et al., 2004). Team members who have diverse

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

organizational, work, or life experiences form the age diversity teams (Kunze et al., 2011) and that provides problem-solving capabilities and task-relevant perspectives (Kearney et al., 2009). The combination of both perspectives and diverging knowledge is expected to lead to more innovative and creative solutions (Bantel and Jackson, 1989). Moreover, creativity, problem-solving and reflective thinking can be encouraged by the introduction of diverging perspectives as they ignite critical debate regarding the accomplishment of the task (De Dreu, 2006).

Cultural Diversity: is defined as the differences between individuals who come from different cultural backgrounds, beliefs, and worldview which might influence communication (Sheu and Sedlacek, 2004). The impact of culture on knowledge management has been studied, and many findings are available in this regard. Some studies and research papers claimed that the practices of knowledge management are not influenced by culture (Jensen and Szulanski, 2004; Gupta and Govindarajan, 2007). Moreover, other studies, such as Simonin (1999) reported that the ambiguity of knowledge sharing is not affected by cultural differences. In contrast, other studies such as (Voel and Han 2005) reported a significant impact of culture on knowledge management sharing (Voel and Han, 2005). More detailed studies like the one by Finestone and Snyman (2005) found that barriers in knowledge sharing can be created due to cultural diversity. Sackmann and Friesl (2007), who conducted their study on teams, found that cultural differences can influence knowledge sharing behaviour in teams. They found that such cultural differences in terms of nationality, gender and ethnicity can negatively influence the sharing of knowledge. In terms of the type of knowledge management sharing, Thiessen et al. (2007) found that cultural differences have a more negative influence on the transmission of explicit knowledge than on the tacit knowledge management sharing. Other studies reported that knowledge sharing is not influenced by cultural diversity (Horak, 2010).

Motivators: Based on the finding of Fullwood et al. (2013), promotion as an extrinsic motivator was found to be one of the most motivating factors of instructors in England to share knowledge. Also, tendency to learn and help others was found to be one of the main motivators for medical professionals in Kuwait to share knowledge. Those professionals stated that there were no rewards to receive for sharing as reported by (Marouf and Al-Attabi, 2010). These findings provide evidence of the role played by the context of culture or industry in moderating the relationship between rewards and knowledge sharing. Such sharing of knowledge is reported to be influenced by both demotivators and motivators. Age, industry, and culture are all examples of motivators and demotivators to knowledge sharing. Moreover, those motivators and demotivators can be intrinsic and extrinsic (Oye et al., 2011). Age, industry, and culture were reported to have no impact on the knowledge-sharing behaviour within Saudi Arabian companies as reported by Dulayami and Robinson (2015). Rahman (2011) reported that improving performance and effective communication channels were reported as main motivators of knowledge sharing. Knowledge sharing was also reported to be highly influenced by social factors (Boh and Wong, 2015). Among academics in universities, commitment, and enjoyment in helping others were also reported as intrinsic motivators that positively influence knowledge sharing (Tand and Ramayah, 2014).

2.3 Diffusion of Innovations (DOI)

Innovation is a term used to describe the development of a certain idea of an invention to meet certain goals in certain context (Gertner, 2012; Manzi, 2012). The process of innovating takes time when it is adjusted in order to fit into the context. This innovation refers to an enhanced form of the original product, practice, program, or process. When such as innovation gets adopted by individuals or organizations, it becomes the new standard. In the field of learning, enhancing the standard practice by improving the original or introducing a new one is referred to as innovation. The aim of such innovation is usually to obtain better outcomes. The process of innovative practice involves procedures and the combination of programs that finally results in products (Redding et al., 2013).

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

Relative advantage: Individuals' beliefs regarding the new innovation being better than the original one is known as relative advantage. In other words, this concept refers to the extent to which individuals feel that their learning performance can be enhanced by the sustainability of education. Hung et al. (2016) also define this concept as the perceived idea that this innovation is better than the original standard or idea. The relative advantage that is important to the adopters is mainly determined by the context within which the innovation is adopted and the nature of that innovation. The DOI theory provides that relative advantage of an innovation to influence the adoption technology (Rogers, 1983). Kulviwat et al. (2007) reported a considerable relationship between usefulness and relative advantage indicating that the concepts covered by constructs are very similar. Little attention has been given to the relationships among perceived ease of use, perceived usefulness within knowledge management sharing, relative advantages, and DOI research. The only research is found in this relation revealed that students perceived a higher level of usefulness of the sustainability for education (Hung et al., 2016).

Complexity: The difficulty in understanding innovations and their ease of use by the users is known as complexity. This concept is employed in the current investigation to define the difficulty encountered by individuals that can influence their learning performance. Hung et al. (2016) highlight that this term refers to how difficult it is to understand and use an innovation. Complexity and perceived ease of use were heavily studied and were reported for their influence on IT adoption in the field of DOI and knowledge management sharing (Venkatesh and Bala, 2008; Arts et al., 2011). The degree of how difficult to understand or use a certain innovation determines its complexity and this negatively influences the adoption and the implementation of the innovation (Rogers, 1983). In the adoption of an innovation, complexity is considered a barrier and a hurdle (Tornatzky and Klein, 1990; Grandon and Pearson, 2004). Therefore, an innovation with a high level of perceived complexity is less likely to be adopted.

Trialability: the opportunity given to adopters to experiment with an innovation is known as (Al-Isma'ili et al., 2016). This term refers to the adopters' feelings of whether to try the innovation before adopting it. Innovations that can be tried out first tend to be perceived with less uncertainty by adopters who believe accepting it and those individuals incline to comprehend through this experience. Trialability concerns "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1983). Moreover, it is noticed that the research on IT adoption within organizations has not paid much attention to the issues of trialability and observability (Puklavec et al., 2014). One of the few studies addressing this issue found that higher levels of usefulness and ease of use of the system are expressed as the levels of trialability are high (Yang, 2007). The hypothesis in the current work assumed that Big Data technologies with a high level of trialability are the ones with low levels of adoption.

Observability: refers to the adopters' observation of the consequences of using a certain innovation by previous users (Boonsiritomachai, 2014). Based on this definition, observability can refer to the level of observing the results of innovations by others. Consequently, friends and neighbors are presumed to ask adopters for feedback. Visibility is considered as an element that stimulates peer discussion of new subjects. The research is conducted in the field of knowledge management sharing where results reveal that there is a substantial impact of the perceived use on the observability by individuals (Huang, 2004; Yang, 2007). Trialability and observability being important characteristics of innovation have been also included in the research in the field of innovation adoption (Ramdani and Kawalek, 2009; Boonsiritomachai, 2014).

Behavioural Intention to Use big data refers to the tendency to employ and continue using certain technology and it includes the determining factors behind the use of this technology (Venkatesh et al., 2012). Moreover, in this research, big data acceptance is considered as an essential component in developing frameworks for innovation usage (Venkatesh et al., 2003; Davis et al., 1989). The roots of these philosophies and models originate from the framework of TRA which determines big data utilization as a function of attitude focusing on certain norms and specific behaviour which were expanded to comprise perceived control and hence TPB (Venkatesh and Bala,

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

2008). Moreover, user's post-adoption confidence is reflected by the user's post-adoption confidence and the perceived ease of use resulting in better levels of user satisfaction and determination plan (Pelling and White, 2009).

2.4 Sustainability as a Purpose of Education

Environmental educators pay much attention to the concept of sustainability as most advocates in this regard are from environmental studies backgrounds and from facilities management and education (Fien, 2002, p. 244). Sustainability refers to the improvement of the original systems of education based on competitive principles and values and on a predatory view of the world (Gadotti, 2010, p. 203). Sustainable development is just a part of sustainability which is a broader concept. It is defined as the harmony among differences, the dream of living well and the dynamic balance with others. The task of pedagogy of sustainability, known as the pedagogy complementary to Earth Pedagogy, is to create theoretical–practical teaching aids necessary for this education for sustainability (Antunes, 2002). Achieving harmony among human beings and developing the Earth, known as Gaia, is based on sustainability which is an essential element of Cosmo vision. Haan (2007) mentions that education for sustainability emerged as a 'new field of learning and action' which lead to the building of new skills and competencies (UNESCO 2006). Such teaching materials are encouraged to be used in schools and universities. Such places are also required to come up with new activities to fit in their social and economic context. Certain challenges might be posed when approaching sustainability in cultural diversity. Thus, this requires that the different cultural perspectives and aspects be taken into consideration while elaborating the teaching materials (Ferreira et al. 2003). Another thing is that there is limited time allocated for other subjects such as sustainability since graduate and postgraduate courses are heavily loaded with compulsory subjects. However, sustainability should be inserted in such curricula (Crofton, 2000; Springett and Kearins, 2001). In order to reach sustainable development, lifelong learning is considered essential due to the fact that learning these subjects through the different stages of education is essential. Hands-on science experiments, demonstrations and participating in public debates are examples of sustainability concepts inserted in such curricula (Martins et al., 2006). The development of big data in educational contexts has led to new data-driven techniques to assist informed decision making and initiatives to improve educational efficacy (Fischer et al., 2020). Big data is also recognized as a game-changer, capable of changing the way firms function in various organizations for long-term competitive advantage (Muhammad et al., 2020). Big data is used in a variety of sectors; in this paper, we look at how big data is used in education (Khan & Alqahtani, 2020). Universities must continue to play their role as proving grounds for educating the future generation and innovation, based on big data, in improving the education process, and outlines the challenges associated with big data mining, storage, and security in order to respond to the needs of digital transformation (Mkrttchian et al., 2021).

3. Research Methodology

3.1 Developing of The Research instrument

To ensure established content validity, the study adapted scales from previous validated studies. The survey consists mainly of two sections: first one concerns about demographic profile of respondents. The second section is further divided into two main parts: the first part contains 18 scales borrowed from Davis et al. (1989) and Venkatesh and Davis (2000). The other part integrates 24 scales that developed using DOI and reconstructed from the previous research (Davis et al., 1989; Moore and Benbasat, 1991; Karahanna et al., 2002), and 5 scales modified from (Al-Rahmi et al., 2020a; Al-Rahmi et al., 2021a; Alamri et al., 2020a). The instrument-items of the study were examined and assessed by two experts in the field. Preceding to the empirical work, an appropriate permission was received by a government university for gathering data. In order to assess the sustainability for education via through knowledge management sharing and diffusion of innovations, the sampling of this study includes both undergraduate and postgraduate students. The instrument-items of knowledge management sharing

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

and DOI theory were ranked by using a 5-point Likert item in order of collecting responses relating to assess sustained education through the adoption of big data.

3.2 Sampling and Data Collection

To obtain views about sustainability for education through knowledge management sharing and diffusion of innovations, a sell-administered questionnaire was distributed and completed by students. On April 2020, the study distributed 565 questionnaires manually on King Faisal University. About 532 questionnaires were received providing a response rate of 94.2%. Further, a visual examination yielded to have 519 valid-instance for data analysis. The visual examination of the return cases resulted to discarde13 cases that were not completed. A further analysis was conducted to eliminate nine cases with missing values and five cases with outliers resulting to have 494 valid questionnaires. This filtration is important as suggested by Hair et al. (2012), they indicate that this procedure is essential to conduct since the presence of outliers can lead to imprecise results.

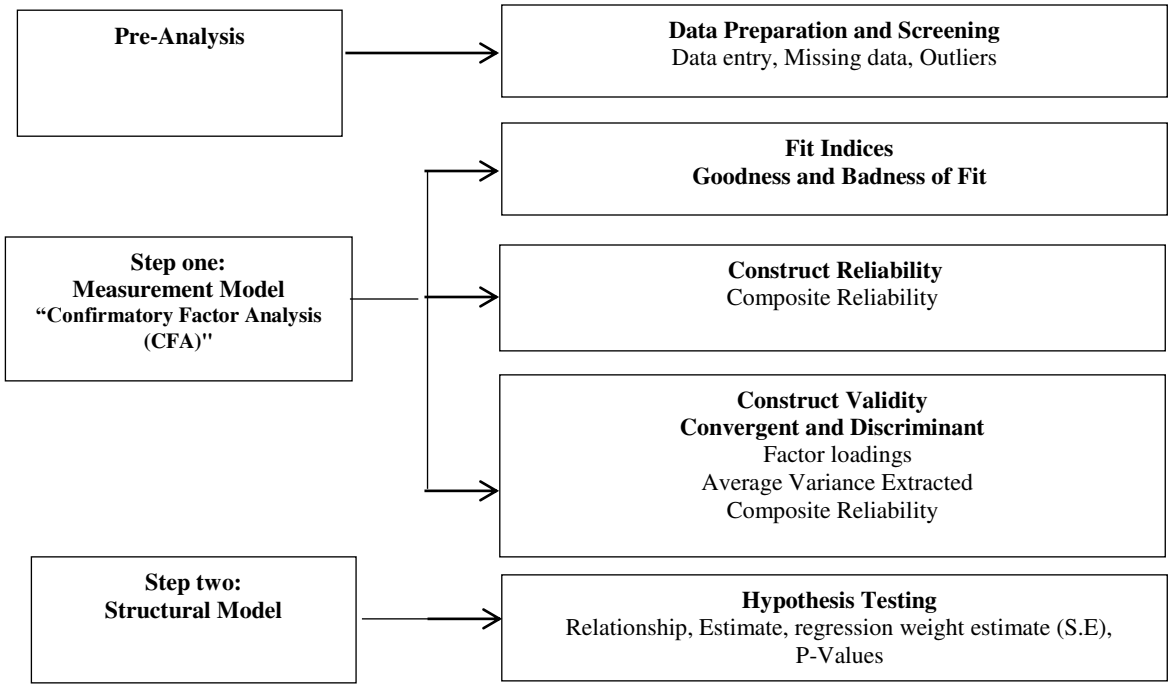

Figure 3. Data Analysis Process
Source: Author

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

4. Result and Analysis

For preliminary data analysis, the study utilized the common software tool SPSS "the Statistical Package for the Social Sciences". The details of demographic results showed that males and females represent 235 (47.6%) and 58 (11.7%) of the sampling, respectively. The age profile indicated that majority of the sampling was 30-35 representing about 403 (81.6%). The next cluster of age was 25-29 with 58 cases (11.7%) followed by age above 36 years constituting 33 cases (6.7%). Lastly, the subjects of participants were scattered into three categories social science with 40 cases (8.1%), engineering with 160 cases (32.4%) were from, and science and technology with 294 (59.5%). The next stage considered Structural Equation Modeling (SEM) as the primary statistical analysis technique using AMOS 23 to analyze data and examine the outcomes of hypothesises. According to the suggestions of Hair, Sarstedt, Ringle, and Mena (2012), the study proceeded data analysis using confirmatory factor analysis (CFA) to assess the overall fit of the measurement model and further conducting two methodological procedures: first evaluating the constructs reliability and second constructs validity by calculating both convergent and discriminant validity of measurements. Then study examines the structural model.

4.1 Measurement Model Analysis

The Measurement Model Overall fit: AMOS 23 is the main software tool of analysis employed in the current research. Confirmatory factor analysis (CFA) - structural equation modeling (SEM) are utilized to examine the collected responses. In detail, the measurement model is assessed by a number of techniques such as reliability, convergent validity, discriminant validity, and Uni-dimensionality. In order to evaluate the overall fit of the measurement model of the sustainability for education through big data, knowledge management sharing, and innovation; the study follows the recommendations of Hair et al. (2012) by applying confirmatory factor analysis (CFA). Results indicated that the model succeeded in producing and an adequate fit to the data. The key statistics of goodness-of-fit indices comparative fit index (CFI) and Tucker-Lewis coefficient (TLI) pass the suggested cut-off value of .90. Moreover, the other indices such as normed fit index (NFI), incremental fit index (IFI), relative fit index (RFI), and the parsimonious goodness of fit index (PGFI) also generated fits results above in the recommended Figure 3. Last but not least, table 1 also shows that the normed chi-square "chi-square/degree of freedom" was perfect and less than the cut-off value of 3.0. Regarding the badness-fit indices, results illustrated that root mean square error of approximation (RMSEA) and the root mean-square residual (RMR) were also below the required levels .05 and .10 respectively. Figure 4 depicts the measurement model of knowledge management sharing and diffusion of innovations (DOI) theory of the sustainability for education.

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

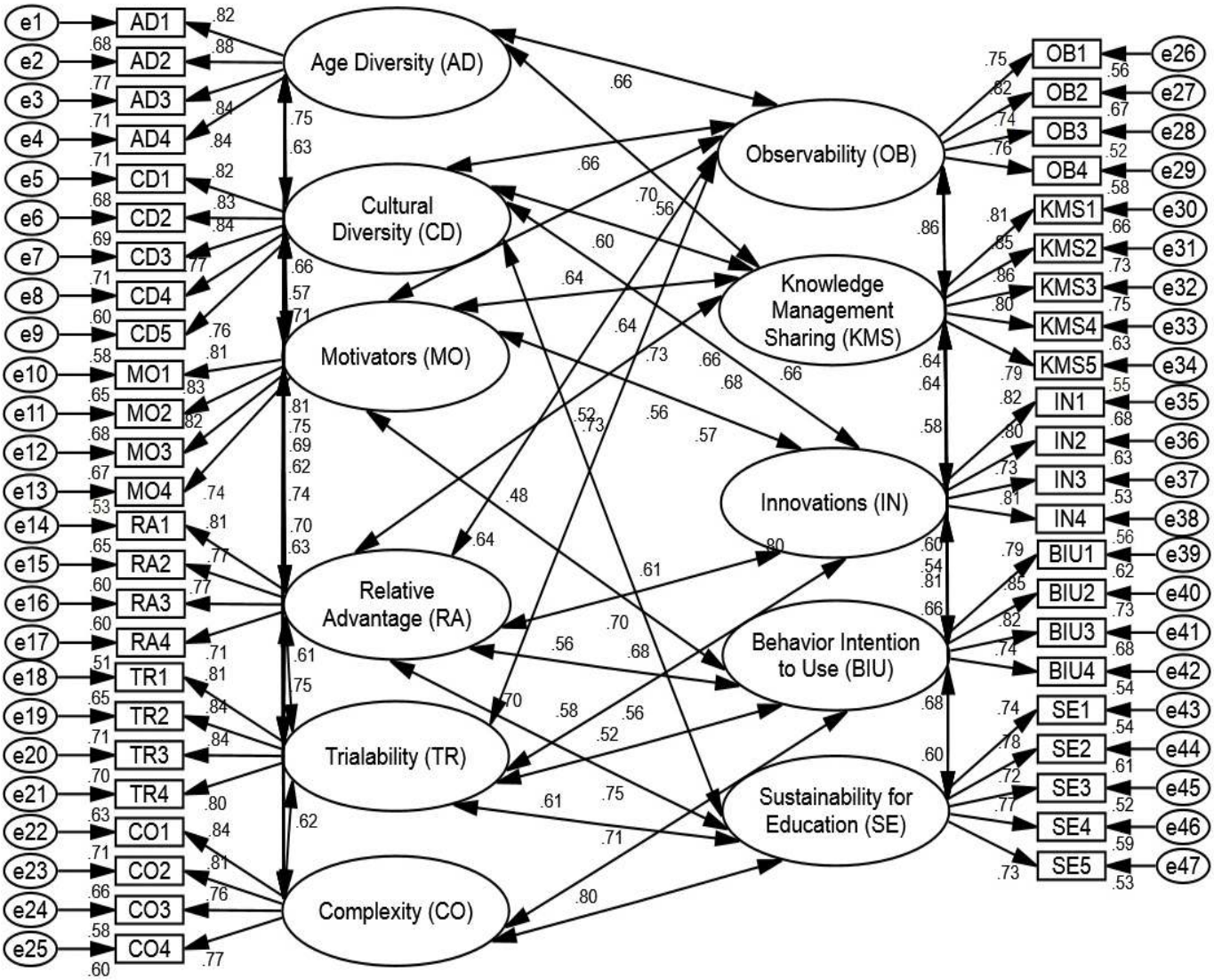

Figure 4. Measurement Model
Source: Author

Table 1. Goodness and Badness of Fit Indices

Measure and suggested cut-off value	Values
Chi–square ($\chi 2$) ≤ 3.5 to 0, df ≥ 0 and (ρ value > .01)	3090.657, df=979
Normed Chi–square ($\chi 2$) ≥ 1.0 & < 5.0	3.157
Root-Mean Residual (RMR) < 10	.037
Normed Fit Index (NFI) ≥ 0.90	.971
Relative Fit Index (RFI) ≥ 0.90	.958
Incremental Fit Index (IFI) ≥ 0.90	.958
Tucker Lewis Index (TLI) ≥ 0.90	.968
Comparative Fit Index (CFI) ≥ 0.90	.969
Root Mean Square Error of Approximation (RMSEA) (<0.05 for good fit or .05-.10 for adequate fit)	.045

Source: Author

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

4.2 Constructs Reliability

The study employed the common practice in SEM which is composite reliability (CR) to ensure an established inner consistency of constructs. The results illustrated that all the constructs exceeded the recommended limit of CR with values varied from 0.832 to 0.937 as suggested in the literature (Hair et al., 2012). Moreover, the results of Cronbach's Alpha (CA) suppressed the suggested value of .70 exhibiting an accepted level of reliability and varying from 0.832 to 0.918. Table 2 shows the reported results.

4.3 Constructs Validity

As indicated earlier, constructs validity includes two sub-division of assessment, convergent and discriminate validity. To assess convergent validity, we applied three common producers of Hair et al (2012) by computing factor loadings (FL), average variance extracted (AVE) and CR. Table 2 demonstrated that all items exhibited accepted loadings into their proposed factors by exceeding the suggested value of 0.50 and ranging from 0.70 to 0.99 Hair et al (2012). Moreover, AVE indicator demonstrates an accepted convergent validity when it exceeds the cut-off value of 0.50. Findings showed that all items have more variance than errors with values ranging from 0.551 and 0.660. Lastly and as indicated earlier, the computed CR confirmed further the convergent validity whereas all constructs surpassed the cut-off value of 70.

4.4 Discriminant validity

Discriminant validity a common approach is employed to estimate the scope of the variance between a concept and its items with other concepts (Bagozzi and Yi, 1988). A concept deems to be a distinct notion by contrasting the AVE of a particular concept with the square correlations between concepts (Fornell and Larcker, 1981). In addition, correlations of items in any two given constructs should not be above the square root of the average variance that is shared by them in one construct (Hair et al., 2012). In this regard, findings showed that all AVE of each constructs were above the square correlations between as demonstrated in table 3. Consequently, discriminant validity proved to be well established and concluding that convergent validity meets the suggested assessment guidelines (Hair et al., 2012; Fornell and Larcker, 1981).

Table 3. Discriminant Validity Results

Factors	AD	CD	MO	RA	CO	TR	OB	IN	BIU	KMS	SE
AD	.922										
CD	.331	.909									
MO	.420	.436	.918								
RA	.397	.370	.443	.908							
CO	.344	.402	.452	.344	.832						
TR	.448	.321	.362	.436	.399	.897					
OB	.374	.523	.502	.428	.429	.442	.921				
IN	.455	.385	.405	.382	.447	.502	.439	.892			
BIU	.509	.443	.331	.438	.518	.449	.423	.439	.908		
KMS	.429	.396	.439	.341	.411	.539	.389	.500	.359	.901	
SE	.432	.449	.491	.470	.399	.451	.501	.432	.438	.492	.902

Source: Author

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

Table 2. Confirmatory Factor Analysis Results

Factors	Code	Factor Loading	AVE	CR	CA
Age Diversity	AD1	.823	.552	.881	.888
	AD2	.881			
	AD3	.844			
	AD4	.842			
Cultural Diversity	CD1	.820	.609	.921	.832
	CD2	.833			
	CD3	.841			
	CD4	.773			
	CD5	.764			
Motivators	MO1	.811	.660	.914	.910
	V2	.832			
	MO3	.824			
	MO4	.744			
Relative Advantage	RA1	.813	.594	.889	.899
	RA2	.772			
	RA3	.774			
	RA4	.713			
Complexity	CO1	.842	.583	.906	.909
	CO2	.810			
	CO3	.764			
	CO4	.773			
Trialability	TR1	.811	.555	.899	.900
	TR2	.842			
	TR3	.844			
	TR4	.803			
Observability	OB1	.753	.601	.832	.897
	OB2	.823			
	OB3	.741			
	OB4	.763			
Innovations	IN1	.820	.591	.911	.890
	IN2	.803			
	IN3	.731			
	IN4	.814			
Behavior Intention to Use Big Data	BIU1	.792	.605	.876	.905
	BIU2	.853			
	BIU3	.824			
	BIU4	.744			
Knowledge Management Sharing	KMS1	.813	.551	.937	.862
	KMS2	.853			
	KMS3	.861			
	KMS4	.802			
	KMS5	.792			
Sustainability for Education	SE1	.743	.606	.907	.918
	SE2	.781			
	SE3	.724			
	SE4	.772			
	SE5	.734			

Source: Author

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

4.5 Structural Model Analysis

In this final stage, structural equation modeling (SEM) is employed as the primary statistical analysis technique using AMOS 23 to evaluate the outcomes of hypotheses. The path modeling analysis was estimated to validate the research model in order to capture the sustainability for education. Based on the findings, the eleven hypotheses were accepted as illustrated in Figures 5 and 6 below. The following Table 3 depicts the results of assessing hypotheses with other measures such as standard errors and values of unstandardized coefficients of this structural model.

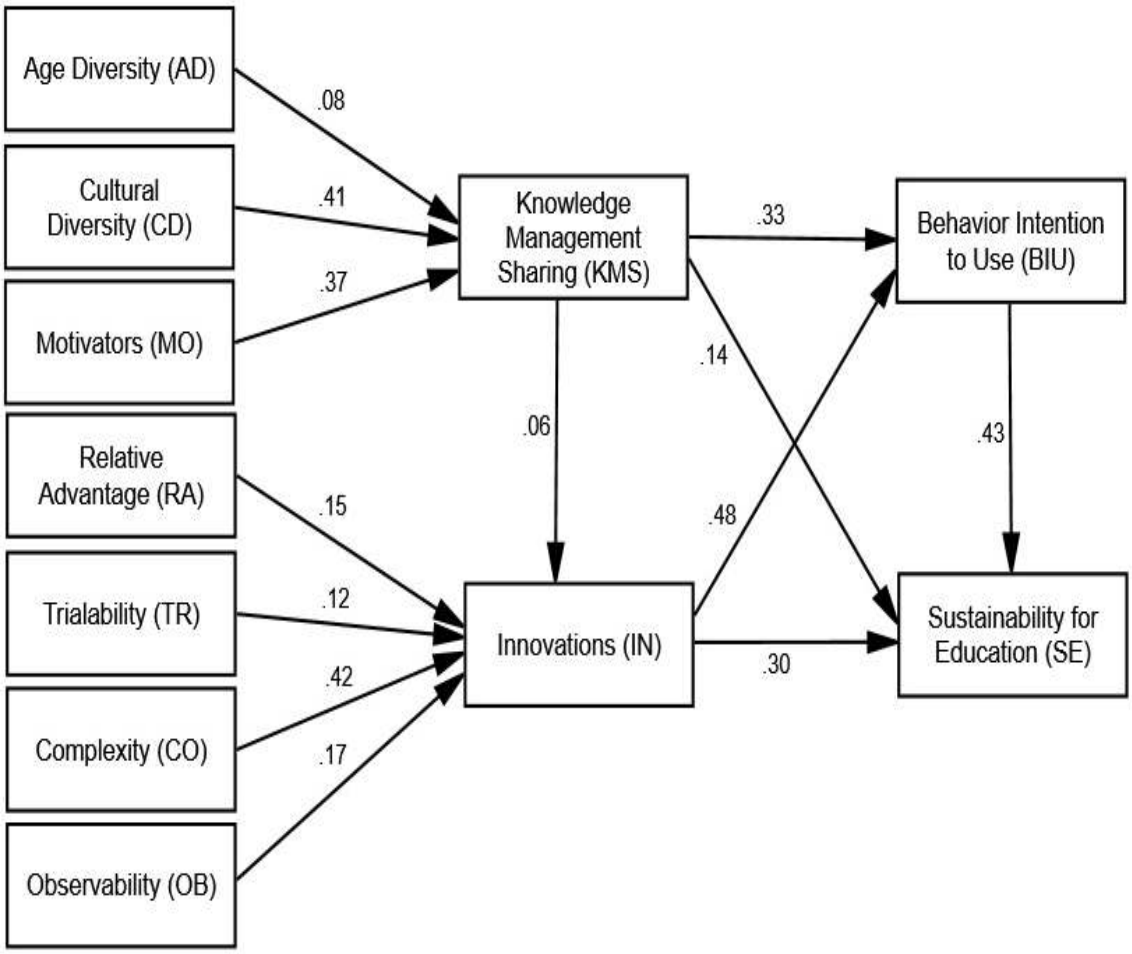

Figure 5. Results of Path Model Estimation
Source: Author

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

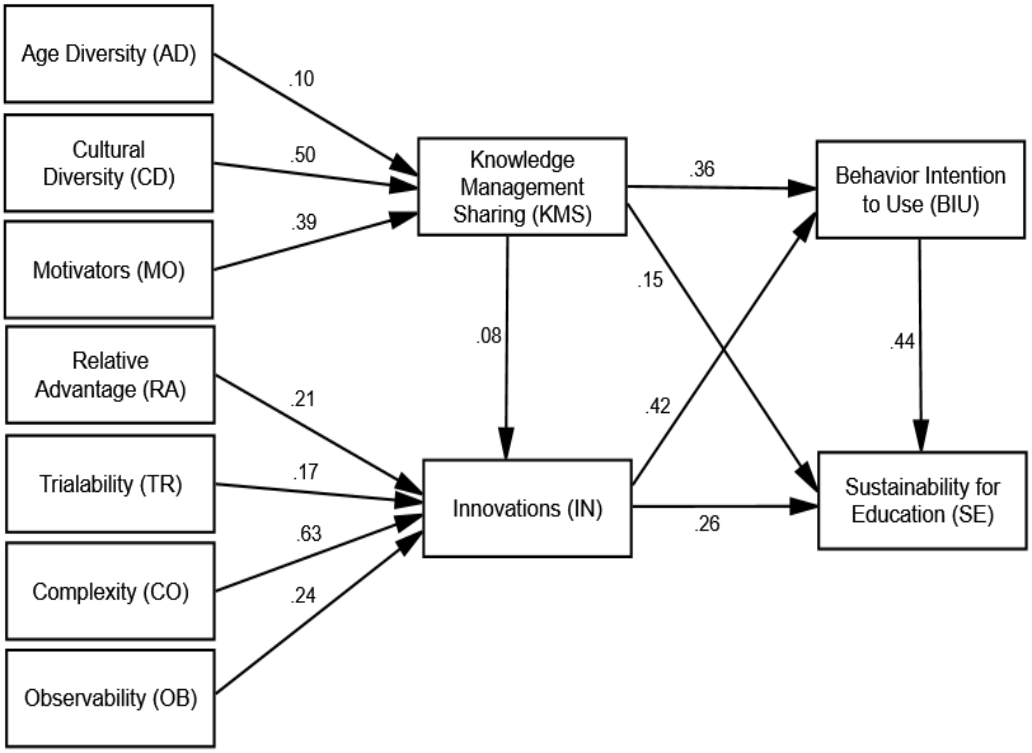

Figure 6. Results for the Hypotheses Checks
Source: Author

Table 3. Results of the Structural Model

H	Independent	Relationship	Dependent	Estimate	S.E	C.R	P	Result
H1	AD	→	KMS	.083	.039	2.115	.034	Supported
H2	CD	→	KMS	.409	.031	13.006	.000	Supported
H3	MO	→	KMS	.368	.044	8.352	.000	Supported
H4	RA	→	IN	.152	.030	5.043	.000	Supported
H5	TR	→	IN	.119	.033	3.650	.000	Supported
H6	CO	→	IN	.417	.024	17.695	.000	Supported
H7	OB	→	IN	.171	.032	5.300	.000	Supported
H8	KMS	→	IN	.061	.025	2.418	.016	Supported
H9	KMS	→	BIU	.328	.031	10.587	.000	Supported
H10	KMS	→	SE	.135	.030	4.571	.000	Supported
H11	IN	→	BIU	.478	.034	14.088	.000	Supported
H12	IN	→	SE	.298	.034	8.720	.000	Supported
H13	BIU	→	SE	.432	.034	12.640	.000	Supported

Source: Author

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

Regarding the first two hypotheses, the relationships between age and cultural diversity and knowledge management sharing were able to achieve the following results (β=0.083, t=2.115, p<0.001) and (β=0.409, t=13.006, p<0.001) respectively concluding both hypotheses are positive and supported. The third hypothesis is also positive and supported, as the analysis indicated that the relationship between motivators and knowledge management sharing (β=0.368, t=8.352, p<0.001). The following two propositions were also positive and supported; findings showed that both relative advantage and trialability were strong predictors for innovations with (β=0.152, t=5.043, p<0.001) and (β=0.119, t=3.650, p<0.001) respectively. In the same line, findings illustrated that both factors complexity and observability were strong predictors for innovations and the proposed links were positive with and (β=0.417, t=17.695, p<0.001) and (β=0.171, t=5.300, p<0.001) respectively. Moreover, findings also revealed that the relationship between knowledge management sharing and innovations is positively approved, the results of this postulation were as follows (β=0.061, t=2.418, p<0.001). For the behaviour intention factor, results indicated that predictors knowledge management sharing and innovations had substantial impacts on users' intention to employ big data with (β=0.328, t=10.587, p<0.001) and (β=0.478, t=14.088, p<0.001) respectively. Lastly, findings showed that the three predictors knowledge management sharing, innovations and intention to use big data had significant influences on sustainability for education obtaining the following results (β=0.135, t=4.571, p<0.001), (β=0.298, t=8.720, p<0.001) and (β=0.432, t=12.640, p<0.001) respectively. The outcomes of these results confirm that all suggested hypothesises are supported and in line with previous research (Salleh and Janczewski, 2016; Nam et al., 2015; Fullwood et al., 2013; Boh and Wong, 2015; Gadotti, 2010; Crofton, 2000; Springett and Kearins, 2001; Ferreira et al., 2003; Martins et al., 2006).

5. Discussion and Implications

The aim of this study was to develop a novel approach towards behavioral intention to employ big data and acceptance of big data by integrating DOI theory with TAM Model to discover the features influencing innovations, knowledge sharing, students' behavioural intentions to use big data, and adoption of big data in higher education organizations. This study was an innovative endeavor in applying innovations, knowledge management sharing and intentions to use big data into a big data acceptance through TAM model and DOI theory. In the light of the aim of this research, the relationships among eleven innovative characteristics were explored with age diversity, cultural diversity and motivators should impact knowledge management sharing and behaviour intention to use big data. Also, relative advantage, trialability, complexity, observability, innovations, adoption of big data for sustainability for education.

Innovation can be understood as generation, adoption, and implementation of new ideas, policy, program, process, product, or service to the adopting organization (Kamasak and Bulutlar, 2010). It can be seen that the higher education institutions can have a wide framework of knowledge sharing and enhancing innovation performance initiatives but not necessarily to the same standard as in other organizations (Aljanabi and Kumar, 2012). The field of big data is witnessing a considerable amount of investment despite the fact that it is still in its primary stages. Such investments aim for new technologies and techniques (Ohlhorst, 2013). It is reported in research as well as in media that organizations around the world are adopting big data. Such adoption, in relation to knowledge management sharing, has advantages and disadvantages. One of the disadvantages is that such adoption can make knowledge management sharing obsolete within organizations. Also, knowledge management can be thrown back to its dark ages where its concentration is mainly based on technology and correlation resulting in failures (Virtanen, 2011). As for the advantages, big data is providing the solution for many issues and problems that were previously available in relation to knowledge management sharing such as giving more priority to technology over the phenomenological and human sociology perspective of knowledge. One of the notable problems in the field of knowledge management sharing is that this concept is highly dis-unified. It is assumed that big data could provide a solution for that by providing a sort of unity. It is noticed that these both concepts and areas have shared lessons and things to be learnt, which opens the door for future research. The

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

assumption that social interactions could be the generator of innovation and new knowledge is one such lesson from the area of knowledge management sharing (Leonard and Sensiper, 2002).

The findings of Table 3 illustrate that all the proposed hypotheses are supported confirming that the research model is valid. The implications of this study provide insights into the DOI, relative advantage, trialability complexity, and observability, which in turn affect innovations and behaviour intention to employ big data for sustained education. The study also investigates knowledge management sharing constructs to assess age and cultural diversity, motivators and behavioural intention to accept big data, which should impact acceptance and sustainability as a drive of education. The results of this study maintain that both constructs innovations and behaviour intention have impact to use big data for the sustainability of education. Moreover, findings indicate that age and cultural diversity, motivators and behavioural intention to use big data impact adoption of big data. Similarly, the constructs of relative advantage, trialability, complexity, and observability had optimistic importance with innovation. Additionally, innovations construct influences behavioural intention to employ big data and adoption of big data for sustained education. The unique integration of knowledge management sharing factors with DOI theory and behaviour intention to use big data for the sustainability of education make it possible to validate innovations and behaviour intention to use big data for the sustainability of education.

Findings are similar with preceding studies concluding that age and cultural diversity and motivators had significant positive effects on knowledge management sharing, which lead to impact behaviour intention to employ big data (Cockrell and Stone, 2010; Sohail and Daud, 2009; Oye et al., 2011; Salleh and Janczewski, 2016; Nam et al., 2015; Venkatesh et al., 2012), which also leads to impact acceptance and sustainability as a driver of education. On the other hand, students should have positive effects towards innovations when realise relative advantage, trialability and complexity and observability (Al-Isma'ili et al., 2016; Hung et al., 2016; Ramdani and Kawalek, 2009; Kulviwat et al., 2007) which in turns should impact behaviour intention to employ big data, acceptance, and sustainability as a driver of education.

There is a huge amount of valuable structured and untraditional data beyond the transactional ones used by organizations. Such valuable data can be used to extract valuable information (Rajpathak and Narsingpurkar, 2013). Many social tools such as Twitter, Facebook, Google+ accounts and Linked-in are available in the hands of young people who use them in their everyday life. Young people also use different tools of social media or websites for certain purpose such as uploading photographs through the use of Flickr, having sentiment analysis or opinion mining through semantria.com or crowd sourcing through the use of Amazon.com. All of the above-mentioned activities are examples of the use of big data. In a measure of Zeta-bytes, the digital information that accessible on the internet is increasing by a factor of 10 every five years. Such cyber contents can be retrieved from various sources such as blogs, sensors, RFIDs, telephony, cameras, e-commerce social networks, and medical records. Recently, the enhanced sides of web and in particular online social networks in speeding the information traffic and simplicity of interactions permit more space for users to exchange information, participation and collaborative learning (Sayaf et al., 2021; Al-Maatouk et al., 2020; Alamri et al., 2020b; Al-Rahmi et al., 2019a; Al-Rahmi et al., 2020b; Al-Rahmi et al., 2021b). Since the essential contribution of Nonaka in the early 1990s, the notion of innovation has been related strongly to the emerging of recent knowledge (Sáenz et al., 2009). Individuals contribute their own knowledge in order to improve the degree of innovation (Rahab, et al., 2011) owing to the inability of organizations to create knowledge without the contribution of individuals who have an active role in achieving innovation (Ordaz et al., 2011). Kamasak and Bulutlar (2010) echoed this view and indicate that when ideas and notions are disseminated among individuals and groups, usually the present ideas from the first group appear unique and novel to others, and vice versa, leading to innovate new products or services within the organization which makes innovation a knowledge-intensive task (Zhen et al., 2011). Educational institutions should aim at facilitating students' adoption of technology by illustrating the usage of big data and providing instructional supplies. Practitioners in higher education should draw strategies and plans that enable technology in supporting and assisting students to benefit from big data acceptance, which in turn should

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

ease achieving learning objectives successfully. This study provides results that demonstrated that an enhanced willingness to employ big data for the sustainability of education is associated with higher levels of perception to benefit from using big data.

Furthermore, this study provided three empirical components of confirmations, first, incorporating knowledge management sharing construct with age and cultural diversity and motivators lead to influence intention to employ big data. Next, the effect of innovations via relative advantage, trialability, complexity and observability lead to adopt usage of big data and the sustainability of education. Lastly, the constructs of innovations and knowledge management sharing revealed that to have an impact on behaviour intention to employ big data for the sustainability of education. This theoretical contribution can be considered substantial to previous studies of DOI theory with integrated knowledge management sharing constructs within education setting (Alalwan et al., 2019). According to the findings, the study can conclude three implications for practitioners as follows:

- Educational institutions should be ready to support students and response properly for the potential concerns and issues of knowledge sharing which in turns enhances students learning and provides better skills for researchers.
- Practitioners should design plans and programs aim to prompt learners to have the know-how of using big data for the purpose of education.
- Technology resources should be enriched since such tools are essential components in directing learners' attitude towards using big data, and their willingness to adopt it for the sustainability of education.

In spite of the significant findings this study offers, there are still some limitations. The first concern is the sample size of this study which is linked to the fact that this study was restricted to one University, the results cannot be generalized to other universities, militaries, or school teachers. Another dimension is related to data collection, the current study only used a questionnaire as the main tool of data collection and lost the advantage of using qualitative data collection tools. Qualitative approach should shed the light on the unexpected results and may reveal other dimensions that not covered in this research. Lastly, the current study lacks the absence of addressing the differences between cultures. Thus, future research is recommended to replicate this research and take into consideration these limitations.

6. Conclusion and Future Work

This study revealed that behavioral intention to use big data for the sustainability of education is highly influenced by active knowledge management sharing. Findings further confirmed that innovations can affect behavior intention to employ big data, which is further positively associated with sustainability for education. The unique integration of knowledge management sharing constructs and DOI theory in addressing innovations and behavior willingness to employ big data for the sustainability of education was similarly confirmed by the findings. Accordingly, this research contributes to the knowledge by concluding that innovations and knowledge management sharing impact behavior intention to use big data for the sustainability of education. Therefore, the validated framework of DOI theory and knowledge management sharing constructs should enrich the understanding of the phenomenon. Taking into consideration the paid attention from the students' side to knowledge management sharing on innovations and behaviour intention to employ big data, practitioners in the field should focus in preparing action plans for teachers that contain proposals and instructions in how can big data assists in learning activities. The direction of future research should include other stakeholders such as instructors and educational organizations to unveil the other aspects that not covered in this study. Although findings demonstrate that learners show positive attitudes towards this phenomenon, constraints and facilitators should be included in further studies. Finally, widen the research scope to include other countries should improve the understanding of the outcomes of this study and provide a generalization of the phenomenon.

References

Ahmer, Z. (2013). Adoption of Human Resource Information Systems Innovation in Pakistani Organizations. Journal of Quality and Technology Management, 9(2), 25-50. https://doi.org/10.1007/978-3-642-69746-3_2

Alalwan, N., Al-Rahmi, W. M., Alfarraj, O., Alzahrani, A., Yahaya, N., & Al-Rahmi, A. M. (2019). Integrated Three Theories to Develop a Model of Factors Affecting Students' Academic Performance in Higher Education. IEEE Access, 7, 98725-98742. https://doi.org/10.1109/access.2019.2928142

Alamri, M. M., Almaiah, M. A., & Al-Rahmi, W. M. (2020a). The role of compatibility and task-technology fit (TTF): On social networking applications (SNAs) usage as sustainability in higher education. IEEE Access, 8, 161668-161681. https://doi.org/10.1109/access.2020.3021944

Alamri, M. M., Almaiah, M. A., & Al-Rahmi, W. M. (2020b). Social media applications affecting Students' academic performance: A model developed for sustainability in higher education. Sustainability, 12(16), 6471. https://doi.org/10.3390/su12166471

Al-Isma'ili, S., Li, M., Shen, J. & He, Q. (2016). Cloud computing adoption determinants: An analysis of Australian SMEs. PACIS 2016 proceedings, pp. 1-17. https://ro.uow.edu.au/eispapers/5826/

Aljanabi, A., & Kumar, D. (2012). Knowledge sharing and its impact on innovation performance: A case study of teaching quality assurance program. Research Journal of Commerce & Behavioural Science (RJCBS), 2(2), 14-23. https://www.researchgate.net/profile/Dileep-M/publication/259322929_Knowledge_Sharing_and_Its_Impact_on_Innovation_Performance_A_case_study_of_Teaching_Quality_Assurance_Program/links/00b4952aff2394dbdb000000/Knowledge-Sharing-and-Its-Impact-on-Innovation-Performance-A-case-study-of-Teaching-Quality-Assurance-Program.pdf

Al-Maatouk, Q., Othman, M. S., Aldraiweesh, A., Alturki, U., Al-Rahmi, W. M., & Aljeraiwi, A. A. (2020). Task-technology fit and technology acceptance model application to structure and evaluate the adoption of social media in academia. IEEE Access, 8, 78427-78440. https://doi.org/10.1109/access.2020.2990420

Al-Rahmi, A. M., Al-Rahmi, W. M., Alturki, U., Aldraiweesh, A., Almutairy, S., & Al-Adwan, A. S. (2021a). Exploring the Factors Affecting Mobile Learning for Sustainability in Higher Education. Sustainability, 13(14), 7893. https://doi.org/10.3390/su13147893

Al-Rahmi, A. M., Shamsuddin, A., Alturki, U., Aldraiweesh, A., Yusof, F. M., Al-Rahmi, W. M., & Aljeraiwi, A. A. (2021b). The Influence of Information System Success and Technology Acceptance Model on Social Media Factors in Education. Sustainability, 13(14), 7770. https://doi.org/10.3390/su13147770

Al-Rahmi, W. M., Alzahrani, A. I., Yahaya, N., Alalwan, N., & Kamin, Y. B. (2020). Digital Communication: Information and Communication Technology (ICT) Usage for Education Sustainability. Sustainability, 12(12), 5052. https://doi.org/10.3390/su12125052

Al-Rahmi, W. M., Yahaya, N., Aldraiweesh, A. A., Alamri, M. M., Aljarboa, N. A., Alturki, U., & Aljeraiwi, A. A. (2019a). Integrating Technology Acceptance Model with Innovation Diffusion Theory: An Empirical Investigation on Students' Intention to Use E-Learning Systems. IEEE Access, 7, 26797-26809. https://doi.org/10.1109/access.2019.2899368

Al-Rahmi, W. M., Yahaya, N., Alturki, U., Alrobai, A., Aldraiweesh, A. A., Omar Alsayed, A., & Kamin, Y. B. (2020). Social media–based collaborative learning: the effect on learning success with the moderating role of cyberstalking and cyberbullying. Interactive Learning Environments, 1-14. https://doi.org/10.1080/10494820.2020.1728342

Antunes, A. (2002). Ângela. "Leitura do mundo no context planeterização: poruma pedagogiada sustentabilidade". Doctoral dissertation, São Paulo, FE-USP, 2002. Retrieved from http://unesdoc.unesco.org/images/0014/001410/141019e.pdf

Arts, J., Frambach, R. T. & Bijmolt, T., (2011). Generalizations on consumer innovation adoption: a meta-analysis on drivers of intention and behavior. International Journal of Research in Marketing, 28(2), pp. 134-144. https://doi.org/10.1016/j.ijresmar.2010.11.002

Bagozzi, R.P., Yi, Y., & Nassen, K.D. (1988). Representation of measurement error in marketing variables: Review of approaches and extension to three-facet designs. Journal of Econometrics, 89(1-2), 393-421. https://doi.org/10.1016/s0304-4076(98)00068-2

Bantel, K.A., & Jackson, S.E. (1989). Top management and innovations in banking: Does the composition of the top team make a difference. Strategic Management Journal, 10 (S1), 107–124. https://doi.org/10.1002/smj.4250100709

Bartol, K.M., & Srivastava, A. (2002). Encouraging knowledge sharing: The role of organizational reward systems. Journal of Leadership and Organization Studies, 9(1), 64–76. https://doi.org/10.1177/107179190200900105

Bell, S.T, Villado, A.J., Lukasik, M.A., Belau, L., & Briggs, A.L. (2011). Getting specific about demographic diversity variable and team performance relationships: a meta-analysis. Journal of Management, 37(3), 709–743. https://doi.org/10.1177/0149206310365001

Boh, W. F., & Wong, S.-S. (2015). Managers versus co-workers as referents: Comparing social influence effects on within- and outside-subsidiary knowledge sharing. Organizational Behavior and Human Decision Processes, 126, 1–17. https://doi.org/10.1016/j.obhdp.2014.09.008

Boonsiritomachai, W. (2014). Enablers affecting the adoption of Business Intelligence: A study of Thai small and medium-sized enterprises, Melbourne: College of business: Victoria University. https://vuir.vu.edu.au/28817/

Bunderson, J.S & Sutcliffe, K.M. (2002). Comparing alternative conceptualizations of functional diversity in management teams: process and performance effects. Academy of Management Journal, 45(5), 875–893, 2002. https://doi.org/10.2307/3069319

Camelo-Ordaz, C., Garcia-Cruz, J., Sousa-Ginel, E., & Valle-Cabrera, R. (2011).The influence of human resource management on knowledge sharing and innovation in Spain: the mediating role of affective commitment. The International Journal of Human Resource Management, 22(07), 1442-1463. https://doi.org/10.1080/09585192.2011.561960

Chen, H., Chiang, R. H., and Storey, V. C. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. MIS Quarterly, 36 (4), 1165-1188. https://doi.org/10.2307/41703503

Chen, Y., Chen, H., Gorkhali, A., Lu, Y., Ma, Y., & Li, L.(2016). Big data analytics and big data science: a survey. Journal of Management Analytics, 3(1), 1-42. https://www.tandfonline.com/doi/abs/10.1080/23270012.2016.1141332

Cockrell, R. C., & Stone, D.N. (2010). Industry culture influences pseudo-knowledge sharing: a multiple mediation analysis. Journal of Knowledge Management, 14(6), 841-857. https://doi.org/10.1108/13673271011084899

Cockrell, R.C., & Stone, D.N. (2010). Industry culture influences pseudo-knowledge sharing: a multiple mediation analysis. Journal of Knowledge Management, 14(6), 841-857. https://doi.org/10.1108/13673271011084899

Crofton, F.S. (2000). Educating for sustainability: opportunities in undergraduate engineering. Journal of Cleaner Production, 8(5), 397-405. https://doi.org/10.1016/s0959-6526(00)00043-3

Davis, F. D. (1993). User Acceptance of information technology: system characteristics, user perceptions and behavioural impacts. International Journal of Man-Machine Studies, 38, 475– 487. https://doi.org/10.1006/imms.1993.1022

Davis, F.D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. MIS Quarterly 13, 319–340. https://doi.org/10.2307/249008

De Dreu, C.K.W. (2006). When too little or too much hurts: evidence for a curvilinear relationship between task conflict and innovation in team. Journal of Management, 32(1), 83–107. https://doi.org/10.1177/0149206305277795

Dulayami, S.H., & Robinson, L.(2015).The individual and the collective factors affecting knowledge sharing in Saudi Arabian companies. Journal of Documentation, 71(1), 198–209. https://doi.org/10.1108/jd-09-2014-0121

Elias, M.A & Ghaziri, H.M. (2007). Knowledge management. USA, Pearson Education, Inc; 2007.

Ferreira, A. J. P., Ferreira, C. S. A., Knobl, T., Moreno, A. M., Bacarro, M. R., Chen, M., & Mead, G. C. (2003).Comparison of three commercial competitive-exclusion products for controlling Salmonella colonization of broilers in Brazil. Journal of food protection, 66(3), 490-492. https://doi.org/10.4315/0362-028x-66.3.490

Fien, J. (2002). Advancing sustainability in higher education: issues and opportunities for research. International Journal of Sustainability in Higher Education 3(3), 243–253. https://doi.org/10.1016/s0952-8733(02)00005-3

Finestone, N., & Snyman, R. (2005). Corporate South Africa: making multicultural knowledge sharing work. Journal of Knowledge Management, 9(3), 128-41. https://doi.org/10.1108/13673270510602827

Fischer, C., Pardos, Z. A., Baker, R. S., Williams, J. J., Smyth, P., Yu, R., ... & Warschauer, M. (2020). Mining big data in education: Affordances and challenges. Review of Research in Education, 44(1), 130-160. https://journals.sagepub.com/doi/full/10.3102/0091732X20903304

Fornell, C., & Larcker, D.F.(1998). Evaluating structural equation models with unobservable variables and measurement error. Journal of marketing research, 39-50. https://doi.org/10.2307/3151312

Fullwood, R., Rowley, J., & Delbridge, R. (2013). Knowledge sharing amongst academics in UK universities. Journal of Knowledge Management, 17(1), 123–136. https://doi.org/10.1108/13673271311300831

Gadotti, M. (2010). Reorienting education practices towards sustainability. Journal of Education for Sustainable Development, 4(2). 203-211. https://doi.org/10.1177/097340821000400207

Gartner, A. (2016). Gartner Survey Shows More Than 75 Percent of Companies Are Investing or Planning to Invest in Big Data in the Next Two Years, 2016. [Online] Available at: http://www.gartner.com/newsroom/id/3130817

Gertner, J. (2012). The idea factory: Bell Labs and the golden age of American innovation. New York, NY: The Penguin Press, 2012. https://books.google.com.sa/books?hl=en&lr=&id=uOMt_XCo81QC&oi=fnd&pg=PT14&dq=The+idea+factory:+Bell+Labs+and+the+golden+age+of+American+innovation&ots=_Ud62v2qFD&sig=J3RuKUpluXob-WXRxh09nu-Ube4&redir_esc=y#v=onepage&q=The%20idea%20factory%3A%20Bell%20Labs%20and%20the%20golden%20age%20of%20American%20innovation&f=false

Grandon, E. E. & Pearson, J. M., (2004). Electronic commerce adoption: an empirical study of small and medium US businesses. Information & Management, 42, 197-216. https://doi.org/10.1016/j.im.2003.12.010

Gupta, A.K. & Govindarajan, V. (2007). Knowledge management's social dimention: Lesson from Nucor steel, Sloan management Review 42(1), 71–81. https://www.proquest.com/openview/d3a5485cd0c4bfeeb934a04e3fefeaf5/1?pq-origsite=gscholar&cbl=26142

Haan, (2007). Gerhard de. Education for Sustainable Development: A New Field of Learning and Action, in Unesco Today. Journal of the German Comission for UNESCO, Bonn: UNESCO, 6–10. https://doi.org/10.1177/097340820700100203

Hair, J.F., Sarstedt, M., Ringle, C.M., & Mena, J.A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. Journal of the Academy of Marketing Science. 40(3), 414–433. https://link.springer.com/article/10.1007%2Fs11747-011-0261-6

Hameed, M.A., Counsell, S., & Swift, S. (2012). A conceptual model for the process of innovation adoption organizations. Journal of Engineering and Technology Management, 29, 358-390. https://doi.org/10.1016/j.jengtecman.2012.03.007

Horak, S. (2010). Does the individual's culture play a role in the value perception of members of small multinational teams?. Business & Economics Journal, 1–7. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.456.4203&rep=rep1&type=pdf

Huang, L. Y. (2004). A study about the key factors affecting users to accept Chunghwa Telecom's Multimedia on Demand. https://etd.lis.nsysu.edu.tw/ETD-db/ETD-search/view_etd?URN=etd-0208106-140854

Hung, S. Y., Huang, Y. W., Lin, C. C., Chen, K., & Tarn, J. M. (2016, June). Factors Influencing Business Intelligence Systems Implementation Success in the Enterprises. In PACIS (p. 297). https://aisel.aisnet.org/pacis2016/297/

Ishikawa, A., & Nakagawa, J. (2013). An Introduction to Knowledge Information Strategy. From Business Intelligence to Knowledge Sciences; World Scientific: London, UK, ISBN 978-981-4324-42-7, 2013.
Jensen, R., & Szulanski, G. (2004). Stickiness and the adaptation of organizational practices in, crossborder knowledge transfers. Journal of International Business Studies, 35(6), 508-523. https://doi.org/10.1057/palgrave.jibs.8400107
Joshi, A., & Roh, H. (2009). The role of context in work team diversity research: a meta-analytic review. Academy of Management Journal, 52(3), 599–627. https://doi.org/10.5465/amj.2009.41331491
Kamaşak, R., & Bulutlar, F. (2010). The influence of knowledge sharing on innovation. European Business Review, 22(3), 306-317. https://doi.org/10.1108/09555341011040994
Karahanna, E., Evaristo, J., & Srite, M. (2002). Methodological Issues in MIS Cross-Cultural Research. Journal of Global Information Management, 10(1), 48-55. https://doi.org/10.4018/978-1-59140-144-5.ch011
Kayser, V., Nehrke, B., & Zubovic, D. (2018). Data Science as an Innovation Challenge: From Big Data to Value Proposition. Technology Innovation Management Review, 8(3) https://doi.org/10.22215/timreview/1143
Kearney, E, Gebert, D., & Voelpel, S.C. (2009).When and how diversity benefits teams: the importance of team members' need for cognition. Academy of Management Journal, 52(3), 581–598. https://doi.org/10.5465/amj.2009.41331431
Khan, S., & Alqahtani, S. (2020). Big data application and its impact on education. International Journal of Emerging Technologies in Learning (iJET), 15(17), 36-46. https://doi.org/10.3991/ijet.v15i17.14459
King, W.R. (2009). Text analytics: Boon to knowledge management?. Information Systems Management, 26(1), 87-87. https://doi.org/10.1080/10580530802552102
Kulviwat, S., Bruner, G. C., II, Kumar, A., Nasco, S. A., & Clark, T. (2007). Toward a unified theory of consumer acceptance of technology. Psychology & Marketing, 24, 1059–1084. https://doi.org/10.1002/mar.20196
Kunze, F, Boehm, S.A., & Bruch, H. (2011). Age diversity, age discrimination climate and performance consequences–a cross organizational study. Journal of Organizational Behavior, 32(2), 264–290. https://doi.org/10.1002/job.698
Kwon, T.H., Kwak, J.H., & Kim, K. (2015). A study on the establishment of policies for the activation of a big data industry and prioritization of policies: Lessons from Korea. Technological Forecasting and Social Change, 96, 144-152. https://doi.org/10.1016/j.techfore.2015.03.017
Lam, A., & Lambermont-Ford, J. P. (2010). Knowledge sharing in organizational contexts: A motivation-based perspective. Journal of Knowledge Management, 14(1), 51–56. https://doi.org/10.1108/13673271011015561
Leonard, D., & Sensiper, S. (2002). The role of tacit knowledge in group innovation. In: Choo, C., Bontis, N. (eds.). The Strategic Management of Intellectual Capital and Organisational Knowledge. Oxford University Press, Oxford, 2002. https://doi.org/10.1142/9789814295505_0013
Li, X., Troutt, M. D., Brandyberry, A. & Wang, T. (2011). Decisions Factors for the Adoption and Continued Use of Online Direct Sales Channels among SMEs. Journal of the Association for Information Systems, 12(1), pp. 1-31. https://doi.org/10.17705/1jais.00255
Manzi, J. (2012). Uncontrolled: The surprising payoff of trial-and-error for business, politics, and society. New York, NY: Basic Books, 2012. https://doi.org/10.5860/choice.50-2137
Marouf, L., & Al-Attabi, F. (2010). Community of practice in the Kuwaiti medical sector: An exploratory study. DOMES: Digest of Middle East Studies, 19(2), 286– 300. https://doi.org/10.1111/j.1949-3606.2010.00035.x
Martins, A.A., Mata, T.M., & Costa, C.A. (2006). Education for sustainability: challenges and trends. Clean Technologies and Environmental Policy, 8(1), 31-37. https://link.springer.com/article/10.1007/s10098-005-0026-3
Mkrttchian, V., Gamidullaeva, L., Finogeev, A., Chernyshenko, S., Chernyshenko, V., Amirov, D., & Potapova, I. (2021). Big Data and Internet of Things (IoT) Technologies' Influence on Higher Education: Current State and Future Prospects. International Journal of Web-Based Learning and Teaching Technologies (IJWLTT), 16(5), 137-157. https://doi.org/10.4018/ijwltt.20210901.oa8
Moore, G.C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. Information Systems Research, 2(3), 192-222. https://doi.org/10.1287/isre.2.3.192
Muhammad, R. N., Tasmin, R., & Aziati, A. N. (2020, April). Sustainable Competitive Advantage of Big Data Analytics in Higher Education Sector: An Overview. Journal of Physics: Conference Series, 1529(4), p. 042100. IOP Publishing. https://doi.org/10.1088/1742-6596/1529/4/042100
Nam, D., Kang, D., & Kim S. (2015). Process of big data analysis adoption: Defining big data as a new IS innovation and examining factors affecting the process. Hawaii, Hawaii International Conference on Systems Sciences, 2015. https://doi.org/10.1109/hicss.2015.569
Nelson, T.D. (2005). Ageism: prejudice against our feared future self. Journal of Social Issues, 61(2), 207–221. https://doi.org/10.1111/j.1540-4560.2005.00402.x
Nonaka, I. & Konno, N. (1998). The concept of 'Ba': Building a foundation for knowledge creation. California Management Review 40(3), 40–54. https://doi.org/10.2307/41165942
Ohlhorst, F. (2013). Big Data Analytics: Turning Big Data into Big Money. Wiley, New Jersey (2013). https://doi.org/10.1002/9781119205005.ch9
Olszak, C. & Mach-Król, M. (2018). A Conceptual Framework for Assessing an Organization's Readiness to Adopt Big Data. Sustainability, 10(10), 3734. https://doi.org/10.3390/su10103734
Oye, N.D. Salleh, M. & Iaha, N.A. (2011). Knowledge sharing in workplace: Motivators and demotivators.International Journal of Managing Information Technology, 3(4), 71–84. https://doi.org/10.5121/ijmit.2011.3406

Pelling, E. & White, K. (2009). The theory of planned behavior applied to young people's use of social networking web sites. Cyber Psychology & Behavior, 12, 755–9. https://doi.org/10.1089/cpb.2009.0109

Puklavec, B., Oliveira, T., & Popovič, A. (2014). Unpacking business intelligence systems adoption determinants: An exploratory study of small and medium enterprises. Economic and business review, 16(2), 185-23. http://ojs.ebrjournal.net/ojs/index.php/ebr/article/view/344

Rahab, C., Sulistyandari, S., & Soedjono, S. (2011).The development of innovation capability of small medium enterprises through knowledge sharing process: An empirical study of Indonesian creative industry. International Journal of Business and Social Science, 2(21), 112-123. http://ijbssnet.com/journal/index/801:vol-2-no-21-si--november-2011abstract14&catid=19:hidden

Rajpathak, T., & Narsingpurkar, A. (2013). Knowledge from big data analytics in product development. TCS white paper, 2013.

Ramdani, B. & Kawalek, P., (2009). Predicting SMEs' adoption of enterprise systems. Journal of Enterprise Information Management, 22(1/2), 10-24. https://doi.org/10.1108/17410390910922796

Redding, S., Twyman, J. S., & Murphy, M. (2013). What is an innovation in learning? In M. Murphy, S. Redding, & J. Twyman (Eds.), Handbook on innovations in learning (pp. 3–1И). Philadelphia, PA: Center on Innovations in Learning, Temple University; Charlotte, NC: Information Age Publishing, 2013. Retrieved from http://www.centeril.org/

Rogers, E. M. (1983). Diffusion of Innovation: Third edition. 3rd ed. New York: The Free Press. https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf

Rogers, E.M. (1995). Diffusion of Innovation: Third edition. 3rd ed. New York: The Free Press, 1995. https://link.springer.com/chapter/10.1007/978-3-642-79868-9_2

Sackmann, S.A., & Friesl, M. (2007). Exploring cultural impacts on knowledge sharing behavior in project teams results from a simulation study. Journal of Knowledge Management, 11, (6), 142-156. https://doi.org/10.1108/13673270710832226

Sáenz, J., Aramburu, N., & Rivera, O. (2009). Knowledge sharing and innovation performance: A comparison between high-tech and low-tech companies. Journal of Intellectual Capital, 10(1), 22-36. https://doi.org/10.1108/14691930910922879

Salleh, K., & Janczewski, L. (2016). Technological, organizational and environmental security and privacy issues of big data: A literature review. Procedia Computer Science, 100, 19-28. https://doi.org/10.1016/j.procs.2016.09.119

Sayaf, A. M., Alamri, M. M., Alqahtani, M. A., & Al-Rahmi, W. M. (2021). Information and Communications Technology Used in Higher Education: An Empirical Study on Digital Learning as Sustainability. Sustainability, 13(13), 7074. https://doi.org/10.3390/su13137074

Sheu, H., & Sedlacek, W. (2004). Cultural diversity. In A. Distefano, K. Rudestam, & R. Silverman (Eds.), Encyclopedia of distributed learning (pp. 99–103). Thousand Oaks, CA: Sage Publications, 2004. https://doi.org/10.4135/9781412950596.n36

Simonin, B.L. (1999). Ambiguity and the process of knowledge transfer in strategic alliances. Strategic Management Journal, 20(7), 595-623. https://doi.org/10.1002/(sici)1097-0266(199907)20:7<595::aid-smj47>3.0.co;2-5

Sluiter, J.K. (2006). High-demand jobs: age-related diversity in work ability?. Applied Ergonomics, 37 (4), 429–440. https://doi.org/10.1016/j.apergo.2006.04.007

Sohail, M.S., & Daud, S. (2009). Knowledge sharing in higher education institutions: Perspectives from Malaysia. VINE: The Journal of Information and Knowledge Management Systems, 39(2), 125–142. https://doi.org/10.1108/03055720910988841

Springett, D., & Kearins K. (2001). Gaining legitimacy? Sustainable development in business school curricula. Sustainable Development, 9(4), 213-221. https://doi.org/10.1002/sd.164

Srivastava, A, Bartol, K.M. & Locke, E.A. (2006). Empowering leadership in management teams: Effects on knowledge sharing, efficacy, and performance. Academy of Management Journal 49(6), 1239–1251. https://doi.org/10.5465/amj.2006.23478718

Tan, C.N., & Ramayah, T. (2014).The role of motivators in improving knowledgesharing among academics. Information Research, 19(1), 1–16. https://eric.ed.gov/?id=EJ1020843

Thiessen, M.S.W., Hendriks, P.H.J., & Essers, C. (2007). Research and development knowledge transfer across national cultures'', In Pauleen, D.J. (ed.), Cross-Cultural Perspectives on Knowledge Management, Libraries Unlimited, Westport, USA, 219-243. https://books.google.com.sa/books?hl=en&lr=&id=dk0GRAaYrrMC&oi=fnd&pg=PA219&dq=Research+and+development+knowledge+transfer+across+national+cultures%E2%80%99%E2%80%99,+In+Pauleen,+D.J.+(ed.),+Cross-Cultural+Perspectives+on+Knowledge+Management,+Libraries+Unlimited,+Westport,+USA&ots=WjYWYCLuGi&sig=w3BEsiyApqYcomhawPY6kPRDTTI&redir_esc=y#v=onepage&q&f=false

Tolba, A., & Mourad, M. (2011). Individual and cultural factors affecting diffusion of innovation. Journal of International Business and Cultural Studies, 5 (3), 203- 218. http://commerce.du.ac.in/web/uploads/e%20-%20resources%202020%201st/M.Com%20Sem%20IV/Prof.Kavita%20Sharma_culture%20and%20innovation%20diffusion.pdf

Tornatzky, L. G. & Klein, K., (1990). Innovation characteristics and innovation adoption implementation: A meta-analysis of findings. IEEE Transactions on Engineering Management, 29(1), pp. 28-48. https://ieeexplore.ieee.org/abstract/document/6447463/

United Nations Educational, Scientific and Cultural, Organization (UNESCO). (2006). Education for Sustainable Development Toolkit. Paris: UNESCO http://kpe-kardits.kar.sch.gr/Aiforia/esd_toolkit_v2.pdf

Van Knippenberg, D, De Dreu, C.K.W., & Homan, A.C. (2004).Work group diversity and group performance: an integrative model and research agenda. Journal of Applied Psychology, 89(6), 1008–1022. https://doi.org/10.1037/0021-9010.89.6.1008

Venkatesh, V. & Bala, H. (2008).Technology Acceptance Model 3 and a research agenda on interventions. Journal of Decision Sciences, 39(2), 273-315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478. https://www.jstor.org/stable/30036540

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2021 Volume 9 Number 1 (September)
http://doi.org/10.9770/jesi.2021.9.1(37)

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS quarterly, 36(1), 157-178. https://doi.org/10.2307/41410412

Virtanen, I. (2011). Externalization of tacit knowledge implies a simplified theory of cognition. Journal of Knowledge Management Practice, 12(3), 139-145. http://www.tlainc.com/articl267.htm

Voel, S.C., & Han, C. (2005). Managing knowledge sharing in China: the case of Siemens ShareNet. Journal of Knowledge Management, 9, (3), 51-63. https://doi.org/10.1108/13673270510602764

Yang, M. M. (2007). An exploratory study on consumers' behavioral intention of usage of third generation mobile value-added services, Unpublished Master Thesis, National Cheng Kung University.

Zhen, L., Jiang, Z., & Song, H. T. (2011). Distributed knowledge sharing for collaborative product development. International Journal of Production Research, 49(10), 2959-2976. https://doi.org/10.1080/00207541003705864

Omar A. ALISMAIEL
ORCID ID: https://orcid.org/0000-0002-5016-7875

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

Copyright © 2021 by author(s) and VsI Entrepreneurship and Sustainability Center
This work is licensed under the Creative Commons Attribution International License (CC BY).
http://creativecommons.org/licenses/by/4.0/
Open Access