**Author’s response to reviews**

**Title:** Assessing factors militating against the acceptance and successful implementation of cloud based health center from healthcare professionals' perspective: A survey of hospitals in Benue state northcentral Nigeria

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Manuscript Title: Assessing factors militating against the acceptance and successful implementation of cloud based health center from healthcare professionals' perspective: A survey of hospitals in Benue State, North-Central Nigeria

General remark: The authors would like to thank the editor and the reviewers who kindly and whole heartedly reviewed the manuscript and provided valuable suggestions and comments in order to improve the quality of the submitted manuscript.

We have given the comments serious consideration and altered the manuscript according to the suggestions. Below, we address all comments point-by-point, discussing the subsequent modifications.

We hope that the revised manuscript will meet your expectations and we are willing to answer any other questions you might have during the process.
Technical comments

1. Please provide the co-authors email address

We would like to thank for the comment, email addresses of co-authors have been included at the “Authors information section”, page: 28.

Reviewer #1

1. Interesting report assessing technology adoption in a lower resource area based on a questionnaire.

We would like to thank the Reviewer for the positive comment.

2. The authors conclude that cloud based health centers "will enhance efficiency of healthcare professionals to deliver quality healthcare services to remote communities". However, as written the manuscript does not show that this study supports that conclusion. This conclusion should either be revised or supported within the study design and results.

We would like to thank for the comment and suggestion. We have revised the statement discussion and conclusion sections in order to reflect outcomes of the research study. For instance, conclusion section is changed as follows in order to support the research study;

“This study main focus is on identifying dynamics for the adoption and implementation of cloud based systems in the Nigerian health care system and the necessity of CBHC. The primary objective is to ascertain the fundamental factors that affect the adoption of cloud based health center from the perspective of healthcare professionals in Nigerian hospitals. Our research findings is of managerial importance to policy makers in that our model explain 33% of the factors which hinders the successful implementation of a cloud based health system in Nigeria and contributes to the sustainability and growth of the Nigerian health care system.”

3. The inclusion of the proposed model hinders interpretation of the survey analysis; the manuscript would be improved by focusing on the survey method and results. A future study of the proposed model that assesses whether the model addresses the limitations found in survey answers could then be performed.
We would like to thank for the suggestion. The manuscript is reviewed in order to focus on the survey method and results. Proposed cloud based health center is developed as a model for future implementation stages. Manuscript sections are all changed accordingly in order to highlight the research focus.

4. There are numerous grammar and spelling errors throughout the manuscript - please address these.

We would like to thank for the comment. The manuscript has now been double-checked for grammar and spelling errors.

5. The manuscript would benefit for editing to a more concise presentation of the background. Alternatively the authors could consider revising the manuscript for submission as a review paper or opinion paper.

We would like to thank for the comment. The submitted manuscript is a result of a research study. In accordance, we have edited the manuscript background (Pages: 3-5) to precision.

Reviewer #2

1. The subject of research, the use of cloud based systems in healthcare and their envisaged acceptance from the healthcare professionals, is interesting and has significant impact on the health system, including the ones in low- and middle-income countries, as the considered context of Benue State, Nigeria.

We would like to thank for this worthy commendation.

2. However, the manuscript organization/structure has to be improved. In addition, the authors should consider involving a professional editor to improve the language (as e.g. there are log sentences, mismatches between subject and verb, and typos).

We would like to thank for the above mentioned comment for the structure of the manuscript. The manuscript organization/ structure has been formatted as; Background, Cloud based Health Technologies and Acceptance Models, Cloud Based Health Center, Research Model and Hypothesis, Methods, Results, Discussions and Conclusion. Sub-sections are also created under
necessary sections. Also, the manuscript has been double-checked for long sentences and mismatches.

3. At present, the manuscript is organized as follows, Background, Methods, Results, and Conclusions. Unfortunately, a Discussion section describing the implications of the findings is missing. In addition, some contents do not actually belong to the section where it is. For example, "Proposed model and research hypothesized model" and "Research model and hypothesis" sections appear to belong to "Methods" section.

We would like to thank for the comment. The structure of the manuscript has been re-organized as mentioned in our previous comment. Implications of the research findings are described in the Discussion Section. Also, Methods Section is used after Research Model and Hypothesis Section in order to highlight the research methodology.

4. Then, it appears some results (including Figure 5) have been presented in the conclusions. They should be moved to the results section. However, if the Cloud-Based Health Center (CBHC) is a result of the research or an envisaged architecture has to be clarified. In addition, it appears the proposed CBHC requires users to have their own IT devices (e.g. laptop and tablets), including internet accessibility. Those aspects have to be clarified, adding more about the situation of IT in Nigeria (see next paragraph), including levels of computer literacy and health literacy.

We would like to thank for the comment. Figure 5 has been moved to the Results section as recommended. We have also clarified the rationale behind the proposed system at the Background section (Line number: 118). In addition, more clarifications has been made in the Background section (Line number: 82) concerning Nigerian healthcare system and users possession of a personal technology use: “Currently, the national health care system in Nigeria is divided into three tiers which are: the primary health care (PHC), the secondary health care (SHC) and the tertiary health care (THC). All operating on decentralized systems. They are all burdened with the tasks of providing suitable health care services and programs to the citizens. The federal government specifies the health care polices and ensures that these policies are safeguarded by the PHC, SHC and THC [13]. While the THC is well equipped with adequate internet facility along with good source of electricity supply and other infrastructures, the PHC and the SHC have limited or no access to the internet, and electricity supply is epileptic. However, the sudden availability and affordability of smart phones and alternative means of power supply (e.g. power generator) have motivated people to no longer depend on public source of electricity and internet, since they can subscribe privately to internet services from service providers (e.g. MTN, Glo-mobile network, Etisalat, Airtel etc.). Recently in November 2017, the Nigerian Communication Commission (NCC), revealed that 98.3 million Nigerians are internet
users. Similarly, the International Telecommunication Union (ITU) 2017 report of Nigeria, identified a 75.9% mobile-cellular subscription users per one hundred populations. Signifying a surge in the use of mobile cellular subscription as against 33% in 2013 [14].”

5. In the Background, Cloud based health platforms (CBHP), Cloud-based health knowledge (CBHK), and Cloud-Based Health Center (CBHC) should be described properly. In addition, a background on IT infrastructure in Nigeria (or at least in Benue state) and healthcare system in Nigeria (or at least in Benue State) should be added, to help the reader in better understand the context of the research. In addition, how those concepts have been explained to the survey participants should be described to the reader (in the Methods section).

We would like to thank for the detailed comment. CBHP, CBHK and CBHC discussions have been included in the Background section. We have also discussed the current state of IT infrastructure and health system in Nigeria.

In addition, discussion of background on IT infrastructure in Nigeria is added as mentioned the previous comment from Line 82-94. Finally, Methods section is used to explain the survey details of the participants.

6. Problems, aims and research questions should be at the end of the background. There, the reader is aware of the context.

Problems, aims and research questions have been moved to the Background section.

7. As for the "Research contribution", I would have the following concerns. In the introduction you read that "…, developing countries such as Nigeria need to harness the potentials of cloud computing in their healthcare system by using cloud solutions". It appears that cloud solutions have not been implemented yet in healthcare organizations in Nigeria.

We would like to thank for the observation. At the moment, there is no implementation of any health cloud system in Nigeria. All the health care institutions operate on a decentralized system.

8. Inspired by references #37 and #38, the authors based their research on "Unified Theory of Acceptance and use of Technology expanded (UTAUT2)". However, in the
research described by references #37 and #38, cloud based CPOE and computerized guidelines systems were available to the participants.

We would like to thank for the comment since the references were stated wrong in that paragraph. The references #37 and #38 have been changed as:


9. In the presented research, it appears the final users did not use cloud systems. I was wondering if the authors considered the "Theory of Planned Behavior (TPB)", by Ajzen 1991, as they would explain the "Intention to Use" cloud based solutions to deliver healthcare services. Ajzen I. The theory of planned behavior. Org. Behav. Human Dec. Process. 1991; 50:179-211.

We would like to thank for the comment and recommendation. Final users have not used the cloud system yet and necessary discussions are made in each section of the manuscript in order to cause any misunderstanding. Theory of Planned Behavior is considered during the research study which is one of the models incorporated in UTAUT2.

10. The theoretical framework should be explained in the Methods section, at the beginning (UTAUT?, TAM?, TPB?, other theories?). Then, the proposed model should be formulated, and the hypothesis explained. Please consider that figures and tables have to be explained into the text (e.g. "Figure 3: Hypothesized Research Model" has to be explained in the text).

We would like to thank for the comment and the manuscript structure is re-organized. First, all the theoretical frameworks have been discussed in Cloud based Health Technologies and Acceptance Models Section. Then, Research Model and Hypothesis have been explained. After that, extended UTAUT2 model is discussed in the Method section as recommended. Figure 3: “Hypothesized Research Model” has been explained inside the text under Research Model and Hypothesis section.
11. Then, it appears there are some discrepancies between "Table 3: Characteristics of survey health institutions" and "Table 4: Demographic data of respondent". Numbers of doctors, nurses, and others are not matching; Doctors 87, Nurses 115, Others 98 in Table 3; Doctors 60, Nurses 65, Others 175 in Table 4. It appears that discrepancy could have affected the analyses and the results. "Data analysis" has to be more elaborate.

We would like to thank for the comment. All discrepancies regarding Table 3 and Table 4 has been corrected. All changes are highlighted in yellow in the revised manuscript. ICC analysis is also inserted into the manuscript to improve Data Analysis sub-section.

12. Which analyses have been carried out should be more explained (in the present version of the manuscript, software tools have been mentioned, but which algorithms and functionalities have been used and why is lacking).

We would like to thank for the comment. All the analysis are discussed in details in the Data Analysis sub-section. The statement reads: “SPSS (20.0) was used to carry out the statistical analysis such as construct reliability, convergent validity, discriminant validity and the intraclass correlation coefficient by Fleiss while LISREL (9.30) software was used for the Structural Equation Modeling (SEM)”.

13. Some results have been reported (e.g. Figure 5). They should be moved to the Results section. Then, the other text appears to be a Discussion, so it has to be included in a Discussion section, now missing.

We would like to thank for the comment. Figure 5 has been moved to the Results section and the text in the Conclusion section has also been moved to the discussion section. Discussion section is also included as recommended.

14. A "consent statement" has been presented in the Declaration sections; however, no information is available whether an information sheet has been given to the participants and if the participants accepted to participate in the research. Please elaborate more on the consent to participate.

We would like to thank for the recommendation. The sentence has been rephrased to read: “Prior to the distributions of questionnaires, a written ethical consent specifying that participation in the survey is voluntary and that information given in the survey would be treated as confidential was given to the participants and they all agreed to take part in the survey”.
Reviewer #3

1. First of all congratulations for you work, it shows a real health cloud platform in Nigeria. I realized that the document explains clearly how you get the objectives regarding in 7 hypothesis.

We would like to thank this worthy commendation.

2. Introduction and Evaluations seem to be well done, although I could suggest a second statistic study to comfort the results, perhaps depending by the point of view of the quiz a Kappa study to view the rater’s concordance. I like table 1, really very interesting 'state of the art'.

We would like to thank you for this commendation and suggestions. We carried out additional analysis (Intraclass Correlation Coefficient by Fleiss) as could be seen from Table 7.

3. Introduction needs to be clearer. You mention a questionnaire, perhaps you should introduce any example of this one. Table 2 I found really confuse to me -could not find the essence of you want to tell me: Adapted?-. Why are you telling of "Using human intuition"? This seems to be confused too, You need to tell affirmation no anymore.

We would like thank you for the suggestions. The word “Adapted” has been removed from Table 2. Also, the phrase “using human intuition” has been replaced with the world “ideally”.

4. A second concordance study: e.g. Kappa? Explain in more detail about security access (with password, any other format?) ¿Have you plain a block chain?

We would like to thank for the comment. More explanation has been given concerning the security access of the CBHC under Cloud Based Health Center section.

5. Self-Efficacy by the health professional point of view or by the institution? How do you measure this efficacy?
Self–Efficacy has been indicated to be in reference to healthcare professionals and a measure of construct in the UTAUT2. It is measured by the path coefficient (Beta) and its associated t-value. It could be stated from the research finding that the professionals have not used the cloud based healthcare system yet but have good knowledge related to it.

6. I think this section change, I feel that this health cloud has no problems on any topic, really this is very strange. As an example, security access need to be remake on every iteration of a new version (e.g. DDOS attack and so on), users need to be informed and they need to learn the use of the platform -no only a self-efficacy-.

We would like to thank for the comment. More explanation has been given concerning the security access to the CBHC in the Cloud Based Health Center section.

7. Please release the weakness that is not resolving yet, I'm sure you can find any more.

We would like to thank for the recommendation. The CBHC weaknesses has been stated in the Discussions section.

8. In a same way as 2, I didn't find any weakness conclusion that could be danger to the health cloud model, perhaps you need to see inside the model and the behavior of the human resources that use it. I think Nigeria most useful devices correspond to smartphones & phones? Why don't you mention about the mobility of data?

We would like to thank for the observation/suggestion. The weakness of the CBHC has been identified and written down at the “Discussion Section” with all other limitations. Information related to smartphone use etc. is explained in the Background Section.

9. In other hand, what about the stable situation of the infrastructures to keep a device on that geographic place?

The state/stability of infrastructure has been included at the Background section.

10. What about your future work, Is this project ended yet? (Rethinking about weakness pending task).

The future work has also been explained at the end of Discussions section.
11. Figure 1, 2, 3 has a very little text.

Figure 1, 2 and 3 text size has been increased.