Periodicals of Engineering and Natural Sciences ISSN 2303-4521
Vol. 8, No. 3, September 2020, pp.1935-1950

Digital content management of Heet Sib Sorng custom for semantic search

Wirapong Chansanam, [1] Kulthida Tuamsuk[2], Thepchai Supnithi[3]
[1] Department of Information Science, Khon Kaen University, Thailan
[2] Dean of the Faculty of Humanities and Social Sciences at Khon Kaen University
[3]National Electronics and Computer Technology Center (NECTEC), Thailand

ABSTRACT

This research presents the results of the alteration knowledgeable following the instruction of the digital content management by semantic technology development. The boundary of this research consists of the integration of the opportunities provided by the existing ontology and two datasets with the resources having different contents, including the datasets from the central library, physical and electronic data, and the development of semantical web approaches in ontology. In this research, research and development methodology is used and the data were acquired through literature review. This research shows that the ontology and applications evaluated are high level, and that there is an inclination for integrated systems oriented towards digital content management in the Thai custom semantic search system, which finally bring to the convergence of linked data and knowledge-based system.

Keywords: Digital Content Management, Ontology, Semantic search, On top

Corresponding Author:

Wirapong Chansanam
Departement, Department of Information Science
University, Khon Kaen University
Address, Thailand
E-mail: wirach@kku.ac.th

1. Introduction

Since ancient times, people in the north-eastern part of Thailand have always strictly followed the traditions. For hundreds of years, custom has been a popular activity. Heet Sib Sorng-Klong Sib See's story is a religious conviction that probably came from an Indian community in that region. In short, the story was called "Perng Baan Perng Muang" or, locally, "heet-klong" that means "to be introduced into society" and different elders may interpret the story of Heet Sib Sorng-Klong Sib See differently. However, they are just somewhat different. The variations were primarily memorized and recalled because there was a shortcoming in writing or recording techniques. Very few such stories were written. "Heet," meaning "standard practice" is abbreviated from the Thai word "JaReet," but Northeast people say "H" instead of the Thai word "R." Thus, Heet Sib Sorng is a practice that is usually performed in a span of twelve months per month. The first month, in ancient times, was the beginning of the new year and the twelfth month ended the year cycle, called "Duan Ai" or "Duan Jiang." The tradition was based mostly on Buddhism every month. If the practice isn't Buddhism, people actively tried to engage Buddhism so that they could meet in the temple for merit [1]. In the past, not solely the way of life, the significance of residing as a community practice, it is additionally a social norm that when practiced will be lead to peace. So, that everybody in Thai society should respect and observe. Therefore, Heet Sib Sorng and Klong Sib See are likes a law of society that everybody ought to abide because they have described the obligation of anybody in the society, with the belief that any society will comply with Heet Sib Sorng and Klong Sib See will continue to be keep calm for all. The data perform technique of the Thai custom ("Heet Sib Sorng") by using the explanatory traditional framework for World Wide Web technology nonetheless lacks the management machine to be capable of semantic search the information showing the Thai custom in a variety of dimensions. Computer process data capability allows for comprehensive, reliable analysis and cuts down users' time and effort, as well as new management of information and processing opportunities for agents [2]. The semantic searching is done through a contextual inquiry [3], instead of matching keywords like standard search tools. On ontology is commonly referred to as the field of data semantic technology in computer science. Ontology uses metadata, making use of semantic matching and exchange of information and incorporation by the search engine. This document illustrates how RDF ontology has been developed and a model for the same field for a particular domain. The requisite ontological results can also be obtained by means of a natural language query along with an ontology evaluation of the defined sample size. Thai Custom Semantic Search System (TCSS) is designed to do this known as Thai Custom Semantic Search. Users can easily access information using this system without technical knowledge of semantic web technologies such as SPARQL or RDF. The full spectrum for the ontology-based know-how retrieval method of the Thai specialized field is included in this paper. Many researchers incorporate conceptually express (semantic) into the retrieval process to recover from semantic level and fix the shortcomings of the conventional approach. Conceptual express is used in the form of ontology to achieve semantic intelligence retrieval by specifying strict syntax, using a declining engine, and standardizing the output format of the result. The goal of this article is to effectively combine the general recovery framework and field ontology, solve specific problems between user keywords and terms that domain experts use to define ontology and increase efficiency and accuracy of recovery. The goal is to use a keyword recovery approach that uses thesaurus and ontology.

2. Ontology-based data access (OBDA)

Throughout the literature, the OBDA approach has been thoroughly studied and debated under the formal ontology framework [4]. In particular, OBDA domain knowledge is defined as ontology and usually represents the 2012 World Wide Web Consortium W3C Standard Recommendation for a subset of the OWL 2 Web Ontology Language. Formally forms the basis of OWL2. Definition of logics (DLs) is the logic designed specifically to represent organized knowledge. These logics can be called computer-sound fragments of the first-order logic. For OBDA as a sublinguistic entity, it means OWL2 [5]. Cuenca Grau 's formal equivalent, 2009 is the reason for defining the DL-Lite family [6]. The logic of this family is lightweight since it blends minimal expressive power with strong computing properties. Especially in consideration of domain knowledge[D], this was designed to be particularly effective in large quantities of data inference (and query response) [6, 7], which is a crucial property in any data integration scenario.Virtualization in OBDA is accomplished by the declaration of mapping of domain ontology and data source [8]). Mapping consists of a set of statements relevant to a domain ontology definition or property and a SQL source query. Intuitively, such a SQL query will supply data for adding the concept / property to which the query is related by obtaining the RDF [9, 10] language graph of information. However, the mapping queries are not carried out to create an RDF knowledge graph since this diagram is virtual. Alternatively, they rewrite ontological user queries as a source query that can then be directly executed by the source query engine (usually the RBMS). Moreover, mapping statements contain information on the use of data values collected from sources when identifying ontological objects (IRIs) or objects returned to user queries.

3. Ontology and knowledge retrieval

3.1. Ontology

Ontology is a way of demonstrating a growing machine awareness of the domain. This helps the machine to understand semiconductor data and facilitates the exploration, exchange and inclusion of information. Ontology is different from conventional keyword-based search engines because they are metadata that function semantic matching. Ontology is more searchable than traditional approaches [11, 12]. In general, Ontology consists of definitions of essential concepts in the context of each subject and hierarchies in their respective fields. Ontology, the semantic internet center, was the basis for a conceptual instantiations knowledge domain, i.e. the semanticized web information technology hub. In order to integrate the data type values, classes and subject properties [13, 14] the Ontological Framework aims to model a knowledge domain in the shape of instances. Ontology enables the search for, exchange and the incorporation of information, allowing computer understanding. Ontology is often designed to some purpose; its content and structure are constrained by the emphasis of this mission. Many tools for implementing metadata ontology have been developed. Ontology tools, it is possible to establish ontology in the fields of information system design, biomedicine, communication, linguistics, business, transportation, web services, logic puzzles, engineering, education, architecture, entertainment, administration, home maintenance and so forth. When the domain (or part of it) changes it often has to alter concepts that cause shifts in the ontology of this mini-world. Ontology refers to a variety of works on ontology, ontology and theory, ontology and language development. Ontology can be developed in the areas of information system design, biomedical, media, linguistics, business, travelling, web services, jigsaw logic, engineering, education, building, entertainment, government, housekeeping, etc. When the domain (or part thereof) changes, concepts must also change, resulting in changes in the ontology representing this mini-world. Ontological engineering refers to a series of works related to ontology, ontology and methodology, ontology and languages building. Ontology development is a complex process that can benefit from tool support and is largely domain-oriented.

4. SPARQL

Since more data is saved in RDF formats, a simple way of finding specific information is required. This is filled in by the powerfully searchable SPARQL language, which makes the searching data in the RDF haystack easy. It is the RDF Query Language and SPARQL Protocol. The RDF query language is standardized, just as SQL is a standard RDF query language. The SPARQL query contains a sequence of three times that can be the subject, predicate or object of the variable. The concept in the SPARQL question is to fit three RDF triples and to find the variables solutions. The SPARQL query is running on an RDF dataset. The SPARQL Protocol and RDF Querying Language are used as a channel to collect this information. In rdfDB, RDQL or SeRQL, SPARQL builds on previous RDF query languages.

5. Framework for thai custom semantic search system: tcss

The system TCSS provides a manageable interface that allows inquiries and excerpts data from a specific field of ontology to obtain the anticipated outcomes. This system changes the input query in natural languages to the SPARQL data base's RDF query language, so that SPARQL language cannot be studied. SPARQL query for access to relevant information is then performed in ontology. Three main stages consist of the complete design of the TCSS system. The building of ontology is the first stage that is an essential part of the framework that uses the safe resource. The second step is to map an on-top plugin from Thai custom ontology to a Thai custom database. The 3rd phase is the collection, via Apache Jena API, of converted SPARQL queries in the RDF data base to obtain the results [13]. After recognition of the named entities, the expected language query is scanned as a parsing tree. The query terms are then matched to the ontology classes and properties, and three times. By integrating these triplets, the SPARQL query is created. The detailed frame design is shown below (Figure 1). Each stage is extended to its components.

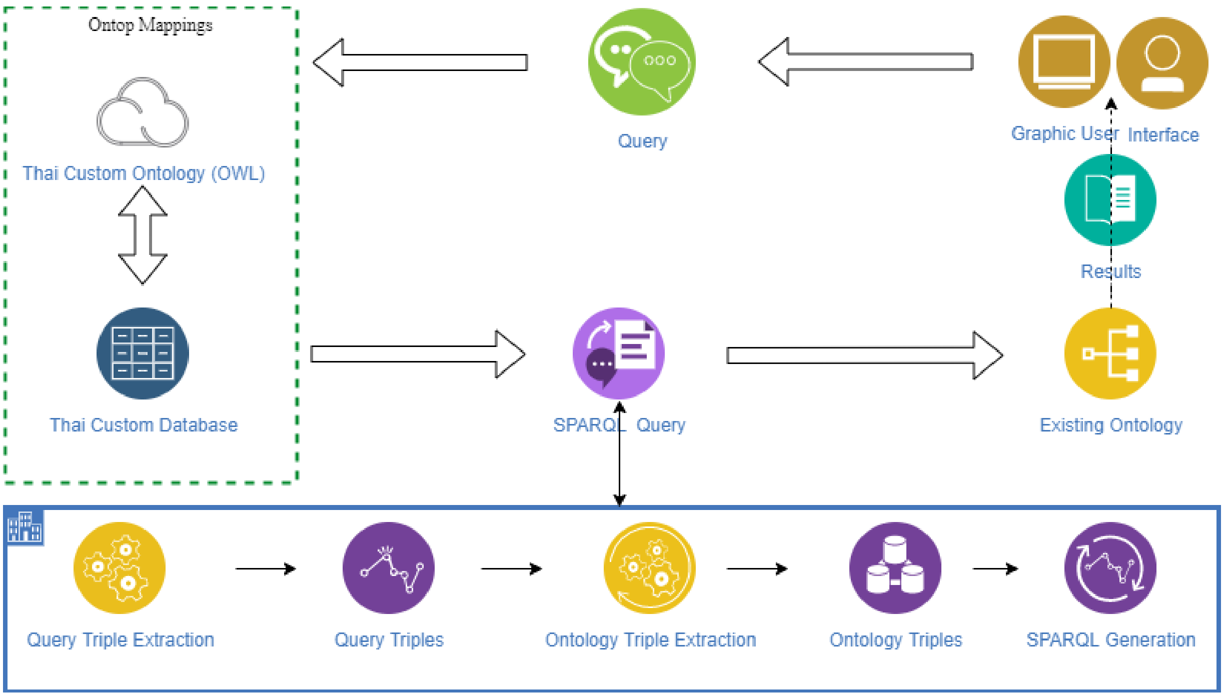

Figure 1. Thai custom semantic search system framework

6. TCSS Architecture on the semantic web proposed

The interface will accept natural language queries with the proposed information recovery framework for custom domains, which extracts data and provides the requested results from domain ontology. Ontology is an OWL / RDF data base that is often used to convert data from the natural language query to a SPARQL query. SPARQL needs more details. The system proposed converts the input query into a SPARQL query, which is an RDF-based database query language. The question SPARQL will be forwarded to and indexed by the RDF database. The proposed semantic web architecture based on TCSS consists therefore of four major phases**:**
Phase1: Ontology building
Phase2: Ontology and databases mapping
Phase3: Testing SPARQL query on developed Ontology and in querying desired results
Phase4: Semantic search prototype development.
The TCSS framework presents the system's four principal phases. The main portion of the project is the ontology construction in particular. Edge accepts natural language queries, which are then translated via on top SPARQL to SPARQL Query Language. Subsequently, translated SPARQL queries will be sent via the Jena API of Apache to Ontology for performance.

6.1. PHASE 1: Building ontology

Ontology Development is a complex and largely domain-oriented process that can benefit from tool support. The Protégé Ontology Editors based in Java have been found to be comprehensible and provide a playback environment, making it a flexible base for fast prototyping; a range of ontological instruments, such as the modeling functionality, basic language, web support and use; import / export format; graphic views; compatibility checks; multi-user supports etc. In [15, 16], Protégé is an ontology and intelligent system construction framework free and open source editor. Protégé is an RDF-format data-creating tool. To build a Thai custom domain ontology, we used the Protégé 5.5.0 tool. In order to create a prototype of the system we used Thai custom domain theme (Heet Sib Sorng). Ontology has been developed in several phases [17-19]. The first step is the compilation of comprehensive knowledge information. The second step includes the definition of all ontology groups and subclasses. The third step is to decide the class and subclass characteristics. Properties are two types: object characteristics and data characteristics. Object properties typically define relation between classes or individuals. Data properties define the relationship between instances and data values. There's a jurisdiction and a range in every property. The fourth step is to establish the authority and scope of each property. Comments can also provide domain definition classes and properties. The fifth step is intended to set up class instances and define data and object properties to describe the relationship between class and sub-class instances. To test the accuracy of ontology, on top Reasoned can be used. Adding plugins like On top Reasoned can also be used to verify that Ontology is developing consistently. Finally, the ontology in RDF or OWL data format must be saved and exported to the required interface for querying.

Figure 2. Steps for ontology building

6.1.1. Classes and subclasses creation

In the custom domain, a prototype for the TCSS system is considered to be the core concept of Thai Custom from Discipline. Thai custom ontology comprises many classes and subclasses as shown in the following figure. The source bump includes classes on different macro subjects, such as Discipline (abstract data types), Values, Books, Author, Editors and Publishers, linked to a Thai custom domain. These classes are inherited from different subclasses. The discipline class also has two general and special discipline subclasses. Explicit Discipline and Implicit Discipline have two subclasses of General Discipline. Explicit Discipline has two subclasses Law and Tradition. Tradition has two subclasses Private Tradition and Public Tradition. Public Tradition has one subclass Custom. Custom has three subclasses Convention Custom, Local Custom, and Tradition Custom (Figure 3).

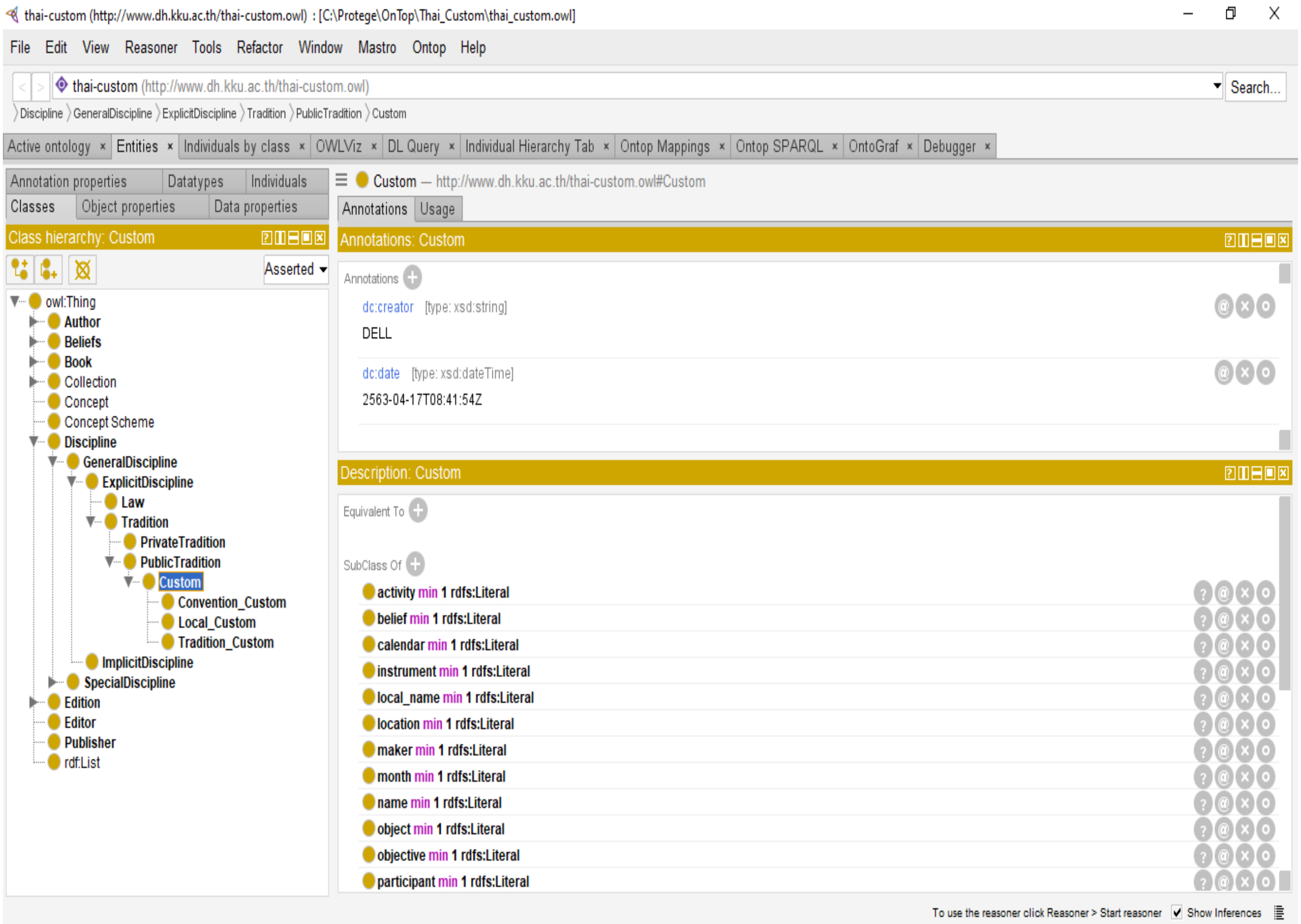

Figure 3. Classes and subclasses of thai custom ontology

6.1.2. Object and Data Properties Identify

In the following figure are the properties of different classes and subclasses. Different properties were described of objects describing the relationship between class instances or individuals. Diverse object properties are edited by, has Edition, has Literature, has part of, publish, Same as, written by (Figure 4), the data properties include: activity, beliefs, calendar, date of First Published, date of Publication, edition Numbers, eng name, genre, instrument, literature, local name. Every property has a field and a range which must be definite through the creation of ontology. For example, Custom Domain and Book range of properties of the literature object (Figure 4).

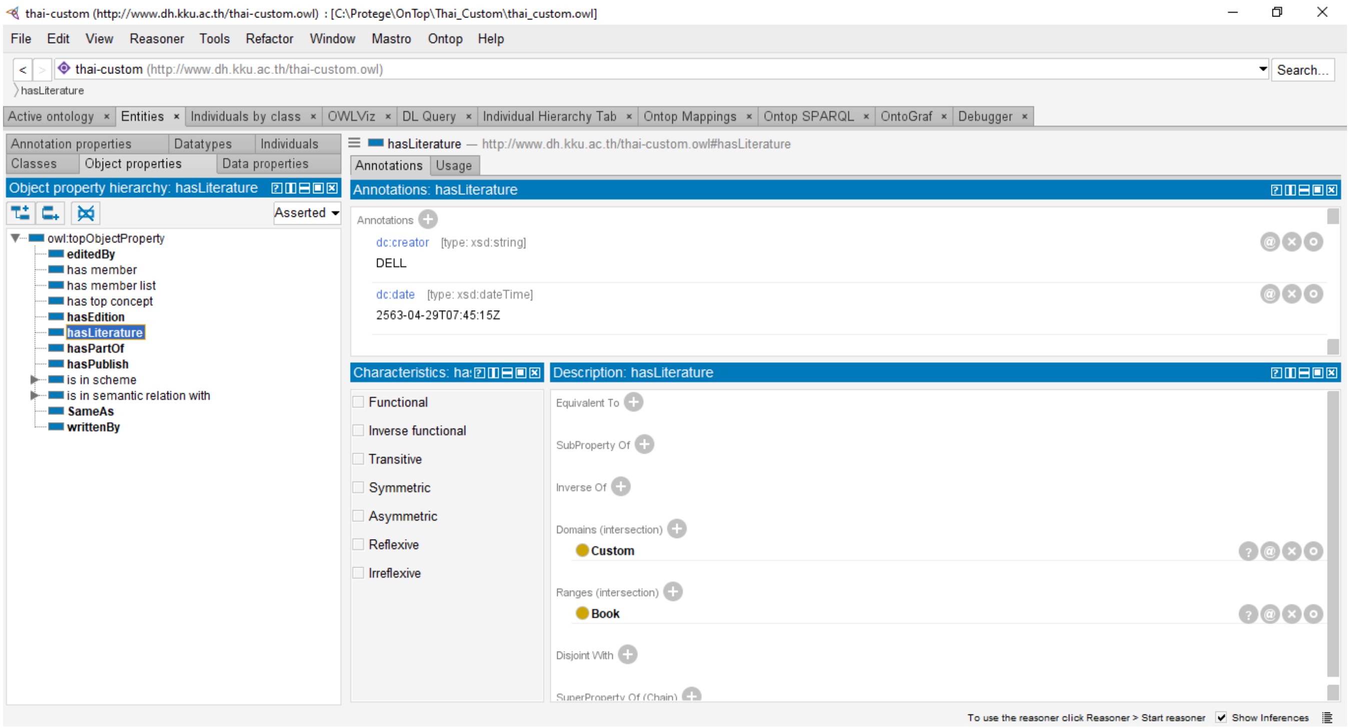

Figure 4. Object properties of thai custom ontology

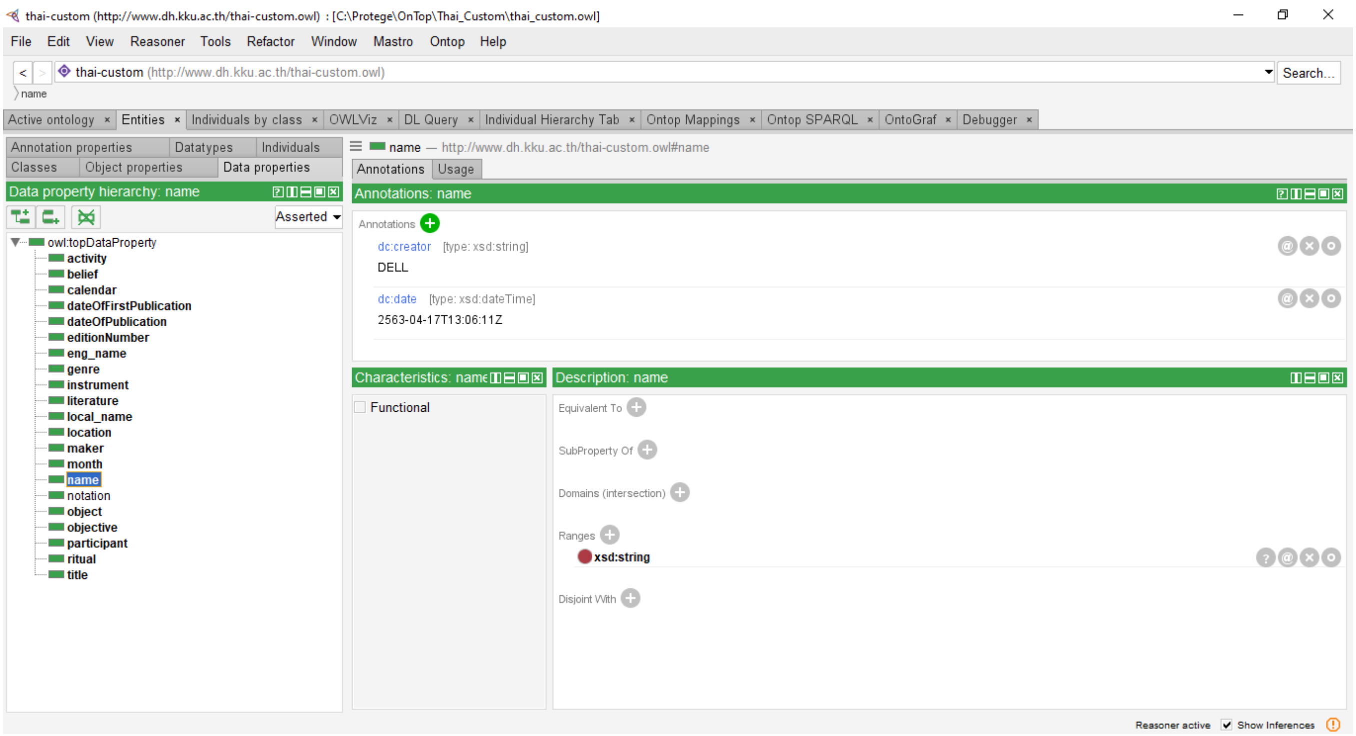

Figure 5. Data properties of thai custom ontology

6.1.3. Individuals creation

Persons serve as an example for classes and subclasses. Relations are formed by individuals (instances) among all things of the particular Ontology. As a custom ontological example of Thai (Figure 6). Equally, all people are built for every class and subclass. Every class has several members acting as its own example.

Like, Local Custom class has twelve individual Heet01, Heet02, Heet03, Heet04, Heet05, Heet06, Heet07, Heet08, Heet09, Heet10, Heet11, and Heet12.

6.1.4. mConsistency checking

On top plugin provides a reasoned to check that the ontology that is developed is consistent. It can start the reasoned inspection and can stop the reasoned inspection after the consistency control. Several other Consistency Check plugins are provided as on top reasons. Throughout the built ontology, the validator RDF is used as well.

6.1.5. Save the ontology and export

The seventh stage consists of RDF / OWL ontology saving. Ultimately, ontology is being exported for queries on the desired interface to the RDF / OWL format. Finally, for a Thai custom domain more than 791 RDF triples, a prototype ontology has been developed.

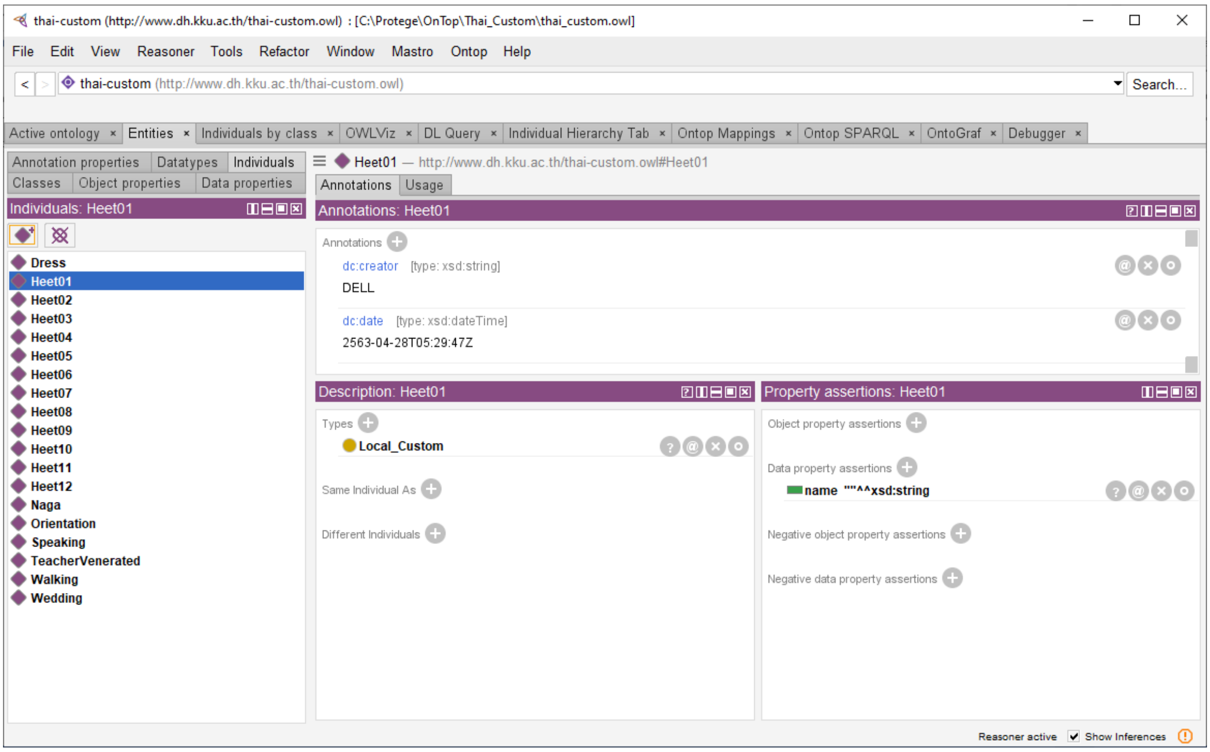

Figure 6. Instances (Individuals) of thai custom ontology

6.2. PHASE 2: Ontology and mapping of databases

This challenge has been addressed in the majority since mid-2000s by ODBA [8]. The conceptual layer of OBDA is given as an ontology, which describes shared terminology, models the domain, hides the structure of the data source and enriches incomplete information with contextual information. The high conceptual approach is then requested and users no longer need to understand the source of the information, their relationship or their data encoding. The OBDA approach is used to convert queries to potentially very large (normally linked and federated) data sources. Ontology is connected with data sources by a declarative specification of mapping, which applies to ontology (SQL) data view symbols (classes and characteristics). Ontology-based facts admittance and integration (OBDA / I) is a common standard that solves traditional problems with access to and integration of data saved by leveraging the conceptual representation of data given in ontology in various types of legacy sources. To that end, they use conventional database systems to merge innovations in the arenas of information representation and the Semantic Web. The main mechanism for establishing this combination is RDF-to-database mapping, which allows virtual views of the contents of data sources to be developed and directly related to the terms of ontology. On top, the company has been developed at the Free University of Bozen-Bolzano and has received commercial funding from the company On topic[20]. There is an Apache license. Assistance is given for R2RML, direct mapping and its own compact mapping langue. SPARQL 1.0 is supported and many optimization measures are being made, not just for operators of JOIN and UNION but also for OPPTIONAL operators[21] (Xiao et al., 2018a). For more expressive ontologies based on mapping and rewriting, On top uses thought of OWL2QL ontologies and a prototype [22]. However, the On top software extensions deal with spatial data[23, 24] , in order to accommodate different types of data sources temporal data [25] and MongoDB databases (which allow one to store and query JSON documents)[26]. This study uses the On top OBDA system which, like many research projects, is a mature open source software. The OWL2, R2RML, SPARQL und SWRL and the OWL2 framework associated with SPARQL support all W3C guidelines relevant to OBDA. Protected data can be obtained from the Protégé's plugins and a SPARQL endpoint from the Javas a library supporting the OWL API and the Sesame API via Sesame Workbench. Then you can view this virtual RDF graph via SPARQL through the relating databases by translating SPARQL queries into SQL queries. We will address each case in three steps: first step will review any related online classes, object properties or data properties and all applicable table in the appropriate data base. The second step is the OBDA model, which maps the database, classes and properties in ontology. The third step, by running a question using a reasoned, tests the OBDA model. SPARQL (figure 8) is used to write the request. In order to maintain the chores in generating and deployment of OBDA arrangements, additional tools are available on the on top core functionality. Ontology and mapping is a dynamic topic that is fundamental to the virtual graphic information system (VKG). Ontology has become well established and extensive study has been conducted [27] mapping engineering is an emerging topic that is worth considering. Nonetheless, mapping involves comprehensive knowledge not just on the field of interest, but also on the way the data is organized in data sources (i.e., the otologist is concerned with the in-depth understanding of databases). This role is difficult and time-consuming. Several donations to sustain this project have been made in the past decade: a pay-as-you-go model. [28] was suggested and a number of tools were developed. The following tools are classified into two categories: boots trapper mapping and editor mapping (see Figure 7). Mapping and ontology engineering. A semi-automatic approach to mapping and ontological development involving close interactions with ontology engineers, field experts and general users is useful. The appropriate tools should give users guidelines on possible mapping and possibly extending the ontological component based on data sources (schema and data) and ontology structure[29].

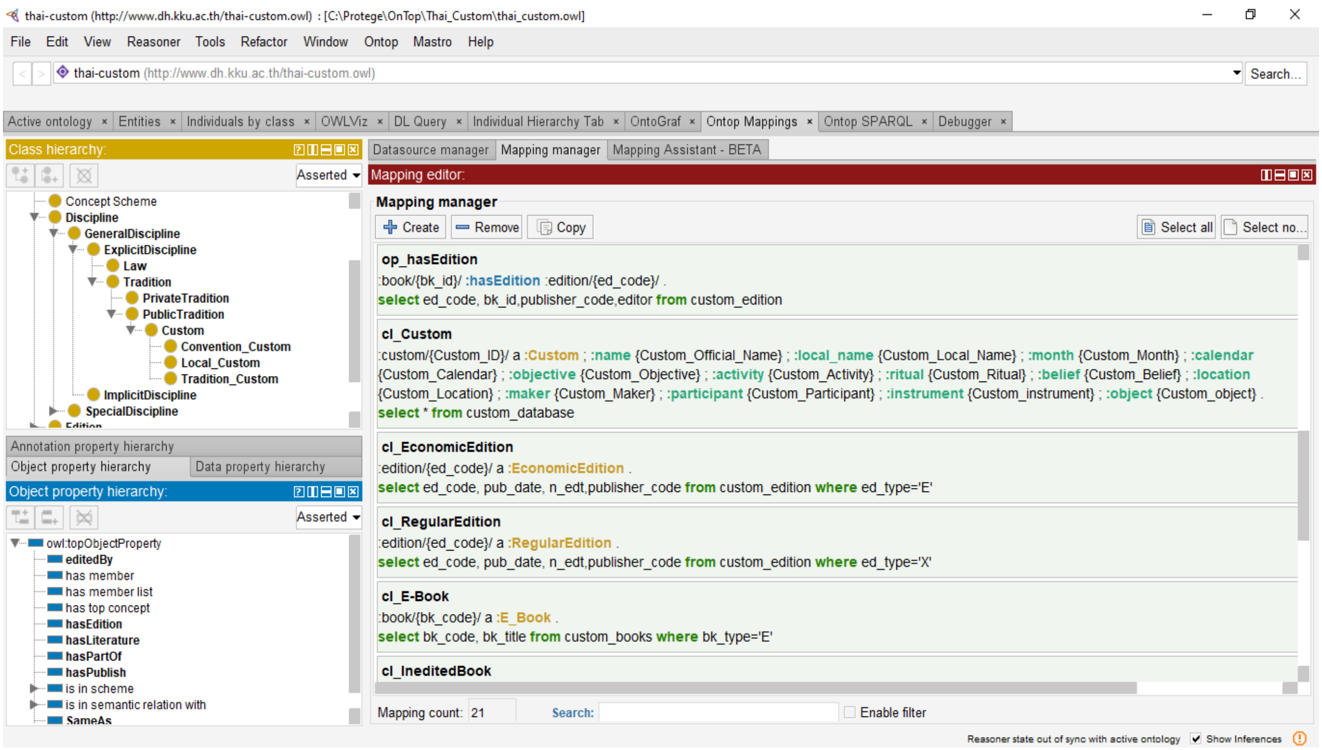

Figure 7.An on top mappings screen short

6.3. Phase3: Testing SPARQL query on developed ontology and in querying desired results

The TCSS framework offers an interface for natural language user queries. This program is user-friendly and SPARQL language should not be learned to access data from an RDF / OWL-based database. It can be easily adapted in natural language and in database queries to a number of questions. The transition from normal to SPARQL is achieved primarily with a special type of regular expressions and then with a simple way of expressing semantical relations. The rest of the process is automatically handled by the system for this SPARQL to finally be made. The TCSS design is planned to achieve the anticipated outcomes in the third step of the proposed semantical search system. SPARQL queries on ontology were carried out using three approaches. SPARQL queries can be first executed using a secure form. The second approach uses the GUI-based SPARQL On top. The third approach involves the SPARQL query editor with command line interface. The second approach is the SPARQL query editor. This is the database engine supporting the language of the SPARQL RDF database (Figure 8).

6.4. Phase 4: Semantic search prototype development

6.4.1. Semantic search for TCSS system

Semantic research is an improved version of contextual research with a view to understanding the contextual relationship of meaning based on ontology. For such research the custom ontology was used as a knowledge base for the semantic search system for Thailand and in particular in the north-east. The system has been implemented as a web-based application for free and easy access. The system considers a number of aspects, among them contextual search content, meaning, book literature, location, photographs, multimedia, word variations, synonymous and general and specific queries, concept corresponding, and natural language queries, in order to produce appropriate knowledge search results. It can understand the nuances of Thai (Thai and English) practice and provide the most relevant results (Figure 9). These are advantages which can only be guaranteed by a semantic approach as they understand the meaning of the content in context.

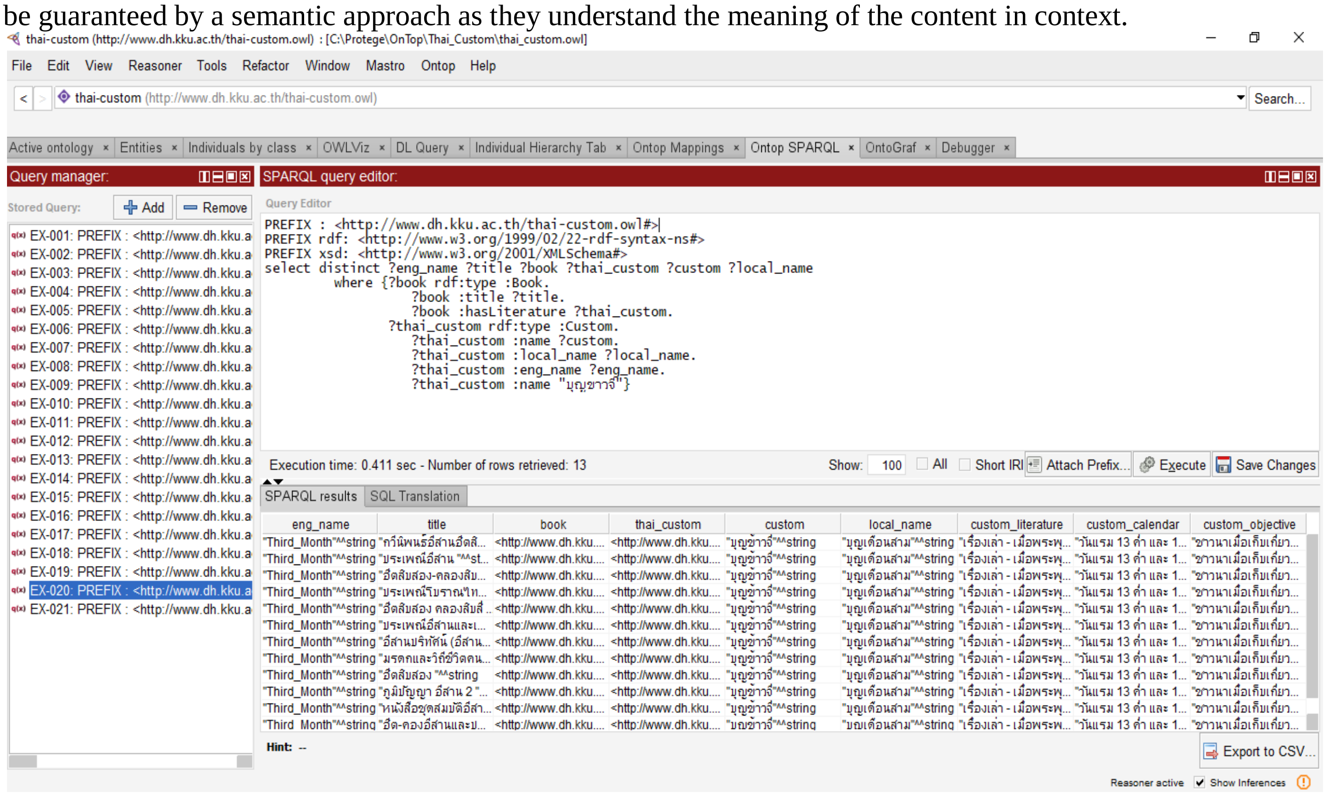

Figure 8. Running SPARQL queries through on top SPARQL

7. Approaches and methods for the evaluation of ontology prototypes

Ontology may be developed from scratch for a particular domain or the current ontology modification [10, 30]. In both cases, methods are required to determine the characteristics and validity of ontology. These techniques can not only be used in ontology engineering, but also be used by end users who are finding an ontology that fits their application domain[31]. Ontology evaluation is also relevant if ontology is automatically populated by a set of non-homogeneous resources that results in duplicate instances or instances that are clustered in the same ontology according to their sources. Both can decrease ontological utility. An important focus was the search for semantical connections between entities in ontology. Such associations document complicated interactions between entities that may include a variety of other entities and cannot easily be tracked in the middle of a broad data set by human users. If users are interested in such a form of search, they will also be interested in understanding the existence or lack of diverse relationships in ontological cases, as this information will influence directly the results of such a search. This increase in the number of ontologies has led to certain experiments in evaluating and verifying ontology using various methodologies and tools [32].For software engineers, beginners and organizations, web information output and efficiency are essential. The quality assessment of ontology is directly related to the success of the applications that use it in application-specific ontology. The SPARQL queries for conceptual ontology established and attractive of desired results have done a qualitative work-based assessment. A metric-based methodology is used to collect various kinds of measurements on the information provided here for the quantitative method of evaluation. This approach considers class places in the ontology diagram, population ontology cases, class distribution etc. The calculation of aspects of ontology and information related wealth and patrimony, rich quality, class wealth, cohesion, class interconnection, etc. is based on different metrics [33].

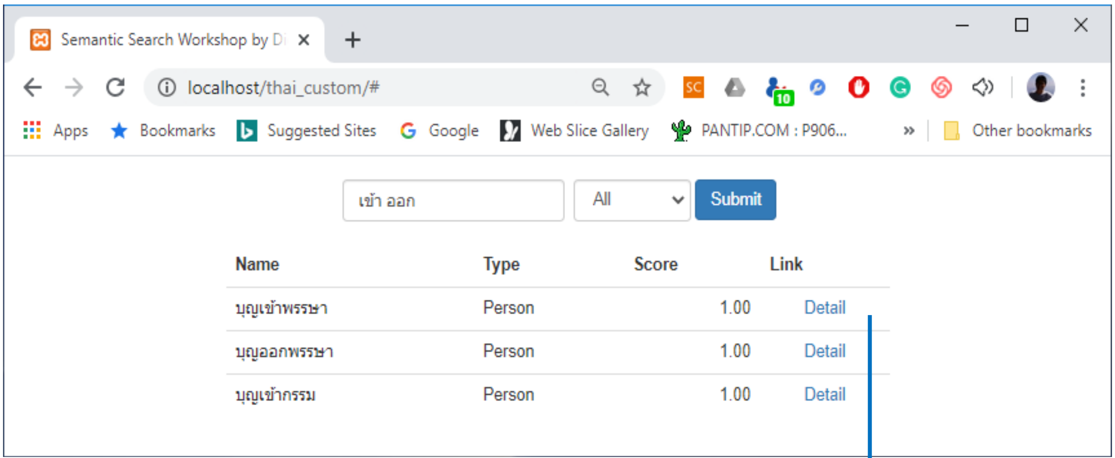

Figure 9. A snapshot of the thai custom semantic search system 1

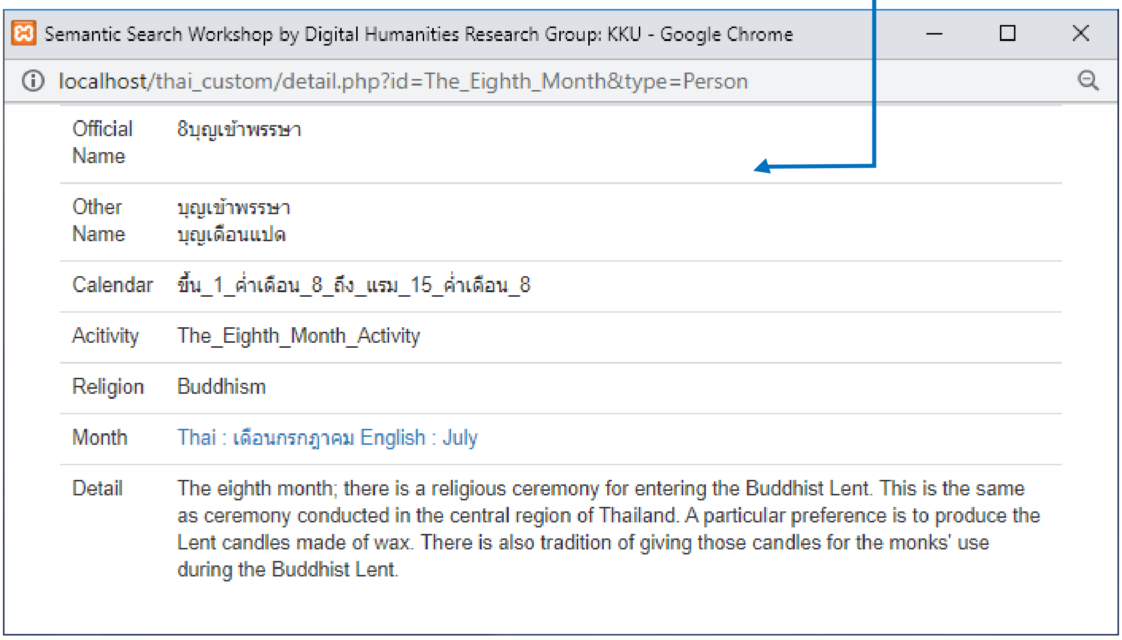

Figure 10. A snapshot of the thai custom semantic search system 2

8. Evaluation of ontology

Ontology Development 101 suggests three ways to assess, test or validate performance of ontology modeling with an expert[34]. We design a structure for both ontology and application evaluation in this section. For both cases the expert evaluation was applied and the tool evaluation was carried out to show its ability. We use two ontology assessment approaches 1) The ontology validation rules that are incorporated in ontology languages and the rules which users offer in order to detect conflicts in ontology, are logical and rules based. For example, in OWL ontology, Ontology is not the same (OWL: sameAs) and two classes are different to each other, Ontology can not be similar as in the two groups. The OWL is a very common type of ontology (OWL: differentFrom). In addition, users can identify properties in conflict with the domain. Users will use the RuleML to define conflicting rules, and they will list all cases in which such rules were violated. The technology is intended for oncologists to evaluate the quality of their work and to detect potential issues[35]. 2) Metric-based methodologies of ontology (feature-based) include a quantitative perspective on ontology efficiency. The techniques are examined by ontology to collect different types of statistics of knowledge provided in ontology or to ask the consumer for some information which is not part of ontology itself. The classes in the ontology schema graph can be interpreted to represent the form of information that has been focused on ontology. In the calculation of consistency metrics, some approaches find examples of population ontology. In the division of instances among the schema lessons, the quality of ontology can also be shown. Several techniques have taken this approach. The authors[36] suggest a hierarchic architecture called Onto Metric, which consists of 160 features distributed over five dimensions in order to determine the consistency and suitability of ontology in accordance with the system requirements of users. The dimensions defined are: content ontology, language, methodology for development, tool design and costs for use. Onto Metric users' principal task is to provide the application with a range of values to measure the suitability of an ontology to system requirements.

8.1. The experts evaluate logic (regulatory)

This assessment focuses on the appointment and application of experts and experts in ontology. A number of criteria were developed separately for the evaluation and the experts.

8.2. Thai Custom ontology evaluation

(1) A generic evaluation framework has been developed based on the requirements outlined in the ontology assessment. Experts have at this point been divided into two assessment groups: Thai customary experts in the north-east of Thailand in particular
(2) Ontology Development Specialists.
We employed (Handcock & Gile, 2011), the technique of snowball which initially found one or more experts and used them to locate additional specialists until they met the requirements. We did not guarantee any bias in the selection process of experts using this tool.
The set of criteria had two aspects. The first of these was to determine, in accordance with the criteria established in Gomez-Perez (Gómez-Pérez & Rojas-Amaya, 1999; Gómez-pérez, Fernández & De Vicente, 1996) the formal characteristics of ontology, e.g. their consistency, consistency and completeness in definitions. The second thing was that the ontology was useful and accessible. The aim of this aspect was to address the question "how it is appropriate for the task for which it was developed," as well as "how well it represents the area of interest."

• Provide a human ontology evaluation questionnaire. The ontology has to be checked and validated using the method of human evaluation. We have drawn up a questionnaire by looking at three aspects:
  1. Basic Information of Assessors
  2. Representation of knowledge and structure of knowledge in a variety of dimensions, including scope, concept, properties, instances and potential for future development and application.
  3. Questions open-ended for recommendation.

• Provide the evaluation of the assessors by assigning each group responsibility.
  1. Ontology specialists — prove that software agents and ontological elements have a comprehensive ontology structure.
  2. Thai custom field experts — verifying and validating correctness, consistency, characteristics and hierarchical relationships in ontology concepts.In the evaluation, on the basis of the semiotic theory

[37] the quality was assessed using several criteria for the evaluation of ontological quality, both syntactical, semantic, and pragmatic. The ontology was evaluated by three Thai custom domain experts and three ontology specialists with criteria and setting (Figure 11).

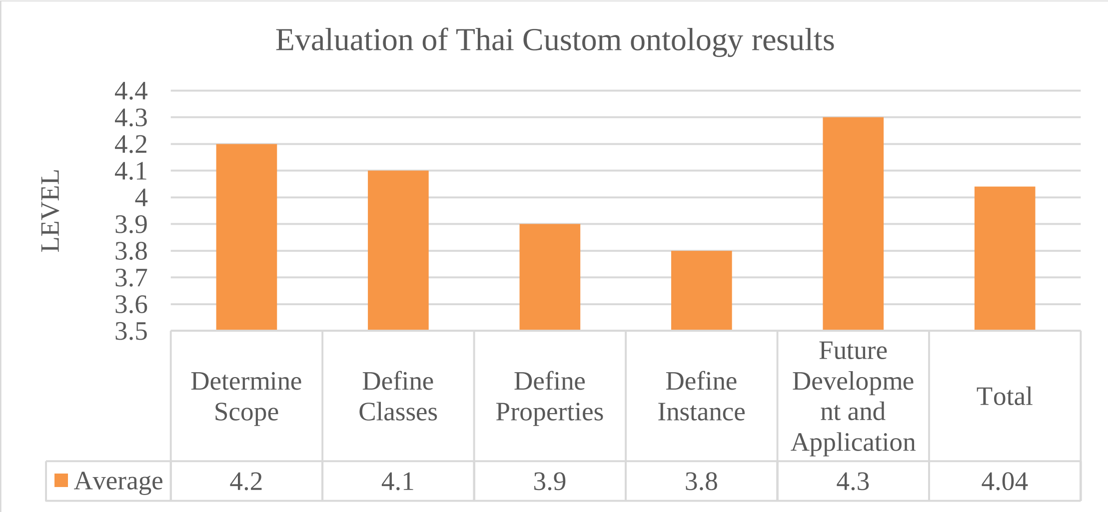

Figure 11. Evaluation of thai custom ontology results

9. Metric-based (feature-based), evaluate toan application

We have established a prototype of a semantical search system to demonstrate practical utility in developed ontology. The assessments were as follows:

- Performance — this is the kind of ontology used specifically. Access to knowledge such as accuracy, reminder, and F-Measure is usually used for discovery[38] (Belew, 2000). More generic performance measures include time and performance.
- Scalability — The Semantic Search System's scalability is related to the capability to perform operation with growing numbers of semantic explanations. This may, however, also affect the scalability of repositories. This can be calculated with efficiency.
- Correctness — It involves the ability to correctly respond to different inputs, contents, or app-issue adjustments by modifying an instance of a search system. This criterion involves mediation and the search system request. Another reference collection must be reviewed for information arising from a request for or an interaction between services.
- Usability — it can help to know which search frames have a graphical interface or an easy-to-use environment. We consider it would be easier to compare using feedback forms due to the absence of frontends for the development of the semantical search system.

In order to assess the semantic search application, the experts have been divided into three groups according to their specific duty:

1. Semantic web experts, checks the description of questions and accepts answers based on a given ontology.
2. Domain experts — define an inquiry based on their knowledge and score the results of the inquiry.
3. Specialist for information retrieval — calculations of the efficacy of the semantic search system.

Satisfaction values were provided by experts based on semantic search success and results based on parameters and tasks (Figure 12). This evaluation was carried out by the sixth expert.

10. Evaluation of system performance

The standard assessment approach to the system for the collection of knowledge is grounded off the notion of applicable and irrelevant papers. Now terms of the need for information about the user context, the binary classification of the document in the test set is important or irrelevant. This decision shall refer to the gold standard or ground truth assessment of relevance. The data collection and information kit must be of appropriate size; the findings differ considerably between the different records and the need to acquire context information. Overall, a minimum of 80% has been defined as required for contextual awareness. The exact application using the established ontology is demonstrated below (Figure 13).

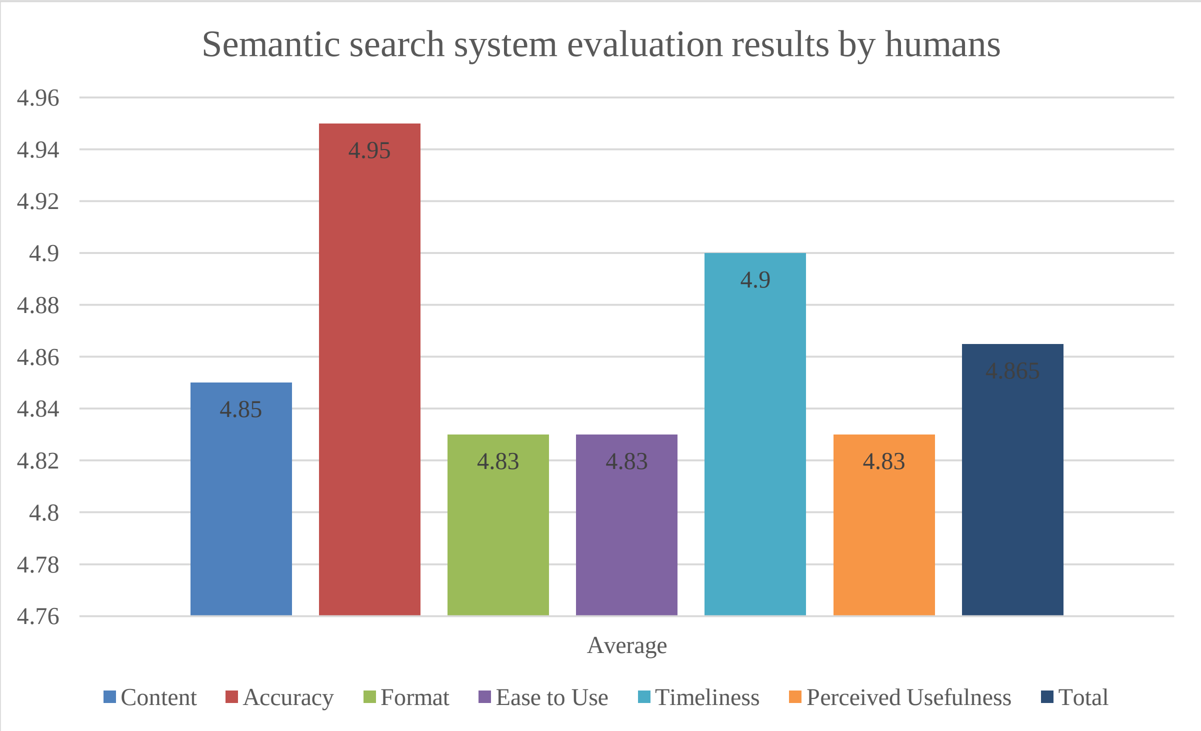

Figure 12. Thai custom semantic search system evaluation results by humans

The results showed that the application for semantic search is effective for precision, retrieval and F measurement values.

Recall = 0.9242, Precision = 0.8133, F-Measure = 0.8652

	Relevant			
Retrieval: Semantic Searching	Relevant meaning	Non-relevant meaning	Overall meaning	
Able	122	0	132	
Unable	0	18		

Figure13.Knowledge retrieval efficiency results

11. Discussion

A newly-developed paradigm that brings together a possibility of using reasoning in relation to fields encoded in ontology with an integrated high-level ontology mechanism [39]. The OBDA is based on ontological data access and integration (OBDA). OBDI uses a declarative mapping specification to connect domain ontology to data sources, which relates to ontological symbols (classes and properties), with views of data expressed through SQL queries [8]. An ontology RDF graph and the mapping of the data together in the resources is still not materialized. Questions that can be formulated via ontology classes and properties will be interpreted using this virtual RDF graph and translated into SQL queries via the mapping data sources. Users simply query ontology in this configuration without understanding their data sources, connections or encoding. We rely on SPARQL as the default language for the Semantic web query. The OWL QL, the OWL profile, (i.e. in the sublanguage terminology of W3C), is specifically designed for the efficient querying of large quantities of data, rather than ontology in OBDA or OBDI settings. We work with the standard mapping language R2RML and with OBDA and OBDI support systems to query the underlying data sources. SPARQL standard endpoint functionality is provided. In specific, here mark the succeeding assistances and thus overcome weaknesses of current approaches to digital humanities integration. We define an existing ontology and standard of representation for customized Thai data, particularly in the north-east part of Thailand, in terms of conceptual reference model [40]. We build a basic OWL 2QL ontology for students who are easy to understand by using custom domain vocabulary (linked to existing abstract ontologies). The ontology was semi-automatically derived from the conceptual model. In two known datasets, the Central Library and the Local Dataset, we describe a set of mappings that link different ontological concepts and data stored. In order to combine these two data sets (and extend to more) in operation, we build a web-based framework, without carrying out expensive ETL processes. In particular, reasoning may be used in the proposed framework to facilitate access to information for academics. A SPARQL endpoint is provided in order for other systems to request integrated data. The definition of ontology is used in the semantic search system to search for answers using the conceptual nature of the input query instead of a keyword match. Research literature tends to require tools to extract domain-specific knowledge from Ontology for complex queries in a natural language using a simple interface. This research paper proposes a solution for the Thai Custom Semantic Search System (TCSS). This prototype offers advanced searches and searching with search results that are automatically applied and returned to a coherent user interface to minimize user handling. The primary objective of this research is therefore to develop a semantic search system to integrate ontology into the domain-specific recovery support for digital content management in Thai custom expertise. The following methodology involves a fragmentary study involving a four-phase division. The first stage is Ontology Construction. The second stage is ontology and database mapping. The third stage is the ontology and results retrieval SPARQL application. The fourth stage is the development of the semantic search prototype. This research paper thus sheds light on the development of a structure for digital content management in a search system for semantic domain knowledge, on the analysis in the seminal language of natural languages queries, and the establishment and mapping of domain ontology with related ontology.

12. Conclusion

In order to collect knowledge of every domain of interest with a view to incorporating machine-readable information into the current human-readable Web, ontology is used for digital content management. In the Thai customary area, the development of ontology is the most basic phase and was illustrated by a prototype. The TCSS (Thai Custom Semantic Search System) proposed to solve the keyword search constraints. Instead of listing all documents with the related information, the method suggested extracts the relevant information. Work can be expanded to develop and deploy broad and complex web ontology and to resolve several other critical ontology issues online. Ontology offers a context in which information is interpreted and communicated within a region. The objective of the evaluation and the application context is a major factor in the decision on an ontological assessment approach. This work can be enhanced by incorporating data in real-time that extracts the user's query data at runtime. Here, the researchers have presented an effort to characterize facts within the context of the project Thai Custom Semantic Search System, which resulted in an ontology designed to integrate two data sources used for digital humanities research. Integration was accomplished with the OBDI paradigm and the OBDA (On top plugin) system was supported. This assisted us to deal efficiently and accurately with data access, integration, and consistency issues. We have specialized existing standards in the Thai custom domain for developing a TCSS system and related ontology. In this regard, we also relied on the thesaurus model, not only because it is already focused on sound modeling principles, but because it also paves the way for potential incorporation into the database of the Digital Humanities Study Community. We intend to further expand our effort to include additional data sets in order to better incorporate the data. We also aim to improve the user interface of our system by introducing data display techniques, allowing users to explore and understand data more easily than traditional. Finally, in our linked data on this interface, the URIs should be displayed.

Authors' note

The data used in this article may be obtained for scholarly and replication purposes by writing to the lead author at wirach@kku.ac.th.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research project was financial supported by the young researcher development project of Khon Kaen University

Refrences

[1] V. J. R. Grabowsky and -. National Integration in Thailand, "The Isan up to its integration into the Siamese state," pp. 107-129, 1995.
[2] W. MALIK, "Visual Semantic Web. Ontology based E-learning management system," ed, 2008.
[3] G. Chen and P. Zhang, "Keywords Retrieval Based on Ontology Inference," in *2012 International Conference on Industrial Control and Electronics Engineering*, 2012, pp. 1750-1753: IEEE.
[4] G. Xiao *et al.*, "Ontology-based data access: A survey," IJCAI Organization, 2018.
[5] B. Motik, B. C. Grau, I. Horrocks, Z. Wu, A. Fokoue, and C. J. W. C. r. Lutz, "OWL 2 web ontology language profiles," vol. 27, p. 61, 2009.
[6] D. Calvanese, G. De Giacomo, D. Lembo, M. Lenzerini, and R. J. J. o. A. r. Rosati, "Tractable reasoning and efficient query answering in description logics: The DL-Lite family," vol. 39, no. 3, pp. 385-429, 2007.
[7] D. Calvanese, G. De Giacomo, D. Lembo, M. Lenzerini, and R. J. A. I. Rosati, "Data complexity of query answering in description logics," vol. 195, pp. 335-360, 2013.
[8] A. Poggi, D. Lembo, D. Calvanese, G. De Giacomo, M. Lenzerini, and R. Rosati, "Linking data to ontologies," in *Journal on data semantics X*: Springer, 2008, pp. 133-173.
[9] A. Gómez-Pérez, M. Fernández, and A. De Vicente, "Towards a method to conceptualize domain ontologies," in *ECAI96 Workshop on Ontological Engineering, Budapest*, 1996, pp. 41-51.
[10] A. Gómez-Pérez and M. D. Rojas-Amaya, "Ontological reengineering for reuse," in *International Conference on Knowledge Engineering and Knowledge Management*, 1999, pp. 139-156: Springer.
[11] P. Sonakneware and S. Karale, "Ontology based approach for domain specific semantic information retrieval system," in *International Conference on Industrial Automation and Computing (April 2014)*, 2014.
[12] O. H. Yahya, H. Alrikabi, I. A. J. I. J. o. O. Aljazaery, and B. Engineering, "Reducing the Data Rate in Internet of Things Applications by Using Wireless Sensor Network," vol. 16, no. 03, pp. 107-116, 2020.
[13] R. Bansal, S. J. I. J. o. E. Chawla, and A. Technology, "An approach for semantic information retrieval from ontology in computer science domain," vol. 4, no. 2, 2014.
[14] M. A. a. Roa'a, I. A. Aljazaery, S. K. Al_Dulaimi, H. T. S. J. B. o. E. E. Alrikabi, and Informatics, "Generation of High Dynamic Range for Enhancing the Panorama Environment," vol. 10, no. 1, 2020.
[15] R. Bansal and R. J. I. J. I. T. E. E. Chawla, "Semantic web tool: for efficient retrieval of links and required information," vol. 3, no. 4, 2013.
[16] I. A. Aljazaery, H. T. S. Alrikabi, and M. R. J. i. Aziz, "Combination of Hiding and Encryption for Data Security," vol. 14, no. 9, p. 35, 2020.
[17] W. Chansanam, K. Tuamsuk, K. Kwiecien, T. Ruangrajitpakorn, and T. Supnithi, "Development of the Belief Culture Ontology and Its Application: Case Study of the GreaterMekong Subregion," in *Joint International Semantic Technology Conference*, 2014, pp. 297-310: Springer.

[18] W. Chansanam and K. Tuamsuk, "Development of an imaginary beings knowledge structure," in *ICADL*, 2015, pp. 291-293: Springer.
[19] W. Chansanam and K. Tuamsuk, "Development of imaginary beings ontology," in *International Conference on Asian Digital Libraries*, 2016, pp. 231-242: Springer.
[20] D. Calvanese *et al.*, "Ontop: Answering SPARQL queries over relational databases," vol. 8, no. 3, pp. 471-487, 2017.
[21] G. Xiao, R. Kontchakov, B. Cogrel, D. Calvanese, and E. Botoeva, "Efficient Handling of SPARQL optional for OBDA," in *International Semantic Web Conference*, 2018, pp. 354-373: Springer.
[22] E. Botoeva, D. Calvanese, V. Santarelli, A. Solimando, and G. Xiao, "Beyond OWL 2 QL in OBDA: Rewritings and approximations," 2016: AAAI.
[23] H. R. Bdulshaheed, Z. T. Yaseen, and I. I. Al-barazanchi, “New approach for Big Data Analysis using Clustering Algorithms in Information,” *Jour Adv Res. Dyn. Control Syst.*, vol. 2, no. 4, pp. 1194–1197, 2019.
[24] H. T. S. Al-Rikabi, *Enhancement of the MIMO-OFDM Technologies*. California State University, Fullerton, 2013.
[25] I. Al Barazanchi and H. R. Abdulshaheed, “Designing a library management system for Gazi Husrev-beg library using data structure and algorithm,” *Herit. Sustain. Dev.*, vol. 1, no. 2, pp. 64–71, 2020.
[26] E. Botoeva, D. Calvanese, B. Cogrel, J. Corman, and G. Xiao, "A generalized framework for ontology-based data access," in *International Conference of the Italian Association for Artificial Intelligence*, 2018, pp. 166-180: Springer.
[27] N. Guarino and C. A. Welty, "An overview of OntoClean," in *Handbook on ontologies*: Springer, 2004, pp. 151-171.
[28] J. F. Sequeda and D. P. J. I. I. C. Miranker, "A pay-as-you-go methodology for ontology-based data access," vol. 21, no. 2, pp. 92-96, 2017.
[29] G. Xiao, L. Ding, B. Cogrel, and D. J. D. I. Calvanese, "Virtual knowledge graphs: An overview of systems and use cases," vol. 1, no. 3, pp. 201-223, 2019.
[30] M. Cristani, R. J. I. J. o. S. W. Cuel, and I. Systems, "A survey on ontology creation methodologies," vol. 1, no. 2, pp. 49-69, 2005.
[31] E. P. B. Simperl, C. Tempich, and Y. Sure, "Ontocom: A cost estimation model for ontology engineering," in *International Semantic Web Conference*, 2006, pp. 625-639: Springer.
[32] J. Hartmann *et al.*, "D1. 2.3 Methods for ontology evaluation," vol. 1, 2005.
[33] S. Tartir, I. B. Arpinar, and A. P. Sheth, "Ontological evaluation and validation," in *Theory and applications of ontology: Computer applications*: Springer, 2010, pp. 115-130.
[34] N. F. Noy and D. L. McGuinness, "Ontology development 101: A guide to creating your first ontology," ed: Stanford knowledge systems laboratory technical report KSL-01-05 and …, 2001.
[35] H. Boley, S. Tabet, and G. Wagner, "Design rationale of RuleML: A markup language for semantic web rules," in *Proceedings of the First International Conference on Semantic Web Working*, 2001, pp. 381-401: CEUR-WS. org.
[36] A. Lozano-Tello and A. J. J. o. D. M. Gómez-Pérez, "Ontometric: A method to choose the appropriate ontology," vol. 15, no. 2, pp. 1-18, 2004.
[37] R. Stamper, K. Liu, M. Hafkamp, Y. J. B. Ades, and i. technology, "Understanding the roles of signs and norms in organizations-a semiotic approach to information systems design," vol. 19, no. 1, pp. 15-27, 2000.
[38] R. K. Belew, R. K. Belew, and C. van Rijsbergen, *Finding out about: a cognitive perspective on search engine technology and the WWW*. Cambridge University Press, 2000.
[39] D. Calvanese *et al.*, "Ontologies and databases: The DL-Lite approach," in *Reasoning Web International Summer School*, 2009, pp. 255-356: Springer.