Adopting e-government services in less developed countries according to the characteristics of business intelligence: (Sudan as a model)

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Abstract
In this paper, a contribution is presented covering the data set in improving and developing electronic services provided to citizens through e-government services based on business intelligence in government agencies in the Republic of Sudan. The Business Intelligence Concept Survey was conducted from the perceptions of information department employees in government agencies. The survey was conducted from April to June 2021 using questionnaires. The dataset contains responses about the factors that influence the use of business intelligence and the barriers and limitations to the use of business intelligence. A five-point Likert scale was used to analyze the quantitative data. The opportunities and challenges associated with it were also discussed and explored. As evidenced by the results, the information department employees agree that business intelligence improves the government decision-making process, which helps decision makers and decision-makers to find alternatives and opportunities that contribute to making more accurate and timely decisions. The results also indicate that creating the infrastructure for applying business intelligence in the e-government work model contributes to the successful implementation of business intelligence in Sudan.
Keywords:
Business Intelligence, E-government, less developed countries, Data analytics, Survey analytics.

1. Introduction

Government decision-making plays an important role in the political, social, and economic development of countries. Developing countries face many significant challenges when it comes to government decision-making. Issues such as planning, mismanagement, ineffective decisions, complex interactions of ideologies, and public expectations for good governance are part of the problems that developing countries have yet to resolve. Given the similarity in the goals of business organizations and the goals of governments of developing countries represented in the necessity of survival considering economic conflict and the general challenges facing the two, I find that the process of integrating the concepts and characteristics of business intelligence in e-government services leads to the creation of a better reality for developing countries.

The widespread use of digital media for public services has spawned a new breed of e-government systems that rely on IT-enabled web interfaces as the primary point of interaction between government agencies and stakeholders [1]. Business intelligence/analytics is the top priority problem for CIOs and investments, according to Gartner [2]. Using big data, the public sector might improve the efficiency of its administration. The figure is estimated to be 250 billion EUR per year, or 0.5% annual productivity increase in the European Union [3]. 'Business intelligence' and 'big data are two words used to describe the software for business analytics. Based on opinion mining, social network analysis, and data from the accounting system, business intelligence, and big data are utilized to enhance online political involvement, e-government service delivery, process transparency, and accountability [4]. The phrase "decision support system" is a 60-year-old word that refers to computer-based aids for making sense and making decisions. The terminology has evolved through time, and the word "business intelligence" is now more often used, among other things. Despite the appearance of new terminology, they all serve the same purpose[5]. Some experts see big data business intelligence 3.0 [4] as a new generation of business intelligence and analysis, while others see it as a paradigm change [6].

The implementation of e-government strategies has been met with significant challenges in both developed and developing countries; each country faces a unique set of factors that can aid or hinder its overall progress towards e-government development [7], with low levels of infrastructure and human capital, as well as a lack of access to both ICT and education infrastructure, emerging countries remain at lower levels of e-government development, resulting in a significant digital divide. In contrast to industrialized nations, where technical advantages exist, participation in the information society becomes a question of choice. Without a doubt, many nations' e-government systems have interacted to the point where certain services are completely integrated, and governments throughout the globe are becoming more conscious of global perspectives in their efforts to handle complex social, political, and economic issues. Public policy making may be described as a dynamic, complex, and interactive system in which public problems are discovered and addressed by developing new policies or changing old ones [8]. Public issues can arise in a variety

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of ways, necessitating a variety of policy solutions (including regulations, subsidies, quotas, and legislation) at the local, national, and international levels[9]. Making public policy is a continuous process with several feedback loops. This system's functionality depends on verification and assessment [11]. Economic, social, or political issues may all impact public policy decisions [12]. Implementing BI on government system data warehouse will provide political leaders insight and foresee the next difficulties and public problems since each system is impacted by distinct public problems and hence demands different public policies. Despite the global expansion of e-governments, much of the development is focused in affluent countries. According to a United Nations e-government readiness study done in 2020, underdeveloped nations are falling behind developed countries in terms of e-government adoption owing to the former's incapacity to implement public e-service programs (United Nations, 2020). As a result, a few academics have questioned whether lessons learned from previous studies of e-government systems in mostly industrialized nations can be applied to developing ones [14]. in particular, has called for more research on the factors that influence e-government adoption in poor countries [15]. Businesses and industries, including the government sector, benefit from information and communication technology (ICT), which allows them to boost transparency and efficiency, improve communication, and deliver better services [17].

At the same time, it makes information more accessible to citizens and increases the usability of services. ICT is a significant factor of a nation's progress and offers the infrastructure for improved decision-making. However, without successful e-government, achieving government expansion, economic growth, poverty reduction, citizen prosperity, and a nation's sustainability would be more difficult [18]. The public sector must be reformed and transformed into a digital public sector in order to improve efficiency, effectiveness, accountability, and openness, as well as improve communication and information access for stakeholders [19]. With the advent of information technology, many organizations, industries, and even government agencies that deal with enormous amounts of data have been obliged to collect, comprehend, and harness electronic data from many sources in order to make meaningful decisions [20]. This has prompted a number of businesses to incorporate computer-based intelligence into their operations in order to improve efficiency and promote speedy decision making[21]. Developed countries are continually improving their information systems by mining the applications of information technology and applying data analysis for decision making and forecasting[23]. Similarly, emerging nations are making strides in implementing information technology standards and business intelligence methodologies in reviewing their data in order to make more educated judgments. However, emerging economies must put in a lot of effort to realize the full potential of business intelligence and information technology[24]. Developed countries are continually improving their information systems by incorporating data analysis for decision-making and forecasting and mining the uses of information technology. Similarly, developing nations are progressing in implementing information technology standards and business intelligence methodologies in reviewing their data to assist them in making more educated judgments. However, emerging economies must put in a lot of effort to realize the full potential of business intelligence and information technology. The spread of information technology in underdeveloped nations has been fast, but it has not been followed by significant developmental gains. As a result, the purpose of this research is to identify factors that influence the adoption of information technology and business intelligence in developing countries, as well as to suggest ways in which such technologies can be used to improve the overall socioeconomic standard of living in these countries.

2.RESEARCH MODEL AND HYPOTHESES

This section aims to clarify the methodology adopted in this paper, in terms of study method and design, methods of data collection and defining the study population, as well as the stages of the questionnaire development and procedures for its distribution and then working on defining the statistical methods used in data analysis [25].

To clearly understand and adequately describe the concept of business intelligence and study the reality of its practice and analyze its impact on e-government in developing countries, the current paper relied on the descriptive-analytical approach, which is related to the presentation of the most important theoretical data. Which allows the study of phenomena in detail and extensively, and through this method I developed the questionnaire as a tool for data collection [26].

2.1 Research Methodology

Objective of the study: This study came to reveal the degree of practice of the main issues of business intelligence activities and its tools and their impact on the provision of e-government services, and to study the nature of the relationship between business intelligence and the use of e-government models in developing countries.

Approach / Approach: The study sample consisted of 30 professionals from the government sector who work in the deployment of e-government technologies in Sudan, and the study employed a qualitative technique.

Study questions: The research problem can be identified by answering the following questions:

1. What is the relationship between the electronic services that the government provides to its citizens through electronic channels and citizens' satisfaction (improving the quality of performance)?

2. What is the statistical relationship between online government services and socio-economic standards of developing countries?

Social/administrative contributions: Shedding light on the factors and their relationship to the success of using business intelligence in e-government applications and models in less developed countries would help governments at all levels reduce losses through the use of the system to improve employee performance, increase citizen satisfaction, enhance transparency, and combat corruption. This will eventually lead to the development of government institutions' services.

2.2 Research Methodology

The concept of business intelligence has often been associated with service organizations such as: (finance, education, hotel, banking, etc.), and government service agencies have been chosen to study this concept, operating in the state of Khartoum.

The sample of this study consisted of 30 individuals. Where it exceeds the minimum required according to the statistical equation specified for the sample size[28].

At 95% confidence, Z = 1.96

The number of sample members was determined by analyzing a random test sample consisting of (6) individuals, where it was found that the mean standard deviation of their educational levels was (0,1273). After that, the required sample size was calculated based on a confidence level of 90% and an allowable error of 0.05 as follows:

N = sample size.

2Z = standard score corresponding to confidence level 1.96

(P) = the percentage of deviation in the test sample.

2(e) = 0.05% standard error

As for the study sample, a random sample of 30 individuals of both sexes and of all ages was selected. It included managers of information technology departments or their representatives and some of those with technical experience in government agencies[28]. Where (30) questionnaires were distributed to the selected study sample to obtain the required data, using the (Drop_ and_ Collect) method of distribution and direct collection[28].

By reviewing the scientific material related to the concepts of business intelligence and e-government in developing countries, the items and phrases of the questionnaire were developed to serve the purposes of the study, and the questionnaire became ready for distribution to the study sample in its final form, which includes two main parts that are described as follows:

The first part: contains general information related to identifying demographic characteristics (gender, age, educational level, salary)[28].

Part Two: This part consists of statements that measure each of the factors and dimensions that affect business intelligence and e-government in developing countries. Many studies have been relied upon in developing these phrases, the most prominent of which is the study of [22][12]. A Likert scale posits that an attitude's strength/intensity is linear, i.e., on a scale ranging from strongly agree to strongly disagree, and that attitudes can be quantified. To know the reality of using business intelligence in e-government applications in developing countries, the Likert Scale Five Point was adopted as follows:

Strongly Disagree DisagreeUndecided Agree Strongly Agree

1 2 3 4 5

Likert Scales offer the advantage of not requiring a simple yes/no response from the respondent, but rather allow for a range of opinions, including no opinion at all.

As a result, quantifiable data is acquired, implying that the data may be evaluated very quickly [29]. Likert scales provide a rank order for answer categories, but the gaps between values cannot be assumed to be equal. As a result, ordinal data should not be represented by the mean (or standard deviation) [30]. You can make use of the following statistics: Summarize using a median or a mode (rather than a mean because the data is on an ordinal scale); the mode is probably the easiest to comprehend. The Statistical Package for Social Sciences (SPSS) program was used to analyze the primary data collected at an earlier stage, and for the purpose of achieving the objectives of this study and to answer its questions.

Several statistical methods were used, including:

1. Descriptive methods that included calculating arithmetic means, standard deviations, and frequencies.

2 Arithmetic averages and standard deviations

3. Test (One Sample T-test)

4 Pearson Correlation

5. Regression analysis

6. multiple regression analysis
7 .Multiple analysis of variance (MANOVA).

3. Hypothesis Test

To test the main hypotheses under study, a simple regression test was adopted to calculate (t) values that measure the possibility of a significant relationship between each independent variable and the dependent variable related to the hypothesis under test. This test is based on the following formula for the null hypothesis and the alternative hypothesis:
There is no linear relationship between the independent variable and the dependent variable H0: B1 = 0

There is a linear relationship between the independent variable and the dependent variable 0 Ha : B1

The statistical rule of this test states that the null hypothesis H0 is rejected if:

That the values of P (Sig) are less than its significance level of 0.05, the relationship between them is significant and statistically significant:

If Sig H0 , Where as P (Sig) 0.05

The values of Pearson's correlation coefficient R between each independent variable and the dependent variable were adopted, as the P (Sig) values of any correlation coefficient between the independent variable and the dependent variable are less than its significance level (0.05 P). The relationship between them is significant and statistically significant.

The ANOVA test was also adopted to calculate the (F) values that measure the level of significance of the relationship between the dependent variable and the set of independent variables included in the regression model used. This test is based on the following formula for the null hypothesis and the alternative hypothesis:

H0 : B1 = B2 = ….. Bj = 0 (1)

That is, there is no linear relationship between the independent variables and the dependent variable

Ha = At least one Bj 0 (2)
That is, there is a linear relationship between at least one of the independent variables and the dependent variable. The statistical rule of this test states that the null hypothesis H0 is rejected if:

That the values of P (Sig) for any correlation coefficient between the independent variable and the dependent variable is less than its level of significance 0.05, the relationship between them is significant and statistically significant:

If Sig H0 , Where as P (Sig) 0.05 (3)

The results of descriptive statistics were also studied with regard to the values of the arithmetic mean and standard deviation for each of the questionnaire questions, and the average frequency was measured. Note that the study variables were measured on the five-point Likert scale to indicate the degree of approval, and the degrees of approval were divided into (5) categories,

Grade (1) too low, (2) low, (3) medium, (4) high, and (5) very high. It makes up a total of 15 degrees, so the mean (3= 15 / 5).

The statistical rule states that the nihilistic hypothesis is accepted if the arithmetic means of each item is less than 3, and nihilism is rejected if the arithmetic mean of each item is more than 3, meaning that the average frequency is more than (0.50).

To verify its statistical significance, the One-Sample t-test was performed. test according to the following equation:

t (M-M0)/(S/$\sqrt{}$n) (4)

Where: M0 = 3 is the arithmetic mean of the five-point Likert scale, (M) the mean for each of the study variables, (S) the standard deviation of the sample, (n) the sample size. Since the null hypothesis: M = M0 : M0 M.

Statistical significance is a decision by an analyst that the data's results cannot be explained only by chance. The mechanism by which the analyst achieves this judgment is statistical hypothesis testing. This test yields a p-value, which represents the likelihood of seeing findings as severe as those in the data if the results are actually attributable to chance alone. A p-value of 5% or less is frequently deemed statistically significant. Statistical significance is used to offer evidence for the plausibility of the null hypothesis, which states that the data is merely the result of random chance[31].

3.1 First Hypothesis:

H01: There is no statistically significant relationship between the electronic services provided by the government to its citizens through electronic channels and citizens' satisfaction (improve the quality of performance).

H11: There is a statistically significant relationship between the electronic services provided by the government to its citizens through electronic channels and citizens' satisfaction (improve the quality of performance).

To test this hypothesis, tests were conducted, the results of which are shown in the following tables.

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Table (1) Results of descriptive statistics for the independent variable of electronic channels

#	independent variable	Arithmetic mean	standard deviation	Average Frequency	t	Sig(2-Tailed)	The result
1	*Electronic Channels*	*3.96*	*0.58*	*0.79*	*19.122*	*0.000*	*Reject Null Hypothesis*

Table (2) Results of ANOVA analysis

#	independent variable	df	R2	F	t	Sig.	The result
1	*Electronic Channels*	*1*	*0.82*	*586.84*	*24.30*	*0.000*	*Reject Null Hypothesis*

The results of the descriptive statistical analysis presented in Table (1) indicated that the respondent sample agreed on the importance of providing service to citizens through electronic channels. It indicates a high degree of approval.

The results of the (One-Sample t-test) analysis also showed that the value of the statistical test (t) for providing service through electronic channels was (0.000) less than its level of significance.(0.05)

It is clear from the values contained in Table (2) that the coefficient of determination R2 explained a rate of (0.82) of the change in the ability of electronic channels to gain citizens' satisfaction and the further improvement of the quality of performance and the positive impact on the political, economic, and social future. And that there is a statistically significant relationship between the degree of government agencies' adoption in developing countries of new means of providing government service through electronic channels and the increase in citizens' satisfaction. The statistical decision rejects the null hypothesis of a statistically significant relationship.

It is also noted that there is a relationship between the degree of government agencies' adoption of electronic channels and the improvement of the quality of performance, by comparing the significant significance of the value (t) of (.000) which is less than (0.05), and therefore rejects the null hypothesis and accepts the alternative hypothesis of the existence of a statistically significant relationship.

3.2 The second hypothesis:

H02: There is no statistically significant relationship between government services that are provided via the Internet and the socio-economic standards of developing countries.

H12: there is a statistically significant relationship between government services that are provided via the Internet and the social and economic standards of developing countries.

Table (3) Results of the descriptive statistics for the independent variable related to online banking services

Table (4) Results of ANOVA analysis

#	independent variable	Arithmetic mean	standard deviation	Average Frequency	t	Sig(2-Tailed)	The result
1	*government services that are provided via the Internet*	*3.80*	*0.39*	*0.76*	*23.58*	*0.000*	*Reject Null Hypothesis*

#	independent variable	df	R2	F	t	Sig.	The result
1	*government services that are provided via the Internet*	*1*	*0.62*	*209.02*	*14.46*	*0.000*	*Reject Null Hypothesis*

The results of the descriptive analysis in Table (3) indicate that the respondent sample agreed on the importance of government agencies adopting the method of providing service via the Internet. The average frequency of the responses of the sample members was (0.76), which is more than (0.50). It indicates a high degree of approval.

The results of the (One-Sample t-test) analysis also showed that the significance of the value of the statistical t-test for the Internet amounted to (.000), which is less than its level of significance.(0.05)

It is clear from the values presented in Table (4) that the coefficient of determination R2 explains the rate of (0.62) of the change in the ability of governments in developing countries to achieve social and economic standards for developing countries.

And that there is a statistically significant relationship between the degree of adoption of the Internet to serve citizens and reduce operating costs. The result of the analysis indicates a significant (F) value of (.000), which is less than (0.05), and based on the statistical decision, the null hypothesis is rejected and the alternative hypothesis is accepted for the existence of a statistically significant relationship.

It is noted that there is a relationship between its use of the Internet and the achievement of social and economic standards for developing countries, by comparing the significance of the value (t) of (.000) which is less than (0.05).

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3.3 Pearson Correlation

is a measure of two sets of data's linear correlation. It is the ratio of two variables' covariance to the product of their standard deviations; consequently, it is effectively a normalized measurement of covariance, with the result always falling between 1 and 1. The metric can only indicate a linear correlation of variables, similar to covariance, and excludes many other types of interaction or association.

Table (5) Pearson Correlation Between two areas (business intelligence and e-government in developing countries)

areas	correlation coefficient	Statistical significance
business intelligence	*0.65*	*0.00*
e-government in developing countries		

It appears from Table (5) that the correlation coefficient between two fields (business intelligence and e-government in developing countries) reached (0.65), which is a statistically significant value at the significance level (α = 0.05), which indicates a strong correlation between the application of the concept of e-government provided by government agencies to citizens through the adoption of business intelligence in providing services.

3.4 Regression analysis

Table (6) Regression analysis Between two areas (business intelligence and e-government in developing countries)

areas	β	T	R	R Square	F	Statistical significance
business intelligence	*0.71*	*14.57*	*0.65*	*0.42*	*212.52*	*0.00*
e-government in developing countries						

It appears from Table (6) that the ratio of the impact of business intelligence in the e-government of developing countries amounted to (0.71), which represents its (β) value, where the value of (T) reached (14.57), which is the values of a statistical function at the significance level (α = 0.05), and this indicates There is a statistically significant effect of applying the concept of business intelligence in the e-government of developing countries, and the value of (R) is (0.65), which is a statistically significant value that indicates a correlation between the application of the concept of business intelligence in the electronic government of developing countries, and the value of (R- Square) is (0.42), which is A statistically significant value that explains the ability to apply the concept of business intelligence in the e-government of developing countries. The value of (F) is (212.52), which is a statistically significant value. This indicates the existence of a statistically significant relationship at the significance level ($\alpha = 0.05$) when applying the concept of business intelligence in the e-government for developing countries.

4. RESULTS AND DISCUSSION

In this subsection, the study discusses the results obtained from a qualitative analysis collected from interviews with specialists in government agencies in the Sudanese capital, Khartoum.

The information gathered during the interview was subjected to impartial examination.

The steps involved in objective interview analysis (Braun & Clarke, 2006) are as follows: The initial stage was to transcribe and translate each recorded interview from Arabic to English and then to examine the transcripts several times to check that the data was consistent.

The final analysis and drafting of the qualitative analysis results were based on the texts that were studied. Keywords, linking phrases, and code structure were used as a guide to scan the data. When picking objective subjects for the interviews, data redundancy was removed. Finally, the concerns in this section established the structure of this section in relation to the research goal of applying business intelligence in the application and development of e-government models in developing nations.

Implication of the study

- The incoming statistical data shows that 61.25% of the managers surveyed in the studied sample confirm their quest to use business intelligence in developing models of electronic services provided in the future, compared to 11.53% who do not agree to use business intelligence in developing models of electronic services provided in the future, and 18.83% of them are not sure of that. This came with an arithmetic mean of 3.57 and a standard deviation of 1.18, and the ratio of the answer to the intensity of the scale was good (74.83%) expressing the possibility of adopting business intelligence in developing models of electronic services provided in the future. Among the most prominent variables that contributed to enhancing the statistical results received:
- The administration of government agencies seeks to gain citizens' satisfaction through the use of electronic services, and this came at a rate equivalent to (81.8%) based on the total area of the answer scale, which is (5) degrees on the Likert scale.
- As came a paragraph, most IT employees will have familiarity with and use of business intelligence techniques such as reporting, OLAP analytics (OLAP cube), data mining, business process management, measurement standards, text extraction, predictive analytics, etc. This came with an answer rate of 79% of the total area of the answer scale.
- According to a paragraph, government organizations use modern approaches including integrating numerous data sources to create a uniform and integrated view of government data. This finding was confirmed by applying business intelligence in the future as a means of securing all informational and service needs of citizens, with a fair response of 77.8%.
- Bu using the spss software, and by adopting the Varimax method addition, when conducting the factor analysis process on the questionnaire paragraphs regarding the possibility of using business intelligence in developing future models of electronic services provided. The statistical results produced four factors that represent the study of the current phenomenon and collectively explain (85.291%) These factors are explained further below:
- The first factor: Business intelligence tools

The first factor includes (8) variables that explain a total of (21.0087) of the variance, and the eigenvalue has reached the factor (4.850). The set of variables saturated with this factor indicates that they represent the techniques of using business intelligence in the studied government agencies, and that is why this factor was called by this name.

- The second factor: the advantages of using business intelligence in the e-government model

This factor includes (4) variables that explain a total of (15,325) of the total variance. The intrinsic value of this factor has reached (3.526). The group of variables saturated with this factor indicates that they represent the advantages of using business intelligence in the electronic government model. That is why it was called by this name.

- The third factor: the efficiency of electronic service delivery using business intelligence tools

This factor includes (12) variables that explain a total of (13.863) of the total variance, and the intrinsic value of this factor has reached (3.188), and the group of variables saturated with this factor indicates that it represents the efficiency of electronic service provision using business intelligence tools. That is why this factor was called by that name.

- The fourth factor: the availability of electronic services continuously 24/7

This factor (5) includes two variables that explain a total of (10.355) of the total variance, and the intrinsic value of this factor has reached (2.382), and the group of variables saturated with this factor indicates that it represents the provision of electronic services constantly 24/7. That is why this factor was called by that name.

CONCLUSION

The results of the tests for the variables of each of the hypotheses were analyzed and discussed to answer the research's questions arising from the aspects of the problem on which the study was based, based on the results of the statistical test for the hypotheses of the study.

The first issue is: What is the relationship between the electronic services provided by the government to its citizens via electronic channels and citizen happiness (increasing performance quality)? According to the findings, there is a considerable link between the usage of electronic channels to service citizens and citizen satisfaction (improving the quality of performance). In terms of lowering the cost and effort required to acquire government services for citizens.

Second, what is the relationship between government services delivered over the Internet and the socioeconomic status of emerging countries? The study's findings revealed that there is a significant relationship between the degree of adoption of government agencies in less developed countries and the provision of services via the Internet, as well as the social and economic standards of developing countries, with this variable ranking second after Electronic Channels in terms of relative importance, with a coefficient of determination (0.62) and an average of 3.80, indicating the importance of this method for developing countries.

It is critical to identify and confirm the determinants of using business intelligence in e-government models and frameworks, as well as to adapt them, particularly in the context of LDCs, for the effective use of information technology resources, which mainly suffer from a severe shortage of tools and weak infrastructure.

This highlights the necessity of taking a closer look at the principles of using business intelligence in developing nations in order to facilitate the prevention of corruption on the one hand and effort to prevent corruption on the other, in addition to the organizational benefits. This would aid decision-makers in developing effective strategies, as well as programmers and technicians in developing and launching products and services that fulfill end-user needs.

The use of systems, controlled expenditures, headcount management, and employee performance improvement, aligned processes in the spending chain, keeping pace with the financial performance of major projects, strengthening relationships with citizens, and using systems reports can all help governments in less developed countries reduce losses.

Some research can be undertaken using the proposed research paradigm based on the findings of this study. The model results in this study can thus be used by academics and researchers interested in improving the effectiveness of e-government models in developing nations.

Curvilinear effects, which influence the linkages between business intelligence tools and e-government model applications, need to be investigated further.

References

[1] Siau, K., & Long, Y. (2009). Factors impacting e-government development. Journal of Computer Information Systems, 50(1), 98–107.Gartner, Flipping to Digital Leadership: Insights from the 2015 Gartner CIO Agenda Report, Gartner,Stamford, US, 2014.

[2] J. Manyika, M. Chui, B. Brown, J. Bughin, R. Dobbs, C. Roxburgh, and A. H. Byers, Big Data: The next Frontier for Innovation, Competition, and Productivity, McKinsey Global Institute, 2011.

[3] H. Chen, R. H. Chiang, and V. C. Storey, Business intelligence and analytics: From big data to big impact., MIS Quarterly, 36 (2012), 1165–1188.

[4] S. Alter, A work system view of DSS in its fourth decade, Decision Support Systems, 38 (2004), 319–327.

[5] A. McAfee and E. Brynjolfsson, Big data: The management revolution. (cover story), Harvard Business Review, 90 (2012), 60–68.

[6] Belachew, M.: E-government initiatives in Ethiopia. In: Davies, J., Janowski, T. (eds.) Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2010), pp. 49–54. ACM, New York (2010).

[7] Adrees, M. S., et al. "A framework of promoting government services using social media: Sudan e-government case study." Journal of Physics: Conference Series. Vol. 1167. No. 1. IOP Publishing, 2019.

[8] Jadi, Yassine, and Lin Jie. "An Implementation Framework of Business Intelligence in e-government systems for developing countries: Case study: Morocco e-government system." 2017 International Conference on Information Society (i-Society). IEEE, 2017.

[9] Majzoob K. Omer, Mohammed S. Adrees and Osama E. Sheta, 2018. Recommend Stages Model to Implement e-Government Application Strategies. Journal of Engineering and Applied Sciences, 13: 6708-6712.

[10] Adrees, M. S., Omer, M. K., & Sheta, O. E. (2015). Recommend stages model to implement e-government application strategies. International Journal Of Core Engineering & Management, 2(3), 31-40..

[11] Seo, DongBack, Chee-Wee Tan, and Gumala Warman. "Vendor satisfaction of E-government procurement systems in developing countries: an empirical research in

Indonesia." Information Technology for Development 24.3 (2018): 554-581.
[12] Nations, United Nations E-Government Survey 2020.
[13] Gaardboe, Rikke, Tanja Svarre, and Anne Marie Kanstrup. "Characteristics of business intelligence and big data in e-government: Preliminary findings." Innovation and the public sector (2015): 109.
[14] Jadi, Yassine, and Lin Jie. "An Implementation Framework of Business Intelligence in e-Government Systems for Developing Countries." 10th European Conference on Information Systems Management. 2016.
[15] Glyptis, Loukas, et al. "E-Government implementation challenges in small countries: The project manager's perspective." Technological Forecasting and Social Change 152 (2020): 119880.
[16] Adrees, M. S., Omer, M. K., & Sheta, O. E. (2016). Cloud computing adoption in the higher education (Sudan as a model): A SWOT analysis. American Journal of Information Systems, 4(1), 7-10.
[17] Sagarik, Danuvas, et al. "E-government 4.0 in Thailand: The role of central agencies." Information Polity 23.3 (2018): 343-353.
[18] Pedersen, Keld. "E-government transformations: challenges and strategies." Transforming Government: People, Process and Policy (2018).
[19] Meiyanti, Ruci, et al. "E-government challenges in developing countries: a literature review." 2018 6th International Conference on Cyber and IT Service Management (CITSM). IEEE, 2018.
[20] Ashaye, Olusoyi Richard, and Zahir Irani. "The role of stakeholders in the effective use of e-government resources in public services." International Journal of Information Management 49 (2019): 253-270.
[21] Adrees, M. S., Abdalla, A. I., & Karrar, A. (2016). A proposed framework for using GIS to enhance traffic safety in Sudan: a case study. American journal of traffic and transportation engineering, 1(1), 1-6..
[22] Naqvi, Al. "AI-GOVERNMENT VERSUS E-GOVERNMENT: HOW TO REINVENT GOVERNMENT WITH AI?." Handbook of Artificial Intelligence and Robotic Process Automation: Policy and Government Applications (2020): 97.
[23] El-Adaileh, Nadeem Ali, and Scott Foster. "Successful business intelligence implementation: a systematic literature review." Journal of Work-Applied Management (2019).
[24] Altheide, D. L., & Johnson, J. M. (1994). Criteria for Assessing Interpretive Validity in Qualitative Research. In N. K. Denzin & Y. S. Lincoln (Eds.). Handbook of Qualitative Research, pp. 485-499. Thousand Oaks, CA: SAGE.
[25] Mohajan, Haradhan Kumar. "Two criteria for good measurements in research: Validity and reliability." Annals of Spiru Haret University. Economic Series 17.4 (2017): 59-82.
[26] Hallgren, K. A. (2012). Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. Tutorials in Quantitative Methods for Psychology, 8(1), 23-34.
[27] Taherdoost, Hamed. "Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research." How to test the validation of a questionnaire/survey in a research (August 10, 2016) (2016).
[28] Adrees, M. S., Karrar, A. E., & Osman, W. I. (2020, December). Adoption of Smart Cities Models in Developing Countries: Focusing in Strategy and Design in Sudan. In International Conference of Reliable Information and Communication Technology (pp. 933-944). Springer, Cham.
[29] Jamieson, S. (2004). Likert scales: how to (ab) use them. Medical Education, 38(12), 1217-1218.
[30] Johnson, Douglas H. "The insignificance of statistical significance testing." The journal of wildlife management (1999): 763-772.

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