$$\Gamma = \begin{bmatrix} \beta_1 \\ \beta_5 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

Y = the vector of the endogenous variables

X = the vector of the exogenous variables

B = the matrix containing path coefficients

$B_{(i,j)}$ = the coefficient of the path from endogenous node *j* to endogenous node *i*

Γ = The matrix containing the coefficients of paths from exogenous variables to endogenous variables

$\Gamma_{(i,j)}$ = The coefficient of the path from exogenous node *j* to endogenous node *i*

ς = The vector containing the error variables in the path equation

To accommodate for null hypothesis in Structural Equation Model (SEM),

$$\sum = \sum(\theta)$$

$\sum$ = the population covariance matrix of the observed variables

$\sum(\theta)$ = the covariance matrix written as a function of the parameters for HIS use model

$$\sum(\theta) = \begin{bmatrix} \sum_{yy}(\theta) & \sum_{yx}(\theta) \\ \sum_{xy}(\theta) & \sum_{xx}(\theta) \end{bmatrix} \quad (8)$$

to solve for Y

$$Y - BY = \Gamma X + \varsigma$$

$$(1-B)Y = \Gamma X + \varsigma$$

$$Y = (1-B)^{-1}(\Gamma X + \varsigma)$$

$$\sum_{yy}(\theta) = Cov(Y,Y) = E[(Y-EY)(Y-EY)^{'}]$$

$$= E[(Y-EY)(Y^{'}-EY^{'})]$$

$$= E[YY^{'} - EY.Y^{'} + EYEY^{'}]$$

$$\sum_{yy}(\theta) = E(YY^{'})$$

$$\sum_{yy}(\theta) = E(1-B)^{-1}(\Gamma X + \varsigma)((1-B)^{-1}(X\Gamma + \varsigma))^{1}$$

$$= [E(1-B)^{-1}(\Gamma X + \varsigma)(\Gamma^{'}X^{'} + \varsigma^{1})(1-B)^{-1}]$$

$$= (1-B)^{-1}(E(\Gamma X^{'}X^{'}\Gamma) + E(\Gamma XE^{'}) + E(\varsigma X^{'}\Gamma^{'}) + E(\varsigma\varsigma^{'}))(1-B)^{-1}$$

$$\sum_{yy}(\theta) = (1-B)^{-1}(\Gamma\Phi\Gamma^{'} + \Psi)(1-B)^{-1} \quad (9)$$

$$\sum_{xx}(\theta) = Cov(X,X) \quad (10)$$

$$= E(XX^{'})$$

$$\Psi = E(XX^{'})$$

$$\sum_{xy}(\theta) = Cov(X,Y)$$

$$= E[(X-EX)(Y-EY)^{'}]$$

$$= E(XY^{'} - Y^{'}EX - XEY^{'} + EXEY^{'})$$

$$= EXY^{'}$$

$$\sum_{xy}(\theta) = E(X(1-B^{-1})(\Gamma X + \varsigma)^{'})$$

$$= E(X(X^{'}\Gamma^{'} + \varsigma^{'})((1-B)^{-1}))$$

$$\sum_{xy}(\theta) = \Phi\Gamma^{'}(1-B)^{-1} \quad (11)$$

$$\sum_{yx}(\theta) = E(Y,X^{'})$$

$$= E[(1-B)^{-1}(\Gamma X + \varsigma)X^{'}]$$

$$= (1-B)^{-1}E[\Gamma XX^{'} + \varsigma X^{'}]$$

$$= (1-B)^{-1}[\Gamma EXX^{'} + E\varsigma EX^{'}]$$

$$\sum_{yx}(\theta) = (1-B)^{-1}\Gamma\Phi \qquad (12)$$

From equation (8), (9), (10), (11), and (12),

$$\sum(\theta) = \begin{bmatrix} (1-B)^{-1}(\Gamma\Phi\Gamma^{'} + \Psi)(1-B)^{-1} & (1-B)^{-1}\Gamma\Phi \\ \Phi\Gamma^{'}(1-B)^{-1} & \Phi \end{bmatrix}$$

4. Model fitting

The model fitting approach for the exploratory latent growth is similar to an approach often taken with growth mixture models. That is, models are fit with an increasing number of factors until one of the stopping rules is encountered. Models are compared using the Comparative Fit Index (CFI), Tuker-Lewis Index (TLI), and root mean square error of approximation (RMSEA). Also, comparatively, Bayesian Information Criteria (BIC), Sample Size Adjusted BIC (SSBIC) and chi-square are used for fit indexes. From the models, a model is selected as the best representation of the individual trajectories. From the selected model, different specifications can be examined by changing the location of fixed zero factor loadings and by fitting the selected model within the SEM using different rotation criteria.

With regards to [2] on rotation to smooth functions, there are two ways to specify the model with exploratory factors. One way is to specify fixing the factor loading for each of the factors and its variance. This specification will have the same model fit as the specification HIS use model because this is simply a representative of variables that could enhance HIS use. The other way, is to involve fixing *R – 1* fixed factor loadings to 0 for each variable and allowing the variables to correlate. Therefore, having a correlated variable is possible for HIS use model, which might be reasonable. Furthermore, [2][14][15][20] added that the trade-off comes in the form of additional fixed factor loadings – which might also constrain emergent interpretation of factor loading patterns. Although, this is reasonable in some cases, by specifying the model with uncorrelated factors which allow for the estimation of more variable loadings, which is similar to the Tuckerized curve approach.

In line with the goals and objectives mentioned earlier, this study intends to contribute in the following ways.

5. Description of participants

The total population of physicians in Nigeria is approximately 39,210 from the 36 states according to Nigerian Medical Association (NMA). In Lagos state, approximately 4,370 physicians are working at the 56 local government development areas in the state health care facilities. The health care workers in Lagos state are categorized as senior staff (medical officers of health, medical officers, staff nurses, pharmacists, and pharmacy technicians) and others (community health workers, community health officers, laboratory scientists, laboratory technicians, medical record officers, and medical record technicians). The population of the senior staff is 2,035 and the population of other health care workers is 2,335, and the aged range of each of these category is 20 years and above. In the senior staff category, a sample size of 100 or more will be selected from the total population of medical health officers which total population is 228, whereas in the medical officer's category, a sample size of at least 250 or more will be selected from the total population of medical officers which total population is 684.

6. Contribution

Firstly, a theoretical contribution will be made by drawing on theories on information systems use and personal factors to develop an extended, replicable Unified Theory of Acceptance and Use of Technology (UTAUT). The Unified Theory of Acceptance and Use of Technology (UTAUT) will be extended with self-efficacy theory. The extended theory will be validated empirically and may be the lens for assessing physician's use of HIS in developing countries.

Secondly, a contextual contribution will be made by examining the concepts of user acceptance of technology and self-efficacy affect acceptance and use of technology. Also, this study will contribute in the context of HIS use in developing countries. This research is intended to contribute in this area of knowledge by adding to the literatures from the context of developing countries. Specifically, the contribution of this research will be from Nigeria context.

Thirdly, a methodological contribution will be made by providing a new approach to investigate factors influencing the usage of HIS by health care professionals in a developing country context. In addition, the validation of the conceptual research framework with structural equation modelling analysis will provide an informed approach to identify factors that are more influential to achieve successful use of HIS technologies.

Lastly, a practical contribution will be made by examining the factors for successful HIS usage which may influence health care professionals in their medical activities while using technology. This could also contribute to identifying vital human factors that can aid successful implementation of HIS technology. These factors can also enhance other information systems/technology implementation and usage.

Although initial version of this paper has been presented at the i-society 2014 conference. The present study presents the research instrument (appendix 2) use for the fieldwork. In future publication the result of the fieldwork will be presented.

7. Conclusion

In this study, a theoretical model of HIS use and a mathematical model from the theoretical model have been presented. A case study where the exogenous and the endogenous factors can be evaluated through a mathematical model was considered. In future study, the validation of the proposed HIS model will be carried out through survey in a specific context whereby the model will be validated empirically. This reliability of the model after validation will rely largely on the sample size and the approach use unconstrained or latent moderated structural equations (LMS) for estimating the latent interaction effect of the variables in the model. The intended exploratory model from theory could be used in line with mathematical representation of the model to predict factors that could enhance the use of HIS by physicians.

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9. Appendices

Appendix 1: Definition of variables making up the theory

[4] defines self-efficacy as:

> People's judgement of their capabilities to organize and excute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgements of what one can do with whatever skills one possesses (p. 391).

[26] definition of variables in UTAUT

Theory/ Model	Dependent Variable	Independent Variable	Definition	Roots	Reference
UTAUT	Behavioral Intention	Performance Expectance	Performance expectancy is the degree to which an individual believes that using the system will help him or her to attain gains in job performance. (Venkatesh et al., 2003)	BTAM/TAM2 and C-TAM-T	[9];[23]; [17]; [8]
		Effort Expectancy	Effort expectancy is the degree of ease associated with the use of system	TAM/TAM2; MPCU and IDT	[9]; [17]; [23]
		Social Influence	Social influence is the degree to which an individual perceives that important others believe he or she should use the new system	TRA; TAM2; TPB/DTPB; C-TAM-TPB; MPCU and IDT	[9]; [17]; [23]
		Facilitating Conditions	Facilitating condition is the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system	TPB/DTPB; C-TAM-TPB; MPCU and IDT	[9]; [17]; [23]

Appendix 2: Research instrument for fieldwork

	DAY MONTH	TIME STARTED		TIME COMPLETED		RESPONSE
		HR	MIN	HR	MIN	
Interview	/ / 2014					

RESPONSE CODES		
Completed questionnaire	=	01
Partially completed questionnaire	=	02
Not completed (specify reason)	=	03
Reason		

PART ONE

I am confident in using HIS when

		Totally Confident	Confident	Neither agree nor disagree	Not Confident	Not at all Confident	(Do not know)
1.	There was no one around to tell me what to do as I use HIS.	5	4	3	2	1	8
2.	I had never used HIS before.	5	4	3	2	1	8
3.	I had only the HIS manuals for reference.	5	4	3	2	1	8
4.	I had seen someone else using HIS before trying to use it.	5	4	3	2	1	8
5.	I could call someone for help if I got stuck while using HIS.	5	4	3	2	1	8
6.	There is someone to help me get stated using HIS.	5	4	3	2	1	8

		Totally Confident	Confident	Neither agree nor disagree	Not Confident	Not at all Confident	(Do not know)
7.	I had a lot of time to complete the job for which HIS was provided.	5	4	3	2	1	8
8.	I had the built-in help facility for assistance while using HIS.	5	4	3	2	1	8
9.	There is someone showed me how to use HIS first.	5	4	3	2	1	8
10.	I had used similar software similar to HIS to do the job.	5	4	3	2	1	8

PART TWO

With regards to using HIS to what extent do you agree or disagree with the following statements?

		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	(Do not know)
11.	Enable me to accomplish tasks more quickly	5	4	3	2	1	8
12.	Improve my performance	5	4	3	2	1	8
13.	Increase my productivity.	5	4	3	2	1	8
14.	Enhance effectiveness	5	4	3	2	1	8
15.	Make it easier to do my job.	5	4	3	2	1	8
16.	HIS would be useful in my job.	5	4	3	2	1	8

PART THREE:

With regards to what extent do you agree or disagree with the following statements?

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	(Do not know)

		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	(Do not know)
17.	Learning to use HIS would be easy for me.	5	4	3	2	1	8
18.	I would find it easy to get HIS to do what I want it to do.	5	4	3	2	1	8
19.	I would understand how to interact with HIS.	5	4	3	2	1	8
20.	Enhance effectiveness	5	4	3	2	1	8
21.	I would find HIS to be flexible.	5	4	3	2	1	8
22.	It would be easy for me to become proficient at using HIS.	5	4	3	2	1	8
23.	I would find HIS easy to use.	5	4	3	2	1	8

PART FOUR

With reference to what extent do you agree or disagree with the following statements?

		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	(Do not know)
24.	I would have the necessary support to use HIS.	5	4	3	2	1	8
25.	I would have the knowledge necessary to use HIS.	5	4	3	2	1	8
26.	HIS would be compatible with other systems I use.	5	4	3	2	1	8
27.	A specific person (or group) would be available for assistance with resolving HIS difficulties.	5	4	3	2	1	8

PART FIVE

With regards to what extent do you agree or disagree with the following statements?

		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	(Do not know)
28.	People who influence my behaviour think that I should use HIS	5	4	3	2	1	8
29.	People who are important to me think that I should use HIS.	5	4	3	2	1	8
30.	People whose opinions I value think I should use HIS.	5	4	3	2	1	8

PART SIX

With referenceto what extent do you agree or disagree with the following statements?

		Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	(Do not know)
31.	I intend to use HIS, given the opportunity.	5	4	3	2	1	8
32.	I predict I would use HIS, given the opportunity.	5	4	3	2	1	8
33.	I plan to use HIS, given the opportunity.	5	4	3	2	1	8

RESPONDENT CHARACTERISTICS

1. **Local government development area**

2. Health care centre

3. Sex of respondent

Male	1
Female	2

4. Age of respondent in completed years [Age last birth day]

			Years

(Don't know) = 998

5. What is your Occupation/Position (the name or title of your main job)?

INTERVIEWER: PROBE TO KNOW EXACTLY WHAT IS THE POSITION OF THE RESPONDENT IN THE HOSPITAL (DUTIES OR HIS/HER DAILY ACTIVITIES)

_____

(Refused to answer) 97
(Don't know, inadequately described) 98

6. What is the highest level of education that you have ever completed?

No schooling	00
Primary Education	01
Secondary Education	02
Tertiary Education	03
Other (Specify)	97
(Do not know)	98