**Responses to Comments from Reviewer 2**

**NOTE:** The following comments are responded in the revised manuscript using **Green** coloured text and the same are copied here.

**Reviewer’s Detailed Comments:**

The authors present a very well written and timely work on scientific workflow evolution provenance. The scientific workflow community has proposed several provenance ontologies in recent years; yet, these ontologies have not properly dealt with workflow evolution. The authors present a detailed analysis of the shortcomings of previous research while also providing the community with a new ontology that overcomes these shortcomings. Overall, the paper reads well, is well researched, and provides an important contribution to the scientific workflow community. I just have a few minor suggestions for revision. Readers would benefit from the requested extension to Section 5 and the typographical fixes. My other comments are merely suggestions.

**Response:**

We are thankful to the reviewer for the appreciation and valuable suggestions to improve the quality of this work. We have responded to the suggestions in the following way:

**Comment 1:**

*Line 14 on page 2: "and the underline data model", did the authors mean "and the underlying data model"?*

**Response:**

Thank you for pointing this. I have made a correction in the paper.

**Comment 2:**

*Section 3 page 4 lines 19 and 20: the authors write "In computer science, there are several definitions of what an ontology is?". Is this meant to be a question? The subsequent sentences would seem to imply this is a typo.*

**Response:**

Thank you for pointing this. I have made a correction in the paper.

**Comment 3:**

In recent years the semantic web community has taken an interest in so-called Ontology Design Patterns (ODPs). The benefit of ODPs lies in the observation that a majority of datasets and ontologies share a relatively small set of common modeling and publishing challenges. ODPs, as small modular ontologies, provide a common strategy, established best practice, and common building blocks for future ontology development. The community ODP library at <http://ontologydesignpatterns.org/wiki/Community:ListPatterns> provides several workflow patterns that may be of use here - namely for pattern in Figure 7. It is not clear how well any of these patterns fit the authors' needs; yet, reuse of existing ODPs could further the authors' interoperability goals.

**Comment 4:**

The following works may be of interest to the authors as the ODP methodology may help further modulize their ontology.

[1] E Blomqvist, P Hitzler, K Janowicz, A Krisnadhi, T Narock, M Solanki, Considerations regarding Ontology Design Patterns, Semantic Web 7 (1), 1-7, 2016

[2] http://ebooks.iospress.nl/volumearticle/45584 available at https://www.geog.ucsb.edu/~jano/odpquestions.pdf

**Comment 5:**

*In Section 4.2.2 the description of a Deletion event has prov:startedAtTime and prov:endedAtTime. It's unclear from my reading why a Deletion has a time span and is not an instantaneous event.*

**Response:**

In WePROV, we defined Deletion as an **Activity**. According to the PROV-O definition an Activity is something that occurs over a period; therefore, it has some startTime and endTime. Since weprov:Deletion ⊂ prov:Activity therefore it inherits the prov:startedAtTime and prov:endedAtTime properties. This is to make sure that if a workflow is deleted then the deletion of a component (i.e., port, program, or controller) starts after and ends before the workflow deletion time. For Deletion activity the associated Instantaneous event is **Invalidation** that occurs at a specific time, so it has property prov:atTime.

**Comment 6:**

The authors may want to consider versioning and citation of their ontology (referring to the public GitHub page in section 4.3). The WePROV ontology is a much-needed contribution to the scientific workflow community. I would anticipate significant usage of this ontology and the authors should consider making a GitHub release to version the ontology. You may also want to look at a Zenodo DOI so subsequent ontology versions can be properly cited. For example: <https://zenodo.org/record/3674917>

**Response:**

We appreciate reviewer’s encouragement and suggestion.

**Comment 7:**

*Equation 2 on page 20 appears to have a typo. Should this be delta\_W = W\_i+1 - W\_i*

**Response:**

Equation 2 in the paper draft is :

delta\_iW = W\_i+1 – W\_i

delta\_iW represents a revision that captures the changes made in the version i of W (i.e., W\_i) to get i+1 version of W (i.e., W\_i+1) . Since there can be multiple revisions in the workflow design, there can exist various delta\_Ws for a workflow W. We number each revision details with i that represents the revision count of a workflow. So, it would be delta\_iW instead of delta\_W.

**Comment 8:**

The reader would benefit from an extension of Section 5.2. Was the encoding of WePROV an entirely manual process? Are there any tools and/or methodologies that were identified that could at least partially automate the creation of WePROV from existing workflow provenance? The authors justify their use of Taverna workflows; although, it would be helpful if they could also comment on other popular workflows in the context of the evaluation. Would the creation of WePROV have been easier or more difficult with another workflow system?

**Response:**