

USE OF ONTOLOGY APPROACH TO STANDARDIZED SCIENTIFIC EXPERIMENTAL DATA REPRESENTATION

Nur Adila Azram¹, Rodziah Atan², Shahreen Kasim³

¹Halal Products Research Institute, Universiti Putra Malaysia

²Faculty of Computer Science and Information Technology, Universiti Putra Malaysia

³Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia

*Corresponding Author Email:

¹nuradila.azram@yahoo.com, ²rodziah@upm.edu.my, ³shahreen@uthm.edu.my

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ABSTRACT

Scientific experimental data are rapidly produced by researchers in various research domains. It is difficult to manage and organize different experimental data because of different data sources involved. There is a need to have a standard scientific experimental data representation so that data from different sources can be represented in a standard format. One effective way to standardize scientific experimental data representation is through ontology approach. Ontology can provide a controlled vocabulary of terms that will give a standard name to the parameters of scientific experimental data. In this paper, we focused on standardizing scientific experimental data from laboratory instruments. We explained the flows of the ontology schema design and shows some of the parameters in the proposed ontology schema for instruments experimental data.

KEYWORDS

Ontology, Ontology Approach, Ontology Schema Design, Experimental Data

1. INTRODUCTION

Scientific experimental data are data produced by a measurement, test method, experimental design or quasi-experiment design in many areas of study such as medical, science and food science which involved with multidiscipline areas [1]. Scientific experimental data can be data or information from samples or results of experiments running through machines or instruments. With multidiscipline areas involved, it results in data stored in different ends and human intervention is required in forming a chain of data analysis. It is challenging for experiment data collection, analysis, management and sharing due to information infrastructure [2]. These cause users or researchers facing problems in managing and analysing scientific experiments data from different sources such as laboratory instruments and machines because data or information stored may apply different structures and formats. These leads to lack of standardization in the ways data are stored [3]. It also creates an issue of data integrity mainly in assuring the accuracy of data and efficiency in gathering and analysing data.

There are too many experiments data run by instruments in different research areas. The data can be vary in terms of formats, types, processing, methods and requirements in which it reflected in how data are sought out and used by different users [4]. Sometimes, researchers need to select and analyse the data manually from each sources separately. These might leads to transition and inter-process errors as well as prone to human intervention errors which would increase integrity issue. The objectives of this paper is to design scientific experiment data ontology schema mapping for standardizing laboratory instruments experiments data representation hence improving data integrity.

2. METHODOLOGY

This paper used ontology approach to standardized scientific experimental data representation from laboratory instruments. Ontology can be defined as representation of knowledge for a particular

subject or domain which is written with standardized and structured syntax [5]. It is a data model which consists of classes, properties and representation of relationships between them which shows the power of ontologies [6]. Using ontology would ease in identify more complex relationships in data, greater interoperability and more efficient using computer reasoning. Ontology can be use for data standardization as it provides a vocabulary to represent and communicate domain knowledge along with a set of relationships containing the vocabulary's terms at a conceptual level. It describe the semantics of data in information sources and to solve heterogeneity problems [7]. Figure 1 shows the flows of the designed ontology schema for scientific experimental data from laboratory instruments.

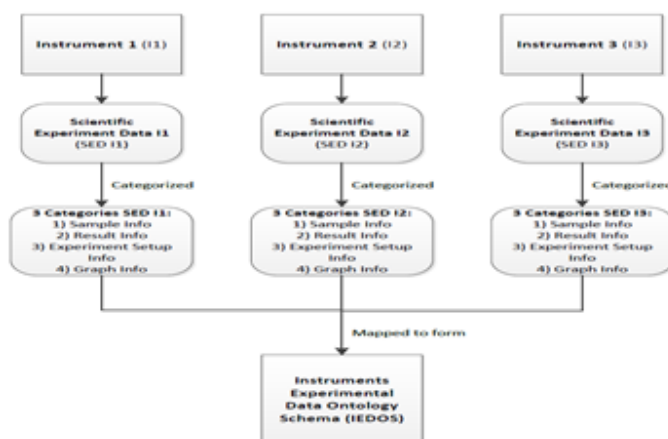


Figure 1: Flows of designed ontology schema for scientific experimental data

Based on Figure 1, first three instruments from laboratory have been selected to be used in designing the ontology schema. Then, information on experiment data from the selected instruments are gathered. Based on

the information, they are grouped into three categories which are Sample Information, Result Information and Experiment Setup Information. These three categories were chosen based on what are the important information needed by users in their experiments data. Based on the data from these three categories, they were mapped to form Instruments Experimental Data Ontology Schema (IEDOS). Figure 2 shows some of the parameters in Instruments Experimental Data Ontology Schema (IEDOS).

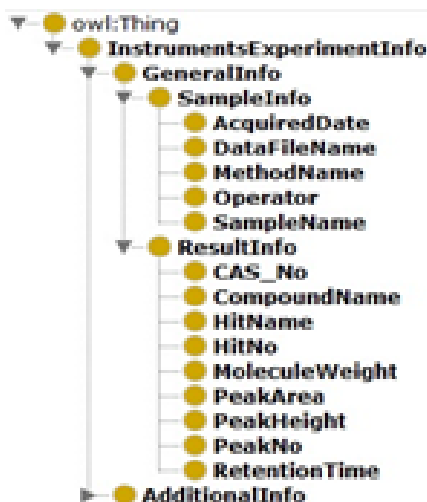


Figure 2: Parameters in Instruments Experimental Data Ontology Schema

Currently, the ontology schema is being implemented to standardized data representation from the selected instruments. With the designed ontology schema, It is expected standardization of scientific experiment data representation from laboratory instruments can be done and will as well help in improving data accuracy hence the integrity of data.

3.CONCLUSION

This paper proposed an ontology schema for scientific experimental data from Halal laboratory instruments to help users or researchers in Halal

research to standardized data representation from various instruments so that they can easily managed and analyzed their data. With the designed instruments experimental data ontology schema mapping, it will contribute to giving a high-level knowledge management capabilities with the use of consistence terms in data collection and metadata records. It also can facilitate interoperability of mapping between controlled vocabularies or terms and mapping of different data categories.

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