Review of the paper „GIS for All: Exploring the Barriers and Opportunities for Underexploited GIS Applications" (17-26-1-RV)

Remarks for the author(s)

Summary

The article is meant to give a comprehensive overview of the current state of GIS use as well as of the barriers affecting the more widespread use of GIS. Based on the findings due to this topics the article aims at revealing barriers hindering the more widespread adoption (application) of GIS and summarizes potentials for future GIS use. The article concludes with a short discussion of the potential contributions of Open-Source GIS solutions and data towards more widespread use of GIS focusing especially on Open-Street Map and Cloud Computing as examples.

All in all the article is meant to give an overview of the whole spectrum of GIS uses as well as the most important constraints and problems GIS users are confronted with. At first glance, considering the relatively short Open-Source GIS section, one might ask how the article fits in a conference primarily oriented towards Open-Source GIS. But considering its intention of highlighting barriers of more widespread GIS use and summarizing potentials for future developments in GIS, the article has the potential to draw an agenda of high interest for the Open-Source GIS community as it might provides interesting links for future developments in Open-Source GIS and data.

Hence, the paper might, according to my opinion, constitute an article/contribution of high interest for the participants of the conference. But unfortunately not in the form it is presented. In the moment, the additional benefit of the analysis compared to prior analyses remains unclear. Furthermore the methodological approach behind the analysis remains in many aspects quite fuzzy. The Open-Source GIS section is in need of a more elaborate consideration/discussion and must be better intertwined with the other sections of the paper/analysis. That means it must more clearly be described/analysed why according to your findings Open-Source products are especially suited to address underexploited GIS potentials and which potentials you thereby explicitly refered to and why.

So, according to my opinion, the draft of the article requires a revision which also includes the re-writing of some passages (please compare my general comments below for details). All in all, a more stringent reasoning would according to my opinion enhance the explanatory power of the whole paper considerably. Thereby especially the description of the method of data acquisition as well as the Open-Source GIS section are, according to my opinion, in need of a revision. The additional benefit of the analysis compared to prior existing analyses has to be better elaborated.

The Open-Source GIS section could/should be more critical! As the whole article opts for an easier usability of GIS and geodata the question if Open-Source GIS products do really fulfill this requirements should be addressed. Possible questions directing such a critical consideration could be: Are they really easy to use for non GIS experts (but GIS experts as well)? Can they really be used out of the box? What about their reliability (think of Open Street Map and its completeness, respectively lack of any information due to completeness or at the GRASS function v.net.distance that used only to compute the shortest network distance for the first computation and delivered Euclidean distances for all other computation steps)? If a lack of training is one of the most mentioned barriers, what does this mean for Open-Source? (is the training really better? According to my experience obviously not as manuals are often missing or too centered on technology. Courses are as expensive as GIS training courses of commercial GIS software providers)...

Concerning Cloud Computing, is it desirable to send data (maybe sensitive data) to some kind of a Cloud?...

Furthermore, it should more clearly be described/analysed why according to the findings Open-Source products are especially suited to address underexploited GIS potentials. Thereby, the agenda for future developments in GIS has to be better elaborated. All in all, at present, it remains unclear why Open-Source products seem to be especially suited for „exploiting underexploited GIS potentials and breaking down existing barriers in GIS use".

Last but not least, the paper seems not to adhere to the format specifications outlined for the FOSS4G academic track papers.

This rather all-embracing critique is not entirely destructive, however. I think that the paper would considerably gain in explanatory power if the limitations outlined would be discussed/addressed objectively in each stage and the conclusions, rather than being devoted to a consolidation of the main results of the exercise, could be made more interesting by setting out an agenda for future GIS uses.

In this sense, please consider my critique as well-intended recommendation towards considerably enhancing the significance of your paper/contribution.

General comments

(Line numbers given refer to the paragraph indicated)

Throughout the text there are minor linguistic errors/spelling errors that should be eliminated.

Page	Paragraph	Line(s)	Comment
1	2	3	„late 1980s" → the late 1980s? „technology have" → technology has?
1	2	2	„approbation and use" are this not synonyms? I would only write „use"
1	3	3	In the paragraph it is claimed that GIS applications have not yet fully delivered its potentials. As reference for this statement you name Nedovic-Budic 1999. This source is quite outdated. I would recommend citing a more up-to-date source.
1	3	4	„several studies have mentioned" Which studies are refered to? Please give an indication of this studies.
2	1	1	„studies indicate" Which studies are refered to? Please give an indication of this studies.
2	2	1	„Researchers have" Which researchers are refered to? Please name the researchers addressed.
2	2		In the second paragraph it is named, that analyses similar to the research the article builds on have already been conducted in the past. But the article itself does not describe in detail which findings have been made in the past. Instead only three (very general) factors hindering more widespread use of GIS are named as examples. As the article aims at exposing barriers of GIS use and identifying underexploited GIS potentials this is according to my opinion to short-sighted. It is my opinion that it is necessary to give a short comprehensive summary of the past findings here. (This could for example be done in the form of a table listing all factors according to the two main categories „organisational" and „technical).
2	2	1	„re-examine and update": Why do you re-examine the findings already made in other research? Here you should mention the additional benefit of your research compared to already existing research. (Maybe you found more barriers than already known or if no new findings are made you could argue that you represent a summary of the findings due to barriers as focal point for your identification of future potentials.) All in all I would recommend revising this two paragraphs so that the overall reasoning is more stringent especially highlighting the additional benefit of your own research.
2	3	3	„group of GIS users" Throughout the article it remains revealed/unclear which group of users are refered to. Is it the same group you interviewed? If this is the case, please explicitly name it. If not, please describe your selection criterion in detail.
2	4		Within your research questions, you state that you are interested in uncovering/analysing the barriers and opportunities for GIS use

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			(questions 2,3). Considering your overall approach I wonder why you did not ask the interviewed experts due to their perception of the utilisation of the GIS potentials ? I would also recommend changing the order of question 2 and 3. According to my opinion a consideration of the barriers and opportunities experienced by the experts would enhance the validity of your findings considerably. So, if you have done such a survey the results must be presented respectively presented in a more explicit manner. If not you must deal with the aspect and present a good, convincing justification for this.
2	5	1	„partial overview". Why? What do you omit and for which reasons? As a hint: you could for example reason that you concentrate on the most important findings of your research here and give a reference to another more detailed research report if such is available, etc.
2	5	2	„evangelists" Maybe it sounds strange for me as I am not a native English speaker, but for me „evangelists" have to do something with church and belief. I would therefore seek an appropriate synonym if necessary.
2	6		Neither the criteria for the selection of the literature analysed nor the criteria guiding the analysis (selection of sectors analysed, topics included/excluded, …) are introduced. So, the whole methodology remains quite fuzzy to the reader. Please be more concise here. (If no specific methodology has been used this should also be indicated)
2. Literature review			In its current state the presentation of results of the literature review is quite confusing. The barriers and opportunities of/for GIS use remain revealed. (Later on (page 5, paragraph 3) the most important barriers identified by the literature analysis are addressed, but here they are not named.) Due to a stringent reasoning, the barriers identified should be clearly named here. All in all the findings of the literature could also be presented in a more condensed manner e.g. within a table pooling your findings. Thereby the findings could for example also be structured according to the identified barriers and opportunities within each field of application. Such a presentation would according to my opinion considerably enhance the section.
3	1	4	„land suitability" I do not know what is meant by this „term". Do you mean „land-management" (land survey, land management, etc.)?
3	1		I would recommend adding the fields of GIS use within environmental protection, military purposes, administrative purposes and surveying, too.
3	3		I would also add geo-marketing to the summary given under point „2.3 commercial sector". When discussing GIS use in the banking sectors you address the method of „market-scoring", so this method should be named.
4			When introducing the literature analysis the order of the topics named

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			differs from the order of the topics described. That means point 2.4 and 2.5 should be swapped in order to adhere to a stringent reasoning.
4	2		Under GIS uses for public interest and education so called public participatory GIS, community GIS, use of visualization techniques in planning etc. could be added as further examples.
4	3		Here some more references would enhance the significance considerably.
5	1		As with the literature analysis the whole methodology of the survey remains quite fuzzy. One could get the impression that a quantitative approach has been followed. But the very short description of the methodology reveals that all in all a more qualitative overall approach has been utilized. In addition, the selection of the participants seem to be based on some kind of „theoretical sampling" but the sampling procedure is not really revealed. So please be more concise here and describe the criteria used for the sampling as well as the criteria for selecting the fields of GIS the sampling has been based on. (E.g. name how many participants from every field have been questioned). Why were participants with an engineering background chosen? Why not participants with a GIS or Geography background, etc.? Furthermore the question arises why key persons have not been selected out of a selection of GIS-sectors analysed in the literature analysis. This should be addressed and justified. Later on (3.2.1) barriers identified by experts dealing with GIS users/customers are addressed. I had to figure this out first. So maybe it would enhance the reasoning if this would be explained/explicitly stated when describing your methodology. E.g. by stating that you selected the national mapping agency customer service, post sales support, user needs research, technical research as well as academic researchers as key experts that are in close (everyday) contact with a multiplicity of GIS users from all fields having therefore an extensive knowledge about the problems and needs of this GIS users.
5	2		Do you also have detailed personal data of your proband's (how long they are working with GIS, which GIS education they do have)? If yes differentiating your findings due to this aspects (maybe in a figure/table) would according to my opinion enhance the whole analysis. It could also be interesting to differentiate between expertise levels in figures 2 and 3 since the expertise level might influence the evaluation of GIS use benefits and barriers.
5	3	2-3	„seven identified during the literature review". Have they?
6			„3.2 Domain discussions". All in all the section addresses barriers according to the knowledge of the participants of your survey. So maybe „Barriers of GIS use identified" or the like would be a more

Page	Paragraph	Line(s)	Comment
			appropriate and meaningful heading for the section. The six expert groups your participants are diveded in could be listed/named before beginning with the presentation of the results.
3.2 Domain Discussions			According to my opinion the findings of the different departments of the National Mapping Agency as well as academic researchers could be presented in a more condensed manner e.g. by pooling the findings. I would recommend summarizing the main findings and, if available, referring to the study/report where more detailed information can be found. (E.g. Is it necessary to quote the questioned/interviewed person's statements within the scope of this paper? According to my opinion this is something more suitable for a comprehensive research report than a publication/speech). And, as mentioned before (remark due to page 2 paragraph 4), why are the barriers experienced by the experts themselves not addressed explicitly?
7	4	5	„including banks, insurance companies,..." This has already been named before and could be deleted here.
8	1	1	„For example, it is may..." → it may
9			4.1 I would appreciate if you could more clearly name the barriers and the reasons causing this barriers. Currently, it is more a listing of the barriers identified (which might be attributed to the overall word limit for the article), sometimes it is hard to identify the problem addressed as the description of the positive aspects about what has already been achieved prevails in the reasoning. All in all a more stringent reasoning throughout this section would according to my opinion enhance its explanatory power.
9	4	1	„Based on the results of the literature review..." Please see my annotation above.
9	5	1	I would avoid writing „thousands" in a scientific paper. According to my opinion „a lot of" would be a more appropriate expression here. „organisations has" → organisations have
9	7		„Entry costs" Is it really getting cheaper? (Think of costs for data?). Is Open-Source really an alternative (for whom, for whom not and why) According to my opinion this aspect needs to be considered more in depth.
10	4		„From the discussions with current users" Until now it was said that the results are based on a literature analysis as well as a survey and expert interviews. Now a new form of data acquisition is introduced here (at least it seems as if this is the case). So, if you really introduce a new form of data acquisition please introduce the methodology followed (selection of participants, leading questions etc.). But following your reasoning I got the impression that you are referring to the questioned experts (interviews) here, too. If so, I

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			would advice not talking from „discussions with users here" and stick to a more stringent reasoning.
10	5	2-3	„The applications come from a range of different domains based on participants' background and experience". Which domains? Which backgrounds and experiences? This aspects remain unclear as the reader of the paper is not informed which specific users have been questioned (due to this aspect, please see also my comments due to page 10 paragraph 4 and page 2 paragraph 3)
10	6	1	„Many users express..." As according to the information given no representative survey (in a statistical sense) has been conducted (small survey population, purposive sample) I would advise to relativise this statement by writing something like „According to the questioned experts, many users express..."
10	7		People dealing with GIS should be acquainted with Remote Sensing, so it could be considered to delete the definition.
11	4		You did also identify future potentials. This should also be named here. e.g „....its wider appropriation and future fields of using GIS"
5 Open-Source GIS			Please be more critical throughout the whole section (see my introductory annotations). Furthermore, I would not name the section „Discussions". In fact selected examples to overcome the barriers identified are introduced that are Open-Source GIS, Open-Source data and cloud computing. Maybe something like „Potentials of recent technological developments towards breaking the barriers identified" would serve as a better title for the section.
12	figures		Please quote the source of the tables. If the tables are based upon your literature review etc. I would recommend adding something like „Source: own depiction based on literature review e.g. section 2" Furthermore in table 2 you name the field of „crisis management". Due to a stringent reasoning, I would recommend to also include this field in your considerations of GIS use for governmental uses (2.1).
12	5	2	„many of the barriers listed above". Which exactly and why. Which not and why? From whom (experts, normal users...) Are Open-Source GIS products really more user friendly (think of GRASS with its own concept of the mapsets)?
13	2	8-10	But OSM does also have disadvantages that should also be named here. For example its completeness is lower than that of commercial products, tags seem sometimes not to be quality checked leading to confusions, a high learning curve is necessary to acquire the data and to prepare it so that it can be reasonably used in own analyses...
14	4/5		According to my opinion the conclusion is too short. I would recommend summarizing your main findings due to barriers,

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			opportunities and future potentials (e.g. in the form of a table, etc.) in more detail, so that a potential reader concentrating at the conclusions gets an comprehensive impression of your main aspects and especially the potential fields of future GIS use/ better use of GIS you identified.