Response to reviewers to

Ontological Foundations for Tracking Data Quality through the Internet of Things

Ceusters W, Bona J

Dear Werner,

Thank you for submitting your research to the Special Topic Conference STC 2016. Submitted full papers and posters were carefully reviewed by at least three selected expert referees, and by at least one member of the SPC.

The status of your submission, as determined by the STC 2016 SPC and the comments of the reviewers are included below.

STC 2016 Decision: Accept. A decision of Accept means that your work will be published in the STC Proceedings, and be Medline-indexed, assuming:

(1) the authors carefully address reviewer comments during the resubmission phase, especially when major revisions are requested. This applies to all content (full papers and posters). We are not asking authors to accept all suggestions, but when re-submitting their revised manuscript, authors would have to explain why they did and did not respond to specific comments, and how. Space will be provided for this explanation within the final submission area of the website. The SPC reserves the right to review authors' revisions, and may change the decision of "Accept" to "Reject", and thus remove from the program, the submissions of authors whose changes are not responsive to the comments of reviewers, or who otherwise do not comply with the final submission procedure ;

(2) the authors strictly comply with IOS guidelines in terms of display and length (maximum of five pages for full papers, and one page for posters) ;

(3) the final submission is in Word format and resubmitted before the final submission deadline on January 11th, 2016 ;

(4) there is at least one paying registration attached to the submission before February 15th, 2016 (in case of authors having multiple accepted submissions, there should be at least one paying registration per accepted submission). Registration for STC 2016 would be open at http://www.stc2016.org.

Thank you again for your contribution to the STC 2016 Conference.

Looking forward to seeing you in Paris in April !

Sincerely,

Jacob Hofdijk, Chair of the 2016 STC Scientific Program Committee

Brigitte Séroussi, Christian Lovis, Co-chairs

Adrien Ugon, Floor Sieverink, Frédéric Ehrler, members

Reviewer Comments (Please note that your submission was reviewed by at least three reviewers. Numbers 1, 2, 3, etc. below represent different reviewers). SPC reviews: have your contribution proofread by a native English speaker, and check the IOS guidelines (5 pages for full posters, one page for posters, and an overall display in compliance with the IOS format).

---------------------- REVIEW 1 --------------------

This is an interesting paper on the use of Ontological Foundations for Tracking Data Quality in the context of the Internet of Things. While ontological realism is an hard topic to understand, the authors did a good job in their explanations.

There are two points that might improve this paper:

Data quality has many aspects such as Accuracy, Completeness, Relevance, Consistency, Timeliness, Reliability, Accessibility. IT would be nice if you can make more explicit how/to which aspects your approach contributes (most).

> **We agree. We emphasized in the paper that the proposed methodology focusses on accuracy, consistency and reliability.**

ALthough it is clear that this is a theoretical idea (with a nice practical example) it would be nice to know whether any real-live projects are already running based on this approach.

> **There are not yet. We wrote explicitly 'the approach <u>envisioned</u> here …' in the abstract of the version submitted for review.**

If not the reasons should be discussed in the discussion section.

> **The method requires an action logic to be developed. We clarified that by adding to the last sentence of the paper ('*Whereas the former requires more education, the latter is a matter of further research and development.*'), the phrase: '*including the design of an action logic for inconsistency detection and alerting.*'**

---------------------- REVIEW 2 --------------------

The paper contains an interesting proposal of IoT participant elements representation based on the principles of ontological realism.

My main concern is precisely under this definition of ontological realism as "a theory that defines the principles for high quality ontology development used in the BFO". It is known that several researchers in biomedical ontologies field doesn't agree with BFO and by extension the OBO ontologies and the theory which is behind the representation of these biomedical ontologies. I think that the paper could be improved maybe adding some extra information about why this approach is better/has more benefits than other methodologies/principles which already exists in ontology development. For example, authors have cited an interesting paper regarding this issue [18] and the discussions that exists behind ontology development methodologies, including BFO.

> **We provided the reference [18] precisely to give readers the opportunity to understand the benefits of BFO, the reasons for its complexity, and the sort of mistakes that are not detectable through other methodologies. It is not possible to elaborate on this within the 5 page restriction imposed by this conference, neither has it any bearing to the topic of the paper. No action taken.**

I also consider that this paper could be considered more a position paper rather than a full research paper since it's main content is regarding the proposal of use of OR theory for the ontology development around IoT and health.

> **Point made by the reviewer is unclear. The call for papers (instructions for authors) states explicitly: 'Scientific papers, <u>future vision papers</u> [emphasis added] or review papers, related to either methodologies for applications, are solicited'. No action taken.**

I like the example provided by the authors, but as they said (based on [18] again) OR theory is hard to understand. Could the authors introduce some graphical representation of the example which can provide a better undersanding?

→ **There is no room for this to do so in the paper. But we will add of course graphics in our presentation at the conference.**

----------------------- REVIEW 3 ---------------------

This is an interesting paper on the use of the internet of things for Health to improve data quality using ontological Ontology Realism and Referent Tracking. Authors propose a methodology to reduce the human data entry and to check the consistency of data sent to the network. Concepts are clearly explained, refering to relevant papers. The methodoly is illustrated by a nice example.

Data quality is a complex domain that cannot be reduced to consistency of data. The problem of missing data - because of malfunctioning of devices or intelligent modules in the network - is not treated.

→ **In response to reviewer 1, we made our focus in this paper more clear. This addresses also the comment of the reviewer here.**

Another limit is that the tracking of data quality during the measurement process has been displaced to the quality of the (re)assignment process of IUI to all entities.

→ **That is not a limitation, but precisely the very contribution of this methodology on top of more traditional quality assurance methodologies which of course we do not intend to replace, but to complement. No action taken.**

----------------------- REVIEW 4 ---------------------

This is a very interesting and appropriate paper dealing with the theory behind ontologies and IOT in healthcare.

Generally i would accept as-is, but i think it would be useful to consider whether the Universals in table 1 are truly exhaustive, …

→ **We did not claim them to be exhaustive; we wrote both in the body of the paper and the table heading that the ones listed are 'essential'. No action taken.**

… and how such issues as network connectivity and domain in terms of security might be included. I am thinking of the case where devices that are not solely indented for clinical use might be incorporated. For example, an air-conditioning unit might be able to report potential distress of an elederly person in a heat wave, but this would not normally reside on a clinical network. I suppose generally i amn asking what attributes of the objects would need to be encoded.

→ **The methodology allows for *any* sensor device to be included. We changed the sentence '*These devices will range from context-aware thermometers, weighing scales and tonometers ….*' on page 1 to '*These devices, some of which not being specifically designed for healthcare purposes, will range from context-aware thermometers, weighing scales and tonometers …*'**

The essential attributes to be encoded are precisely those captured in the universals and defined classes referred to in Table 1, including those denoted in the definitions. This was expressed in the first sentence of section 2.

---------------------- REVIEW 5 ---------------------

This theoretical essay states an intent in the title, but loses its way in the body of the text.

Is this an error ontology, …

> **→ We are not sure what this reviewer refers to by means of the word '*this*' in the above statement. Table 1? No, clearly, *it* is obviously not. Our paper is about 'ontological foundations', as is clearly stated in the title. And no table can be an ontology. No action taken.**

… and if so, how does it relate to patient safety?

> **→ Since *it* isn't an ontology, let alone an error ontology, this question is not relevant.**

a) If this is an error ontology, it ignores a big effort put forth by the WHO.

> **→ see above.**

b) It ignores basic pragmatic issues of the reliability of IOT data on several levels

> **→ unfortunately, this reviewer ignored to be precise about what pragmatic issues he has in mind and what the different levels might be. No action can be taken on vague comments.**

Without a consideration of the basic notions of what "quality" of the underlying data is, the consideration of an ontology as proposed by the authors (without data (How will such a structure be useful to anyone in healthcare?)) is moot.

> **→ we did not propose an ontology. We clarified, in response to a comment of another reviewer, on what aspects of data quality we focus.**