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**DESIGN OF A FRAMEWORK OF BUSINESS INTELLIGENCE
SYSTEMS ADOPTION IN THE HEALTHCARE SMEs IN
NIGERIA: A HYBRID APPROACH**



**DOCTOR OF PHILOSOPHY
UNIVERSITI UTARA MALAYSIA
2024**

**DESIGN OF A FRAMEWORK OF BUSINESS INTELLIGENCE SYSTEMS
ADOPTION IN THE HEALTHCARE SMEs IN NIGERIA:
A HYBRID APPROACH**



By

SALISU ISYAKU

**Thesis Submitted to
Awang Had Salleh School of Arts and Sciences,
Universiti Utara Malaysia,
in Fulfillment of the Requirement for the Degree of Doctor of Philosophy**



Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

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Abstrak

Salah satu cabaran utama bagi eksekutif penjagaan kesihatan ialah membuat keputusan yang berkesan. Dalam pasaran penjagaan kesihatan hari ini, terdapat tekanan terhadap organisasi penjagaan kesihatan swasta untuk mengguna pakai sistem kepintaran perniagaan. Walau bagaimanapun, penggunaan sistem kepintaran perniagaan dalam penjagaan kesihatan swasta agak terhad, dan faktor yang lebih penting dalam penggunaan keputusan tidak difahami sepenuhnya. Tujuan kajian ini adalah untuk merekabentuk rangka kerja penggunaan sistem kepintaran perniagaan oleh perusahaan kecil dan sederhana di Nigeria. Kajian ini menjalankan tinjauan literatur sistematik untuk mengenalpasti faktor, dan 15 pakar telah dipilih menggunakan teknik persampelan bola salji untuk pengesahan faktor. Selanjutnya, kajian mengaplikasikan analisis Partial Least Squares-Structural Equation Modelling (PLS-SEM) menggunakan SmartPLS-4 untuk menganalisis data. Seterusnya, seramai 376 pemilik hospital di Nigeria telah dipilih menggunakan teknik persampelan rawak mudah, namun hanya 152 yang mengambil bahagian. Di samping itu, kajian menjalankan analisis proses hierarki analitik (AHP) untuk mengutamakan faktor signifikan. Data AHP yang dikumpul daripada sepuluh pakar dipilih menggunakan teknik persampelan bola salji. Hasil daripada analisis PLS-SEM menunjukkan bahawa kelebihan relatif, keserasian, kompleksiti, pemerhatian dan kebolehcubaan, saiz organisasi, ketersediaan sumber organisasi, kehadiran kapasiti penyerapan ketua, sokongan vendor dan sokongan kerajaan dalam pengetahuan IT dan inovasi adalah signifikan terhadap penggunaan kepintaran perniagaan. Manakala, persaingan dan sikap tidak menunjukkan keputusan yang signifikan. Seterusnya, keputusan AHP menunjukkan bahawa model adalah konsisten. Dapatan menunjukkan bahawa teknologi adalah ciri yang terpenting, manakala persekitaran pula adalah ciri yang paling kurang penting. Kajian menekankan peranan penting pelbagai faktor dalam penggunaan sistem kepintaran perniagaan bagi meningkatkan pembuatan keputusan penjagaan kesihatan di Nigeria. Kajian ini mengesahkan bahawa teknologi, persekitaran organisasi dan faktor individu memainkan peranan yang signifikan dalam mempengaruhi penggunaan sistem kepintaran perniagaan. Disyorkan agar pihak pengurusan hospital mempertimbangkan faktor terpenting dalam membuat keputusan semasa menggunapakai sistem kepintaran perniagaan.

.

Kata kunci: Sistem Kepintaran Perniagaan, Teknologi-Oorganisasi-Persekitaran, Penjagaan Kesihatan, Hospital, Industri Kecil dan Sederhana

Abstract

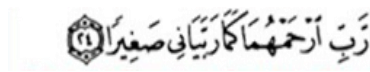
One of the major challenges for healthcare executives is effective decision-making. In today's healthcare market, there are pressures on private healthcare organizations to adopt business intelligence systems. However, adopting business intelligence systems in private healthcare is rather scarce, and the more important factors in the adoption decision are not fully understood. Therefore, the study aims to design a framework of business intelligence systems adoption by healthcare small and medium enterprises in Nigeria. The study conducted a systematic literature review to identify the factors, and 15 experts were chosen using the snowball sampling technique to validate the factors. Further, the study applied the Partial Least Squares-Structural Equation Modelling (PLS-SEM) analysis using SmartPLS-4 to analyze the data. Accordingly, a total of 376 hospitals' owners in Nigeria were selected using a simple random sampling technique, however, only 152 participated. Besides, the study conducted an Analytic Hierarchy Process (AHP) analysis to prioritize the significant factors. The AHP data were collected from ten experts who were chosen through the snowball sampling technique. The result of the PLS-SEM analysis indicated that relative advantage, compatibility, complexity, observability, trialability management support, organizational size, organizational resources availability, absorptive capacity presence of champion, vendor support and government support in IT knowledge and innovativeness were significantly related to the business intelligence adoption. Meanwhile, competition and attitude did not show significant results. Further, the AHP consistency ratios (< 0.1) indicated the model is consistent. Hence, the finding shows that technology is the most important characteristic, while the environment is the least important characteristic. The study emphasizes the pivotal role of various factors of business intelligence systems adoption for enhancing healthcare decision-making in Nigeria. It confirms the significant role that both technological, organizational, environmental, and individual factors play in influencing BIS adoption. It is recommended that the hospital management should consider the most important factors in making decisions when they adopt a business intelligence system.

Keywords: Business Intelligence System, Healthcare, Hospital, Small and Medium Enterprises, Technology-Organization-Environment

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“My lord! Bestow on them Your mercy as they did bring me up when I was small”

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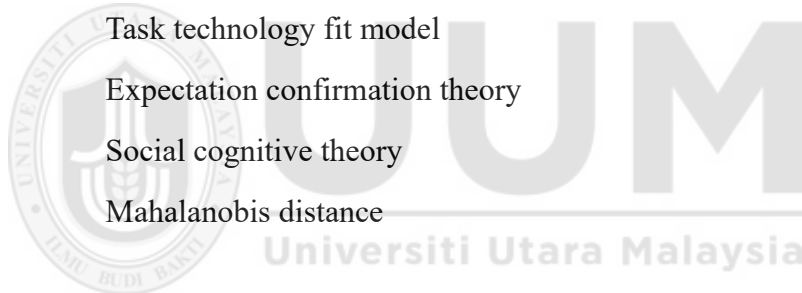
List of Abbreviations

AVE	Average Variance Extracted
CA	Cronbach's Alpha
CB-SEM	Covariance-based Structural equation modelling
CMV	Common Method Variance
CR	Composite Reliability
EM	Expectation maximization
HCM	Hierarchical Components Model
HOC	Higher-Order Constructs
HTMT	Heterotrait-monotrait
IPMA	Importance-performance matrix analysis
MSME	Micro, Small and Medium Enterprises
SME	Small and Medium Enterprises
SMEDAN	Small and Medium Enterprises development Agency of Nigeria
NBS	National Bureau of Statistics
PLS	Partial Least Square
SEM	Structural equation modelling
SPSS	Statistical Package for the Social Science
UN	United Nations
USAID	United State Agency for International Development
VIF	Variance inflation factor
SDG	Sustainable Development Goals
IT	Information Technology
ISP	Internet Service Providers
BIS	Business intelligence systems
ICT	Information and communication technology
PC	personal computers
UHC	universal health care
TOE	Technology-organization-environment
IS	information systems

MCDM	multi-criteria decision methods
AHP	analytic hierarchy process
ANP	analytic network process
CEO	Chief Executive Officer
DSS	decision support system
EIS	executive information systems
OLAP	online analytical processing
MIS	management information systems
ETL	Extract, transform, and load
KPI	Key performance indicator
GPL	General Public License
OR	operations research
MADM	Multi Attribute Decision Making
MODM	Objective Decision Making
MOP	Multi-Objective Programming
MAUT	Multi-Attribute Utility Theory
TOPSIS	Technique for Order Preference by Similarity to Ideal Solutions
ELECTRE	Elimination and Choice Translating Reality
VIKOR	ViseKriterijumska Optimizacija I Kompromisno Resenje
PROMETHEE	Preference Ranking Organization Method for Enrichment Evaluation
EMR	electronic medical record
EHIMS	electronic health information management system
CBPR	computer-based patient record
EHR	electronic health record
HIS	hospital information system
CT	computed tomography
MRI	magnetic resonance imaging
ICU	intensive care unit
SLR	Systematic Literature Review

DOI	diffusion of innovation
TAM	technology acceptance model
UTAUT	unified theory of acceptance and use of Technology
TRA	theory of reasoned action
TPB	theory of planned behaviour
PBC	perceived behavioural control
PEOU	perceived ease of use
PU	perceived usefulness
RIS	Radiological Information System
PACS	Picture Archiving and Communication System
RFID	radio frequency identification
BIM	building information modelling
HFR	Health Facility Registry
CR	consistency ratio
ABC	Absorptive Capacity,
ATT	Attitude,
CPB	Compatibility,
CPT	Competition,
CPX	Complexity,
GVS	Government Support,
ITK	IT Knowledge,
INN3	Innovativeness,
OBS	Observability
OGS	Organizational Size
POC	Presence of Champion,
RAD	Relative Advantage,
RAV	Resource Availability,
TMS	Top Management Support,
TRI	Trialability,

VDS	Vendor Support
CVPAT	Cross-validated predictive ability test
LV	Latent Variables
LOC	lower order constructs
HOC	higher order constructs
TEC	Technological
ORG	Organizational
ENV	Environmental
CI	Consistency Index
GIS	Geographical Information System
GDP	Gross Domestic Products
ECG	Echocardiogram
DMISS	Delone and McLean IS success model
TTF	Task technology fit model
ECT	Expectation confirmation theory
SCT	Social cognitive theory
D2	Mahalanobis distance



CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter introduces the study, the study factors, and the problems that warrant the present investigation both theoretical as well as practical from which the research objective and questions were deduced. It also shows the significance and benefits the study is expected to provide to different groups and individual. It as well delineates the coverage of the study and justifications for the coverage. The chapter ended by providing some definitions of terms frequently used in the study.

1.2 Background of the Study

As Africa's most populous nation and largest economy, Nigeria is experiencing substantial economic expansion. The country's economy is developing at an average annual rate of 7% and by 2050 is anticipated to be among the top ten largest economies (Owoseni & Twinomurinzi, 2018; Tolani et al., 2019). Unfortunately, in Nigeria, Small and medium enterprises (SMEs) which has been considered as the engine of national growth have not performed to expectation due to a myriad of challenges which may be from their outside environment or inherent to the operators (PricewaterhouseCoopers, 2020). It has been reported that up to 80% of the SMEs die within 5 years of their start-up (Emeka, 2023; Ikpoto, 2023) Some of the hitches experienced by SMEs in Nigeria including oft-mentioned infrastructural deficit (SMEDAN/NBS, 2017), inadequate funding, lack of research and limited technical expertise (Tom et al., 2016), lack of data use in decision making, inadequate resources; irregular supply of data tools and lack of data analysis (Bosch-Capblanch et al., 2017).

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Appendices

Appendix A: SLR Questionnaire



Prioritization of Factors Influencing the Adoption of Business Intelligence Systems by HealthCare Organizations in Nigeria

Dear Sir/Madam

You are cordially invited to participate in a study that aims to investigate Factors Influencing the Adoption of Business Intelligence Systems by HealthCare Organizations in Nigeria. The findings of this study will offer practical recommendations on how some important factors influence Adoption of Business Intelligence Systems by Private Healthcare in Nigeria

Your participation is voluntary and you are free to withdraw at any time. Kindly complete the attached questionnaire. This should not take more than 15 minutes of your valuable time.

This study collects no identifying information. All responses will be recorded anonymously and will be treated in a confidential manner. More so, all information provided will be used strictly for academic purposes only.

If you have any questions regarding the questionnaire or this research project in general, please contact me at salisu_isyaku@ahsgs.uum.edu.my or alternatively, you can call or WhatsApp me via +601116240675. Or you can contact my supervisors Dr. Mazlan Bin Mohd Sappri (+60195751979, lolan4574@gmail.com) or Associate Professor Dr. Mohd Faizal Bin Omar (+60132117797, mfaizal.omar@gmail.com)

It will be highly appreciated if you can complete the questionnaire as soon as possible. By completing this questionnaire, you are indicating your consent to participate in the study.

Thank you for your time and cooperation in answering this questionnaire.

Yours Sincerely,
Salisu Isyaku,
School of Quantitative Sciences,
Universiti Utara, Malaysia

Instructions:

This questionnaire contained the potential factors affecting the adoption of Business Intelligence in Healthcare SMEs in Nigeria. Please rate these factors below from "1" Very Low important - "5" Very High important. You can also suggest any other factor that you think is relevant in business intelligence adoption.

The questions in this survey can be best viewed when your PHONE is in HORIZONTAL mode (Landscape). KINDLY, make sure it is horizontal before clicking next

You are required to rate the items on 4-point scale from 1- Very low importance to 5-Very high importance

Please read the following statements, please tick (✓) in the relevant box and provide comments								
S/N	Construct	Constructs Definition	1	2	3	4	5	Comment
1	Relative Advantage	Is the degree to which an innovation is perceived as being better than the idea that it replaces						
2	Compatibility	Is the extent to which an innovation supersedes all other options in meeting the desires and needs of potential adopters.						
3	Complexity	Is the degree to which an innovation is perceived as being easy or difficult to understand and/or to use						
4	Observability	Is the degree to which the results of an innovation are visible to others						
5	Trialability	Is the degree to which an innovation may be experimented with on a limited basis						
6	IT infrastructure	Refers to all of the hardware, software, networks, facilities, etc. that are required to develop, test, deliver, monitor, control or support IT Services						
7	Perceived security	Refers to the extent to users' recognize that the adoption of a certain system is risk free and are secured for dealing with sensitive information						

8	Data quality	Refers to the state of data fitting usage and conforms to user's requirements, goals, and objectives in a specific context						
9	Absorptive Capacity	Is the ability of a firm to recognize the value of new knowledge, assimilate it and apply it						
10	Organizational Size	Refers to the extent of the organizational resource base (usually in terms of number of employees and annual sales revenue) which can influence the adoption of new technological innovation						
11	Social influence	Refers to the ways in which our behaviour is affected by what other people do, or by what other people think.						
12	Facilitating Conditions	Refers to the degree to which an individual user believes that an organisational & technical infrastructure exists to support use of ICT-related innovations in the organisation						
13	Organizational readiness	Refers to whether an organization has made the necessary preparations for the effective deployment of an IT system						
14	Technology resources	Is amount of various technology and technology services possessed by the organization						
15	Presence of Champion	A champion refers to a management-level person who identifies the worth of an idea for the organization, and spearheads authority and resources for such an idea all the way through its development and implementation stage						
16	Resource Availability	Refers to availability of material and non-material						

		capabilities that facilitate and support production and productivity							
17	Top Management Support	Is the degree to which top management understands the importance of the IS function and the extent to which it is involved in IS activities							
18	Competition	Refers to “the degree of stress that the company feels from competitors within the industry.							
19	Government Support	refers to the policies of the governments to support BIS computing providers and its user							
20	Vendor Support	Refers to the support for implementing and using IT applications that a business obtains from external sources of technical expertise							
21	Attitude	Refers to the degree to which the individual holds a positive or negative personal valuation about IT							
22	IT Knowledge	Refers to the intensity of managers’ IT knowledge concerning the new innovative technology, which defines how early/late new innovative technologies could be embraced							
23	Innovativeness	Is the extent to which a manager is willing to actively adopt new management techniques and technologies to improve the organization							

General Comment: Please suggest any missing factors that could influence Business Intelligence adoption in the private healthcare

.....

Thank you for your participation



Prioritization of Factors Influencing the Adoption of Business Intelligence Systems by HealthCare Organizations in Nigeria

Dear Sir/Madam

You are cordially invited to participate in a study that aims to investigate Factors Influencing the Adoption of Business Intelligence Systems by HealthCare Organizations in Nigeria. The findings of this study will offer practical recommendations on how some important factors influence Adoption of Business Intelligence Systems by Private Healthcare in Nigeria.

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It will be highly appreciated if you can complete the questionnaire as soon as possible. By completing this questionnaire, you are indicating your consent to participate in the study.

Thank you for your time and cooperation in answering this questionnaire.

Yours Sincerely,
Dr. Salisu Isyaku
School of Quantitative Sciences,
Universiti Utara, Malaysia

Instruction:

The questionnaire consists of six sections (Section A to Section F) PLEASE try to answer all the questions because they are all very important in this study

The questions in this survey can be best viewed when your PHONE is in HORIZONTAL mode (Landscape). KINDLY, make sure it is horizontal before clicking next

Kindly click NEXT after finishing each section

Definitions

Business Intelligence Systems (BIS) are the modern systems/technologies used by healthcare organizations for effective decision making. It comprises the strategies and technologies used by healthcare organizations to collect, store, analyze and deliver available information to support the strategic decision-making process of the healthcare organizations

Adoption of BIS by healthcare refers to the decision to install this system/technology for effective healthcare decision making

Section A: Technological characteristics

Please indicate as honestly and objectively as possible the extent to which you agree or disagree with each statement using the scale below (1 = Strongly Disagree to 5 = Strongly Agree)

SN	Items Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Adoption of the BIS will provide timely information for decision-making	1	2	3	4	5
2	BIS will improve the quality of decisions and actions	1	2	3	4	5
3	BIS will enhance the effectiveness of decisions and actions in companies	1	2	3	4	5
4	BIS will enable performing decisions and actions more quickly	1	2	3	4	5
5	BIS will give a greater control over a business	1	2	3	4	5

6	The changes introduced by BIS will be consistent with my hospital existing beliefs/values	1	2	3	4	5
7	The BIS will be compatible with my hospital existing information infrastructure	1	2	3	4	5
8	The changes introduced by BIS will be consistent with my hospital existing practice.	1	2	3	4	5
9	BIS will be compatible with my hospital's existing experiences with similar systems.	1	2	3	4	5
10	The skills required to use these technologies are too complex	1	2	3	4	5
11	Integrating these technologies in our current work practices will be very difficult	1	2	3	4	5
12	I believe that a BIS is complex to implement.	1	2	3	4	5
13	I believe that developing BIS is a complex process.	1	2	3	4	5
14	The use of BIS would require a lot of mental effort	1	2	3	4	5
15	The use of BIS would be frustrating	1	2	3	4	5
16	BIS would be too complex for our hospital to use	1	2	3	4	5
17	Using BIS for health purposes is highly visible in my living environment.	1	2	3	4	5

18	The results of using a BIS for health purposes are apparent	1	2	3	4	5
19	I have seen what others do using their BIS	1	2	3	4	5
20	I have seen BIS in use outside of my organization	1	2	3	4	5
21	It is easy for me to observe others using BIS in my organization	1	2	3	4	5
22	Before adopting BIS, I will have had a great deal of opportunity to try its various apps/services.	1	2	3	4	5
23	I know where I can go to satisfactorily try out various BIS apps/services.		2	3	4	5
24	Before deciding whether to use BIS apps/services, I will be able to properly try them out.	1	1	3	4	5
25	I will be permitted to use BIS apps/services on a trial basis long enough to see what they could do.	1	2	3	4	5

Section B: Organizational characteristics

Please indicate as honestly and objectively as possible the extent to which you agree or disagree with each statement using the scale below (1 = Strongly Disagree to 5 = Strongly Agree)

SN	Items Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	My top management is likely to take the risk involved in implementing BIS	1	2	3	4	5
2	My top management will proactively make	1	2	3	4	5

	efforts for the adoption of BIS					
3	My top management will transmit its support for adoption of BIS	1	2	3	4	5
4	My top management is likely to be interested in adopting BIS in order to gain competitive advantage.	1	2	3	4	5
5	My top management is likely to consider the adoption of the BIS applications as strategically important.	1	2	3	4	5
6	The capital of my hospital is high compared to the healthcare industry in general.	1	2	3	4	5
7	The revenue of my hospital is high compared to the healthcare industry in general.	1	2	3	4	5
8	The number of employees at my hospital is high compared to the healthcare industry in general.	1	2	3	4	5
9	My hospital identifies and acquire the external knowledge required.	1	2	3	4	5
10	My hospital understands, analyze and interpret the new external knowledge	1	2	3	4	5
11	My hospital combines internal knowledge with new external knowledge.	1	2	3	4	5
12	My hospital applies the new external	1	2	3	4	5

	knowledge to commercial ends.					
13	I can obtain the resources necessary to support new ideas	1	2	3	4	5
14	When I need additional resources to do my job, I can usually get them.	1	2	3	4	5
15	I have access to the resources I need to do my job	1	2	3	4	5
16	New Technologies has a strong advocate in our hospital.	1	2	3	4	5
17	There are one or more people in our hospital who are enthusiastically pushing for New Technologies	1	2	3	4	5
18	Some people in our hospital have taken the lead in pushing for the adoption of New Technologies	1	2	3	4	5

Section C. Environmental characteristics

Please indicate as honestly and objectively as possible the extent to which you agree or disagree with each statement using the scale below (1 = Strongly Disagree to 5 = Strongly Agree)

SN	Items Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Government effectively promotes new technology adoption	1	2	3	4	5
2	The availability of government security and protection will influence us to use BIS	1	2	3	4	5
3	There are adequate financial aids from	1	2	3	4	5

	government (e.g. tax deduction, tariffs, financial subsidy) to adopt IT applications.					
4	Current laws and regulations are sufficient to protect my organization's interest	1	2	3	4	5
5	Training for BIS will be adequately provided by vendors	1	2	3	4	5
6	There will be adequate technical support during BI implementation	1	2	3	4	5
7	There will be adequate technical support after BI implementation.	1	2	3	4	5
8	Our choice to adopt BIS would be strongly influenced by what competitors in the industry are doing.	1	2	3	4	5
9	My hospital would experience a competitive disadvantage if BIS is not adopted.	1	2	3	4	5
10	We believe that we will lose customers to our competitors if we do not adopt BIS	1	2	3	4	5
11	We feel that it is a strategic necessity to introduce BIS in order to compete in the existing marketplace	1	2	3	4	5

Section D. Individual Owner/managers characteristics

Please indicate as honestly and objectively as possible the extent to which you agree or disagree with each statement using the scale below (1 = Strongly Disagree to 5 = Strongly Agree)

SN	Items Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	The hospital managers are enthusiastic to experiment a new information system.	1	2	3	4	5
2	The hospital managers do not timid to try out new information systems	1	2	3	4	5
3	The hospital managers would sooner create something new than improve something existing.	1	2	3	4	5
4	The hospital managers often risk doing things differently	1	2	3	4	5
5	The hospital managers have an innovative tendency.	1	2	3	4	5
6	The hospital managers tend to actively accept new management techniques.	1	2	3	4	5
7	The hospital managers seem to have a relatively good understanding of computer technologies.	1	2	3	4	5
8	The hospital managers know computer and internet well.	1	2	3	4	5
9	The hospital managers are willing to take information	1	2	3	4	5

	technologies training when opportunities are available.					
10	The hospital managers understanding of computers is exceptionally good compared to other small companies in the same industry.	1	2	3	4	5
11	Computers increase the hospital managers' productivity	1	2	3	4	5
12	The hospital managers find computers easy to use					
13	The hospital managers have seen what other small companies have achieved with computers					

Section D. BIS Adoption

Please indicate as honestly and objectively as possible the extent to which you agree or disagree with each statement using the scale below (1 = Strongly Disagree to 5 = Strongly Agree)

SN	Items Description	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	My hospital is devoted to adopting BIS	1	2	3	4	5
2	The business processes in my hospital require the adoption of BIS	1	2	3	4	5
3	Some of my hospital's departments require the adoption of BIS	1	2	3	4	5
4	My hospital intends to adopt BIS	1	2	3	4	5

5	My hospital intends to start using BI regularly in the future	1	2	3	4	5
6	My hospital would highly recommend BI system for other firms to adopt	1	2	3	4	5

SECTION A: Demographic Information

Please tick ☒ as appropriate in the boxes provided below concerning the demographic informations that fit you

1. Gender:

- ☐ Male
☐ Female

2. Marital Status:

- ☐ Single
☐ Married

3. Highest educational qualification obtained

- ☐ Bachelor's degree/HND
☐ Masters
☐ Doctorate degree
☐ Others (please specify)

4. Age:

- ☐ Below 20 years
☐ 20 Years and Above

5. Medical Experience:

- ☐ Less Than 1 year
☐ 1-5 years
☐ 11 and Above Years

6. Hospital Location

7. Hospital Year of Establishment.....

Thank you for your participation

Appendix C: AHP Questionnaire



Factors Influencing the Adoption of Business Intelligence Systems by HealthCare Organizations in Nigeria

Dear Sir/Madam

You are cordially invited to participate in a study that aims to investigate Factors Influencing the Adoption of Business Intelligence Systems by HealthCare Organizations in Nigeria. The findings of this study will offer practical recommendations on how some important factors influence Adoption of Business Intelligence Systems by Private Healthcare in Nigeria

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It will be highly appreciated if you can complete the questionnaire as soon as possible. By completing this questionnaire, you are indicating your consent to participate in the study.

Thank you for your time and cooperation in answering this questionnaire.

Yours Sincerely,
Dr. Salisu Isyaku
School of Quantitative Sciences,
Universiti Utara, Malaysia

Definitions

Business Intelligence Systems (BIS) are the technologies and strategies used by healthcare organizations to collect, store, analyze and deliver available information to support the strategic decision-making process of the healthcare organizations

Adoption of BIS by healthcare refers to the decision to install this system/technology for effective healthcare decision making

Technological Factors - Comprises both the external as well as internal technologies that are pertinent to the organizations

Organizational Factors - Refers to the internal considerations and characteristics of the organization

Environmental Factors - Refer to those factors that are usually beyond the control of the organizational management

Individual/Managers' Factors - Refers to the characteristics of the managers on whether to adopt IT and how to use them

Kindly rate these factors in pairs (e.g., technology Vs Organization)

Questionnaire for the Main Characteristics

Factor 1	Evaluation																		Factor 2
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
Technology																		Organization	
Technology																		Environment	
Technology																		CEO Characteristics	
Organization																		Environment	
Organization																		CEO Characteristics	
Environment																		CEO Characteristics	

Questionnaire for the Technological Factors

Factor 1	Evaluation																		Factor 2
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
Relative Advantage																		Compatibility	
Relative Advantage																		Complexity	
Relative Advantage																		Trialability	
Relative Advantage																		Observability	

Compatibility																		Complexity
Compatibility																		Trialability
Compatibility																		Observability
Complexity																		Trialability
Complexity																		Observability
Trialability																		Observability

Questionnaire for the Organizational Factors

Factor 1	Evaluation																		Factor 2
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9		
Top Management Support																		Firm Size	
Top Management Support																		Absorptive Capacity	
Top Management Support																		Resource Availability	
Top Management Support																		Presence of Champion	
Firm Size																		Absorptive Capacity	
Firm Size																		Resource Availability	
Firm Size																		Presence of Champion	
Absorptive Capacity																		Resource Availability	
Absorptive Capacity																		Presence of Champion	
Resource Availability																		Presence of Champion	

Questionnaire for the Environmental Factors

Factor 1	Evaluation																	Factor 2
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Vendor Support																		Government Support

Questionnaire for the CEOs Factors

Factor 1	Evaluation																	Factor 2
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Innovativeness																		IT Knowledge

Thank you for your participation



Appendix D: Articles included in the SLR

Database	Authors	No. of papers selected	Quality of paper
Emerald	(Ahmad, 2015; Daradkeh, 2019; El-Adaileh & Foster, 2019; Puklavek et al., 2018; Y. Wang & Byrd, 2017)	5	SCOPUS & WoS
Elsevier	(Bach et al., 2016; Božič & Dimovski, 2019b; Côte-Real et al., 2014; Llave, 2017a, 2017b; Pejić Bach et al., 2019; Ul-Ain et al., 2019)	7	SCOPUS & WoS
IEEE	(Adeyelu et al., 2016; Alarmouty & Fraihat, 2019; Anjariny et al., 2016; Apraxine & Stylianou, 2017; Chaveesuk & Horkondee, 2015b; Chichti et al., 2016; Chuah, 2010; Concepcion et al., 2019; Daryaei et al., 2013; Elhassan & Klett, 2016; Harb & Alhayajneh, 2019; Jalil et al., 2019; Magaireah et al., 2017; Moyo & Looock, 2017; Shahid et al., 2017; Siemen et al., 2018)	16	SCOPUS & WoS
Inderscience	(Ghaida, 2018; Hou, 2013, 2014; Jahantigh, Habibi, & Sarafrazi, 2019; Mathew, 2012; Nasab, Jaryani, Selamat, & Masrom, 2017; Nofal & Yusof, 2016; Pool, Jamkhaneh, Tabaeian, Tavakoli, & Shahin, 2018; Rouhani & Mehri, 2016; Yeoh, 2011; Yoon, Jeong, & Ghosh, 2017)	11	SCOPUS & WoS
Sage	(Banerjee & Banerjee, 2017; Bhatiasavi & Naglis, 2020b; Han et al., 2014; C. K. Hou, 2016)	4	
Springer	(Adeyelu, Kalema, & Bwalya, 2018a; Ahmad & Hossain, 2018; S. Ahmad & Miskon, 2020b; Aldossari & Mukhtar, 2019; Caserio & Trucco, 2018a, 2018b; Ferrari, Rossignoli, & Zardini, 2011; Indriasari et al., 2019; Moyo & Looock, 2019; Shen, Hsu, & Peng, 2012; Venkatraman, Sundarraj, & Seethamraju, 2018; Venter, 2019)	12	SCOPUS & WoS
Taylor & Francis	(Adeyelu et al., 2018c; Boonsiritomachai et al., 2016; Grublješić & Jaklič, 2015; Olszak, 2016; Passlick et al., 2020; Verkoou & Spruit, 2013; H. C. Wang, 2014; Yiu et al., 2020)	8	SCOPUS & WoS