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Ontology design based on data family planning field officer using OWL and RDF.

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Abstract

Population density in Indonesia is ranked fourth in the world. The impact of a large population will affect the level of welfare of the community to decrease, and the number of unemployment is increasing so that the state makes Family Planning Program (PLKB) to control the rate of population growth. Problems in the PLKB program are on knowledge management and mapping from data contraception, counseling and planning so that this research using Ontology method will aim to do mapping with knowledge management and Ontology design shows represented data to relate and describes the resources contained in family planning data. This research approach the representation of ontology that is validated through model transformation from family planning data to ontology design using OWL and RDF which are useful for data processing and representing data to be utilized by field officers in educating the public and eradicating negative issues about family planning programs.

Keyword: *Family Planning, Ontology, Resources Description Framework, Field Officer, Web Ontology Language, Representation.*

1. Introduction

Based on statistics of population data from the CIA World Factbook [1], Indonesia is ranked fourth in the world and high population in indonesia growth resulted in various problems. Requires a handling so that population growth can control, one of the efforts handled by using family planning program. With significant population growth, data managed by family planning programs or BKKBN will continue to grow and have insight and information that can utilize by family planning field officer and the community. BKKBN, is a non-ministerial government agency in Indonesia that is responsible for carrying out government duties in the field of family planning and prosperous families. Family planning data that have knowledge and information are diverse, with a significant amount of data will make the field officer difficulty in doing the process of classification. Data processing and describe each data because it is done manually, not integrated with the system and the community becomes less understood about information and knowledge of family planning programs. After the process of analyzing data in family planning that has knowledge and information to be utilized by a family planning field officer, there are three that is counseling, contraception, and planning [2]. Counseling, contraceptive and planning data obtained from family planning programs have not grouped and classified, so that field workers have difficulties when they want to provide information and public services [3]. The ontology design can be represented and mutually related and describes the resources contained in the family planning data to be constructed with OWL (web ontology language) and RDF (resource description framework) methods [4]. The ontology design of a family planning field officer has the goal of developing a family planning ontology model that integrates various types of family planning entities with data obtained on counseling, contraception, and planning. Also, the data obtained can be done integration and classification with web ontology language and resource description with resource description framework [5].

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(OWL) Web Ontology Language is a standard ontology language which represents data classes, properties, and individuals in Semantic Web. Ontology Technology allows Data Schemes in Family Planning that can be described with a domain of knowledge and accessed by people or computers that share a standard view or domain application [6]. The W3C has recommended OWL as the language of choice for knowledge representation in the so-called Semantic Web. In OWL, objects of the domain represented as interrelated resources and identified by Uniform Resources Identifiers (URI), while attribute values are described by literals. Technically an ontology has represented some components between Classes, or concepts, things common to a domain of interest, Examples, or individuals, certain things, Property and value of it, Constraints and rules for that matter and Functions and processes related to it. With the popularity of ontology [7]. OWL representative language, people consider the use of ontologies to describe the use and rules in family planning, such as the use of OWL to formalize the policy [8].

2. Related Works

Design Ontology PLKB has a purpose of developing an Ontology model of family planning that integrates the various types family planning entity with data obtained that is Counseling, Contraception, and Planning based on existing data on Family Planning Field Officer [9]. Also, the data obtained can be done integration and classification with Web Ontology [10]. OWL is the standard ontology language for Semantic Web. Characteristics that differentiate RDF and ontology compared to relational databases are their degree of linkage different, Ontology and RDF capability in modeling related relationships [11]. With Ontology development methodology and conceptual model [12], the process of developing and mapping data of family planning data can be represented by the information ontology design [13], and PLKB implement RDF that provides a means for vocabularies both machine-processable vocabularies designed to encourage human capabilities [14].The structural construct of RDF is a triple subject, property, and object, which can represent in graph [15]. Data PLKB on the dependent on human control and still in a human-readable format only [16]. PLKB data should be in a machine-readable format so that the semantic web agent can understand the data [17]. Large amounts of data on the PLKB are stored in relational databases (RDBs) and should be represented in Resource Description Framework (RDF) format so that they can be understood by the agent [18].

In this research, the data processed and represented in the ontology derived from data on population and national family planning. Ontology builds facilities in many cases designed for use by family planning officers with appropriate knowledge and representation techniques so that in creating an ontology architecture [19]. The process of creating classes, object properties and data property can do gradually, and each data is related to the other data [20]. An Ontology is required to make target areas with difficulties in performing a specific task [21]. These Ontologies can then be additionally coordinated to deal with the genuinely necessary prerequisites of settling the issues emerging in family planning [22].The process of representation of ontology knowledge using web ontology language and resource description framework to represent data of existing data in family planning [23].

3. Research Method

In this research, Data Family Planning Field Officer implement Web Ontology Language and Resource Description Framework for representing ontologies, (OWL) Web Ontology Language is an ontology language for the web that is an extension of RDF Schema [24]. We analyze the identified shortcomings of an OWL, such as problems with its syntaxes, and deficiencies in the definition of OWL species. In the case study of Family Planning Field Officers, there are various sources of data obtained from the (BKKBN) National Population and Family Planning Agency, Data described include Planning, Contraception, Counseling, and Services [25]. Data mostly collected by different actors through various heterogeneous and distributed information sources, and stored and often managed directly in XML [26]. To enable the large volume of data to be described in such a way that their meaning can exploit by machines and queries can be activated,

this paper presents an automated method to derive OWL ontologies from XML schemas. Contribution of this Ontology relies on the possibility of producing an ontology starting from multiple XML schemas, by discriminating between domain and cross-domain entities and, contextually, simplifying the overall structure of the final ontology generated. Family planning field officer data is obtained from national population and family planning bodies, i.e. counseling, contraception and planning data. Based on table 1 explained the data of family planning field officers there are three different classes, seen that the subclass of the thing consists of counselling, contraception and planning. OWL defines the root of all that exists with owl: Thing. So all the classes created implicitly are subclasses owl: Thing. Creation of class using owl: class and declare subclass with rdfs: subclass. The class is the central point of ontology. The class describes a concept in a domain consisting of multiple instances or individual. The class is also known as the concept, object and categories. A class has subclasses that state a more specific concept of superclass. (OWL) Web Ontology Language , as a Semantic Web standard, can formally represent domain knowledge, organizes concepts or entities within classification hierarchies that provide [27]. Domain ontology chose as representation model of knowledge about physical effects. Ontology is the most widespread form of the knowledge description of any subject domain, easy integration with information systems [28]. Currently, there are tools for creating and supporting ontology creation. These tools are to standard viewing and editing functions also perform import and export of various formats and languages, documenting ontologies, support visualization and graphical editing. Resource Description Framework or RDF is a standard used to describe resources.

Table 1. Class and Subclass of Family Planning Field Officer.

Class	Subclass of
Counseling	Thing
Contraception	Thing
Planning	Thing

4. Experiment and Result

Data Family Planning Field Officer implement Web Ontology Language or OWL, and Resource Description Framework for representing ontologies, Web Ontology Language is an ontology language for the web that is an extension of RDF Schema. We analyze the identified shortcomings of an OWL, such as problems with its syntaxes, and deficiencies in the definition of OWL species. In the case study of Family Planning Field Officers, there are various sources of data obtained from the National Population and Family Planning Agency (BKKBN),To provide a shared understanding of the table fields in a different database, samples of family planning ontologies based on national population and family planning standards developed through the Web Ontology Language method and Resource Description Framework. Data for Services by Family Planning Field Officers currently amounts to 35 classes and 236 property. For counseling data, the number of types there are five parts, and the total capital has taken from each category amounted to 36. For planning data, the number of classes is five sections, and the overall property chosen from each class is 5. For quiz data, the number of classes is five parts and the total property taken from each class is 100, and For contraceptive data, the number of classes is ten sections and the total property taken from each class is 95.The data source comes from the official source of Population and Family Planning Agency which has many classifications such as Contraception, Counseling, Quiz, Planning in Family Planning then Results from processing, classifying and grouping data visualized using tools Protege and Eclipse KOMMA to conduct Resource Description Framework. Protege-OWL can add and edit these terms and annotations. We define three classes in the Family Planning Field Office: Counseling, Quiz, Contraceptive, and Planning. For more efficient ontology development can be done through tools to automate the process of adding ontology

content by repeating design pattern [29]. A Counselling is a service offered to the individual who is undergoing a problem and needs professional help to overcome it. Counseling in the process of service by the Family Planning Field Officers there are five Classes and 36 Property. Counseling divided into three area: Postpartum Counseling, Miscarriage Counseling, and Counseling Balanced Strategy. In the design of Ontology which will do, there are data of Family Planning Officer from BKKBN and divided into three existing data of Contraception Tool, Counseling Data and Planning Data. Based on the data of Family Planning Field Officer. There are three different classes from Family Planning Field Officer. Inside SubclassOf consists of Counseling, Contraception, and Planning. The data of Family Planning Field Officer there are three different classes, it seen that Thing in SubclassOf consists of Counseling, Contraception, and Planning.OWL defines the root of all that exists with owl: Thing. All the classes created implicitly are subclasses owl: Thing. Creation of class using owl: Class and declare subclass with RDF subClas- sOf. A class is the central point of ontology. A class describes a concept in a domain consisting of multiple instances or individual. The class is also known as the concept, object, and categories. A class has subclasses that state a more specific concept of the superclass.

Figure 1. VOWL Family Planning Field Officer

Based on figure 1 explain the data of Family Planning Field Officer there are three different classes, it seen that Thing in SubclassOf consists of Counseling, Contraception, and Planning. OWL defines the root of all that exists with owl: Thing. A class is the central point of ontology and class describes a concept in a domain consisting of multiple instances or individual. The class is also known as the concept, object, and categories. Data Properties Family Planning field officer have slots. The property or slot consists of two types, namely the nature of the object and the nature of the datatype. The properties of the object will connect the instance with the instance datatype property will connect the example with the datatype value. As for the resulting class shown in Figure 2.

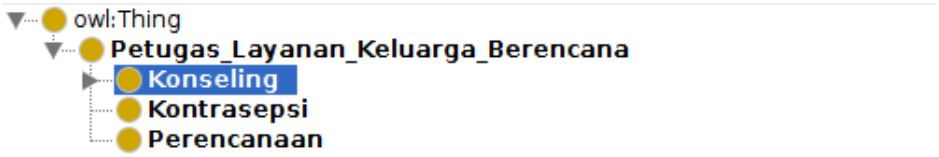

Figure 2. Class Ontology Family Planning Field Officer

Based on figure 2, The design of Ontology above generated three types of classes are Considered Strategy Counseling has the domain of *Konseling* and Range of Individual Group Strategies, *Kontrasepsi* , and *Perencanaan*. Object property of family planning service officer with *Konseling* domain that is counseling data of balanced strategy have data property of *Strategi Kelompok* and *Strategi Individu*, *Konseling Paska Keguguran* have post-miscellaneous property properties, *Konseling Paska Persalinan* has post-natal property properties. Then for object property with *Kontrasepsi* domain and contraceptive recommendation data properties of *Implan KB, IUD, Kondom, MAL, Pil Kombinasi, Pil Progestin, Suntik Kombinasi, Suntik Progestin, Tubektomi , Vasektomi*. For data object property with domain *Perencanaan* and data properties stages are data being *Pasangan Baru Menikah, Pasangan Baru Memiliki Anak, Masa Dewasa Muda, Pasangan Keluarga Dewasa* and *Sedang Mengandung*. Property data with the domains of *Kontrasepsi* and the range string is how to work, how to use, advantages, limitations, notions, can't use, places of service, rumors and facts, and video. Then the property data plan has a range/value string and has a domain that is the domain of young adulthood new couples have children, newly married couples domain, the domain of adult family pairs and domain being pregnant. Then contraceptive recommendation data properties have a range/value string with newly married couples domains new partner domains have children and domains are containing. Ontograf explained the data of family planning field officers there are three different classes, seen that the subclass of a thing consists of Konseling, Kontrasepsi and Perencanaan. OWL defines the root of all that exists with owl: Thing. So all the classes created implicitly are subclasses owl: Thing. Creation of class using owl: class and declare subclass with rdfs: subclass. A class is the central point of ontology. The class describes a concept in a domain consisting of multiple instances or individual. Based on figure 3 data visualization with VOWL more data is described. There is a family planning field class and has three subclasses of *Konseling, Kontrasepsi* and *Perencanaan*. In the sub-class of *Konseling*, there are three sub-properties: *Konseling Paska Persalinan, Konseling Paska Keguguran* and *Perencanaan*. For *Kontrasepsi* subclasses, there are ten sub-properties :*Implan KB, IUD, Kondom, MAL, Pil Kombinasi, Pil Progestin, Suntik Kombinasi, Suntik Progestin, Tubektomi , Vasektomi* . For *Perencanaan* subclasses there are sub-properties, *Pasangan Baru Menikah, Pasangan Baru Memiliki Anak, Masa Dewasa Muda, Pasangan Keluarga Dewasa* and *Sedang Mengandung*. Property data are related to each other and have relationships to class and object properties.

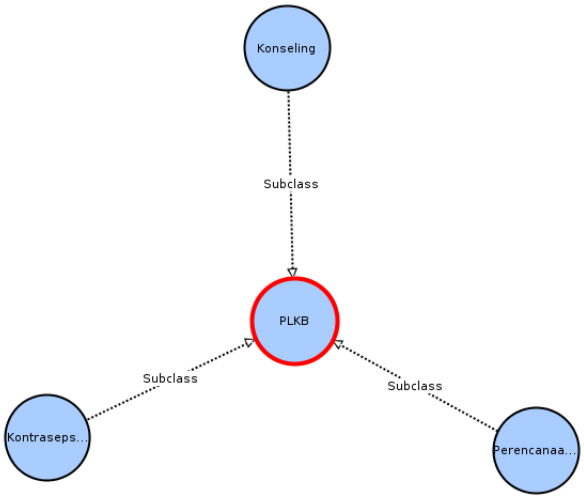

Figure 3. VOWL Family Planning Field Officer

In Figure 4 there is a *Kontrasepsi* class and ten subclasses of *Implan KB, IUD, Kondom, MAL, Pil Kombinasi, Pil Progestin, Suntik Kombinasi, Suntik Progestin, Tubektomi , Vasektomi* In each object property, there is how to work, how to use, can be used if, video explanations, advantages, notions, rumours and facts and place of service. Then there is the data property that represents the existing data components of the object property. Property data are related to each other and have relationships to class and object properties.

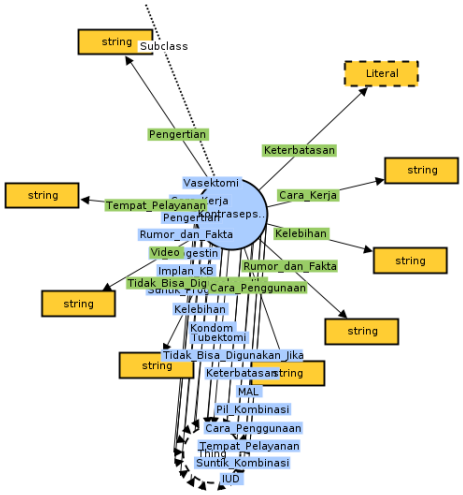

Figure 4. VOWL contraceptive

In eclipse komma there are sections such as classes. For the class in the family planning field officer having three child classes. The classes namely *Konseling, Kontrasepsi* and *Perencanaan*. shown in Figure 5.

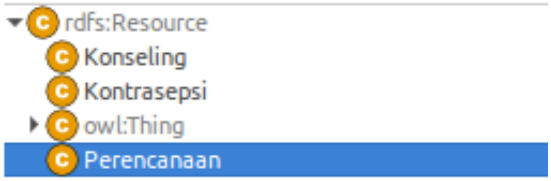

Figure 5. RDF Class Family Planning Field Officer

In each class, there are object properties and data properties. For object properties, there are data properties in each class. The use of RDF Schema is mainly to describe the relationships that occur between classes, properties, values, and instances in a semantic model.

5. Conclusion

In this paper, family planning field data based Standard metadata initially built. Then, with support from BKKBN, data integration, scheme reorganization, and data querying are performed. OWL is the most expressive ontology language used for semantic web applications Since the semantic web provides information that can automatically and integrates information on the Website and RDF functions in information flow, and as the data model used to describe the information. The Ontology tables represented and visualized with VOWL are listed in table 2.

Table 2. Class and Subclass of Family Planning Field Officer.

Class	Subclass of
Counseling	Thing
Contraception	Thing
Planning	Thing

The essence of the work is to achieve interoperability of family planning field officer.This method can restore the semantic of XML schema and data information efficiently. Ontology design no need statistical method. The main contribution of this paper is constructing the ontology automatically from XML schema. The experimental results show that our method of creating data Interoperability is comfortable and convenient for users. Our research can motivate future research to improve ontology within the scope of family planning and provide information to communities in Indonesia to implement family planning programs that assist development Population and Reproductive Health and adding some technologies such as natural language processing and artificial intelligence.

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