

Quran Ontology: Review on Recent Research Issues

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Abstract: *In recent years, there are growing interests of Islamic Knowledge by both Muslims and non Muslims especially in Holy Quran. The researchers of religious Studies started to use the ontology to improve the knowledge construction and extraction from religious texts such as the Qur'an and Hadith. Ontology provide a shared understanding of a domain of interest, they become the key technology of modern knowledge based system, natural language processing, information retrieval and the semantic web (Johanna Volke, 2000). Most of recent researches have been done in Arabic language ontology, and most of them were focused on holy Quran ontology, although many of recent researches were done at that area but they are still incomplete, also there are some other issues including process used to extract and construct ontology, the methods used to build ontology are not unified (López, 1999), so it needs extra work. The review of existing studies will allow future researchers to reviewed different Ontology-based systems and different approaches to developing or "engineering" ontologies for specific domains. This paper tries to review recent research on Holy Quran ontology. We try to investigate the current trends and technology being applied. This investigation covers some important criteria, such as objective of study, outcomes of this studies, language of the text used (original Arabic text or other translation, technologies that used on ontology development, coverage which chapters of the Quran, coverage which topics, overlaps or links to other ontologies, Datasets, ontology testing techniques, and limitations on previous research.*

Keywords: Qur'an, Hadith, Ontology, Natural Language Prossing, Semantic Web.

1. Introduction

The Qur'an is the holy book of Muslims was revealed by Allah Azza wa jallah to prophet Muhammad through the Angel Gabriel (Jibril). The Qur'an is made up of 77,430 words. It is divided into 114 chapters which consist of 6,243 verses (Manal AlMaayah, et al, 2014). Many researches have been done in this area to expand the knowledge of Qur'anic and to increases understanding of the Qur'an and of Islam.

Quran is important for Muslims because it's the source of moral, instructions, guidance, commandment, Calls for worship of God, guidance behavior to Muslim, law and a reference to what is can be do and what cannot do, it is a reference for judging between us, and also provide commands for worshipping God including prayers, fasting, pilgrimage, etc.

To corrects previous faiths and previous holy book texts from alterations introduced by human, Muslims and non-Muslims looking for an authentic source and scholarly knowledge on the Quran and its message (Shahzado Shaikh, 2005). There for researchers who build ontology used authentic books or resources and authentic corpus.

Quran ontology was introduced for the first time in 2009 by Dukes (Dukes, 2009), he represent the holy Quran by using class hierarchy for main concept and relation between them, also build a grammatical dependency tree

that can help researchers in the Quran ontology in the future.

Guber (Guber, 1993) defined ontology as "A formal explicit specification of a shared conceptualization." The notion of ontology can also be used to describe a logical domain theory with very expressive, complex, and meaningful information.

In the early 1990s, the widely cited paper "Toward Principles for the Design of Ontologies Used for Knowledge Sharing" by (Tom Gruber, 1995) is credited with a deliberate definition of ontology as a technical term in computer science. Gruber introduced the term to mean a specification of a conceptualization.

In computer and information science, ontology formally represents knowledge in structured organization (hierarchy of concepts) within a domain, using a shared vocabulary to denote the types, properties and interrelationships of those concepts (Gruber, 2001).

Ontology considered an iterative process in nature and never complete. There are many steps and issues that are considered in sequence to create ontology (Noy, McGuinness, 2001).

Researches were done in different filed of Quran based ontology such as tafseer, hadith, ziker and doa. Also they did a lot of works in name entity recognition domain such as name of times, historical places and animals in Quran.

The review is classified to analysis studies, researches build on special ontology part or Quran chapter(s), hadith, tafseer, doa, some verses that belong to a particular topic like biological science, time names in Quran,...etc, some researches links between Quran and web resources such as multimedia resources. Some of studies build on Arabic and quranic ontology. Classification studies which classify Al-Quran knowledge by using ontology into specific classes.

The rest of this paper is organized as follows, it classified into four sections according to relation among papers. The first section ontology that Concentrated of specific domain of Quran. The second one is to build and creating Arabic and Quranic ontology, develop a Quranic Arabic WordNet and build Quranic corpus and dataset. The third section contains researches done in Arabic language or in holy Quran question/answer field, all systems were building to works as specialized search engines. The fourth section contains classification, analyses, merging and retrieval studies.

2. Ontology on Holy Quran

Ontology considered an iterative process in nature and never complete. There are many steps and issues that are considered in sequence to create ontology (Noy, McGuinness, 2001).

This section reviews some Quran ontology papers, which classified according to relation between topics.

2.1 Concentrated of Specific domain of Quran ontology:

This part reviews Quran Ontology's that Concentrated of Special chapter(juz) or verses that including same topics such as ziker, doaa, time noun, Biological sciences, living creatures,etc.

2.1.1 Ontology Development for Zikr and Doa Al-Ma'thur at Wisdom Level:

A very good approach that designed by (Roslina Othman, et al, 2013), is to constructed and collected Zikr and Doa al-Ma'thur from al-Quran and hadith in the authentic books, research done in Malay language. The research involved three steps, firstly an ontology of Zikr and Doa al-Ma'thur has been build, secondly the problems queries were formulated and running, and solutions list were issued from building ontologies. The approach is considered as distinguish because its first study in that domain and build a semi automatic ontology for ziker and doa using Protégé. The study covered all chapters (Juz) of Quran and give a higher precision at the knowledge level.

2.1.2 An Ontological Model for Representing Semantic Lexicons: An Application on Time Nouns in the Holy Quran:

One of the first Arabic based ontological model was introduced by (Maha Al-Yahya et al,2010) For Representing Semantic Lexicons aimed to design and implement data driven ontological model for time nouns concepts of the Holy Quran by using Web Ontology Language (OWL) technology. The study was applied on

Nouns from the "Time" semantic field, the model has been implemented on the "Time vocabulary" in the Holy Quran, and covered all chapters of Quran. The evaluation of the result indicates that the model is capable to representing word semantically and allows semantic analysis of Arabic words.

2.1.3 Mapping of Biological sciences with Quran and Alhadith: An Ontology Approach:

An approach for building quranic ontology of Biological sciences with Quran and Alhadith was introduced by (Mohammed Ali, et al, 2013), to described Quran and Hadiths biological concepts including life, health, genetics, death, and medicine. This research aimed to link between biological science, Quran science and Hadith narrations to enhance interpretation of Quran and Hadith. This was made by collecting biological events of life that discussed in Quran and Hadith and then mapped them into latest biological concepts and developed ontology for these biological events to create the linkage between them. The study builds partial ontology using Protégé, OWL tool technologies.

Example for ontology implemented in this research, the concept of resurrection after death it seemed difficult to understand by the human mind, He says (who will give life to bones while they are disintegrated.

(وَضَرَبَ لَنَا مَثَلًا وَنَسِيَ خَلْقَهُ قَالَ مَنْ يُحْيِي الْعِظَامَ وَهِيَ رَمِيمٌ) يس (78)

There are many other verses of Quran and narrations of Hadith related to death that need to be put together to increasing the knowledge. The following verses are taken from Quran " Every soul will taste death" (3:185),(21:35) (كل نفس ذائقة الموت وانما توفون اجوركم) ال عمران 185 (كل نفس ذائقة الموت ثم اليها ترجعون) العنكبوت 57

2.1.4 Traditional vs. Chronological Order: Stylistic Distance Analysis in Juz' Amma:

Another study by (Ahmad Alqurneh, Aida Mustapha. 2014) aimed to analyze and investigate whether texts that are close in time effect to style relation. The researchers using analysis technique, distance method between surahs to measure stylistic distances to surahs share same topic to show similarity and dissimilarity between the texts. The analysis has been done to different types of order. The study was done in chapter (30) which called "Juz' Amma".

This research is based on Sadeghi (2011), who used a set of style markers in the Qur'an called the morphemes in a chronological problem. The experiments study find that surahs might be close in style regardless the type of ordering.

2.2 An Quranic ontology building:

This section reviews papers that creating and building Arabic Quranic ontology, Quranic Arabic WordNet, Qur'an Corpus and a dataset from Tafseer book.

2.2.1 A Proposed Model for Quranic Arabic WordNet:

A Proposed Model by (Manal AlMaayah, et al, 2014) aimed to develop a Quranic Arabic WordNet, a semantic connections between Quranic words has been done to

increased understanding of words meanings. The researchers were used traditional Arabic dictionaries, Qur'an ontology and annotated Qur'an Corpus by (Claire Brierley, et al, 2012). Also word by word English translations has been done. Finally words and their corresponding meanings (Arabic, English) will be connected together through

Semantic relations. The below examples show different verse that used words of same meaning (synonymous).

Fear = رهب، روع، خشية، خوف

Rain= غيث، مطر

2.2.2 Building Standard Dataset for Quran Tafseer:

The research by (Mohammed Bakri, et al, 2013) collected a dataset from Quran Tafseer book to provide test resources and evaluation method for Quran tafseer researcher. Each verses of the Quran were associated with its explanations and a list of corresponding Hadiths and other related verses. These relations provided deep analysis for Semantic researches. The research did not contain any ontological features but can be used in ontology-based systems.

2.2.3 Islamic Knowledge Ontology Creation:

The paper by (Saidah Saad, et al, 2009) introduced an approach which composed grammatical rules and techniques of extracting concepts to build taxonomy and classification of Islamic Knowledge, it was depended on general subjects founded in Quran according to (Al-Kabi et al, 2005) classification. The research was generated an ontology automatically from holy Quran, and implemented a part of Quran, and recommended to extract the whole Al-Quran.

2.2.4 A Holy Quran Ontology Construction with Semi-Automatic Population:

This study by (Eman Elkhammash, et al, 2019) suggests an approach for the creation of ontology and its population. The studied ontology is related to named entities in the holy Quran. The major contribution of this approach is to harness the benefits of learning methods, conjoined with statistical models to extract contexts (words surrounding a named entity) from Quran and Hadith and retain the weighty contexts for the recognition of supplementary Named entities to populate the ontology.

investigate methods to (semi)-automatically find only instances of classes, but can't find new classes of the ontology, this work cover only sahih Abokhari not (al-Tirmidhi, Ibn Maja...) and Fiqh (Temporal interpretation of Sharia rules (Islamic law). The study used Protégé to build an Arabic ontology.

2.2.5 Ontology driven Information Extraction from the Holy Qur'an related Documents

This study by (Qurat ul Ain, et. Al, 2011) supports well defined mechanisms for knowledge modeling and retrieval for the documents related to the Holy Qur'an domain. It links varying text available in different documents on a single platform for more efficient and effective integration and retrieval of such literature.

The research has knowledge base covered special Quran domain not all quranic content available on the web. so in the future it could have a knowledge base that not only covers this domain but also covers other related content available on the web.

2.2.6 Quranic Verse Extraction base on Concepts using OWL-DL Ontology

In this study by (Yauri, et al, 2013) propose an Ontology assisted semantic search system in the Qur'an domain. The system makes use of Quran ontology and various relationships and restrictions represented by Protégé. This will enable the user to semantically search for verses related to their query in Al-Quran. The system has improved the search capability of the Holy Quran knowledge to 95 percent accuracy level by using Precision, Recall.

2.3 Search and Question answering ontology-based systems in holy Quran:

The following researches done in Arabic language in holy Quran question/answer field, all systems were building to works as specialized search engines.

2.3.1 Semantic query for Quranic ontology:

The main objective of this study by (Faiza Beirade, et al, 2021) is to design the semantic search engine for the Arabic text of the Quran using Quranic ontology. The system classifying the words according to hierarchical structure, then build Quranic ontology with a semantic relation between the terms of the holy Quran.

The user formulate his question by using his own term, the question is passed to the search engine. And the result of query is treated by treating-function. The system has been test and gives better results because it uses semantic treatments with ontology. Protégé 2000 open source is used.

2.3.2 New instances classification framework on Quran ontology applied to question answering system:

This study introduces an instances classification framework on Quran ontology applied to the semantic question answering system (QAS). The instances classification framework consists of two stages, i.e. construction of training data and classification stage. This study focuses on Tafsir of Indonesian Quran translation. There are several essential components to classify the instances, i.e. pre-processing, morphology analysis, semantic analysis, and features extraction, instances classification with the statistical or machine learning approach: Radial Basis Function Networks (RBFN), and transformation stage. RBFN algorithm is chosen since it robustness to noisy data and has an excellent achievement to handle small dataset.

2.4 Classification, analyses, Merging and retrieval studies:

This section concerned of Verse extraction by used text mining and analysis techniques to find relationship between verses, also used merging techniques to merge

two or more ontology. Semantic search system can be used to retrieve exact information according to user query.

2.4.1 Al-Quran Themes Classification Using Ontology:

Quranic Verse Extraction by (Yauri Aliyu, et al, 2013) derived from or used existing Ontology from the University of Leeds, and they add more concept to UK Quranic ontology such as, Allah, Allah throne, holly book,...etc. Not like current keywords matching approach retrieval methods which retrieved irrelevant information, the proposed method used semantic search system. The advantage of proposed system it has built extra relationships, and it has added more restrictions which help the proposed system to facing more possible user queries.

2.4.2 Keyword and Chapter Relationship Analysis in the Tafseer of Al-Quran:

The aim of study by (Puteri et al, 2013) is to discover pattern and relationships between verses and chapters at the keyword level. The study used text mining technique and network analysis method and it was done in Malay language (translated Tafseer). Research follow the following steps, at the first documents were "cleaned" from stop words, and keywords are identified by using the "weighting statistics" called Term Frequency and Inverse Document Frequency (TF-IDF), then a matrix of extracted keywords was build and converted into network analysis map which illustrated the links (relations) between keywords and chapters. This study did not use clear ontology concept.

2.4.3 Ontology Extraction Approach for Prophetic Narration (Hadith) using Association Rules:

A recent and very useful approach by (Harrag Fouzi, et al., 2013) which used data mining techniques to extracted ontology of Quran and prophetic narrations (Hadith) and used association rules algorithms to identify Islamic jurisprudence (Fiqh) concept and semantic relation between them from Sahîh Al-Bukhârî book. The limitation of this approach is the used of other predefined concepts as it defines in a given document, and places them as individuals into their already built ontology system.

2.4.4 Using Ontology for Associating Web Multimedia Resources with the Holy Quran:

One of the most distinguished works done for the Holy Quran by (Yasser Abdelhamid, 2013), the research used ontology to link the verses of the Holy Quran with the multimedia resources found on the web through ontological tools, in order to Provide the capability of dynamically searching for verses related to specific user query from web resources of the Holy Quran. The paper used an online annotated linguistic resource Eric Atwell et al and Mushaf Al Tajweed MAT (Habash, Mohamed, 2001), the work was faced many problems, and the researcher's recommended that as future plan.

2.4.5 Text categorization in Quran and Hadith: Overcoming the interrelation challenges using machine learning and term weighting:

Paper by (Nur Aqilah, et al., 2021) Quran and Al-Hadith are interrelated in the sense that both often complement each other in interpreting Islamic teachings. This research

had successfully highlighted, observed, and discovered the interrelation element by combining both the Quran and Hadith during testing and training phases by adopting the SVM(Support Vector Machine) as the classifier for the developed model. Supervised machine learning was conducted to classify the dataset corpus of Quran and Hadith into their specified categories. By using three types of classifiers SVM (Support vector Machine model), KNN(K-Nearest Neighbours model) , and NB(Naïve Bayes) were compared using the selected dataset and the best was adopted as the classifier. The SVM(Support vector Machine) used alone , not used to with other classifiers and term weighting, as discussed earlier towards enhancing the classifier and present performance with log (TF-IDF).

2.4.6 Toward a Joint Ontology of Quran and Hadith

In this paper by (Shatha Altammami, et al. , 2020), we investigate the appropriateness of using Quran ontology as the bases for an Islamic ontology that covers the Hadith in addition to the Quran, the study done in Arabic and used python. Hence, the existing Quran ontologies were enumerated, discussed, and then evaluated using a corpus-based evaluation approach. This evaluation was conducted by comparing the keywords extracted from the Bukhari Hadith book section-headings, and the Quran ontology concepts. The findings of this study can be understood through the presented visualization of overlaps in the Hadith keywords and the Quran ontology concepts.

2.4.7 Ontology Mapping and Merging Aspects in Semantic Web:

This comparative study by (Narula GS, et al., 2018)of ontology mapping and merging systems. This manuscript is an attempt to analyze and appreciate the tools available for ontology mapping and merging. The varied available tools automate integration, unification, aligning and merging of varied related ontologies. We also attempt to draw an efficient analysis among some popular tools while applying the PROMPT tool. Two ontologies used for testing according to four mapping criteria (define concept, graph, instance structure and user input) and this provides poor result in comparison.

2.4.8 Computational ontologies for semantic tagging of the Quran: A survey of past approaches:

A paper by (Sameer, Eric, 2014) reports on a survey of recent Qur'an ontology research projects, comparing them in 9 criteria. We conclude that most of the ontologies built for the Qur'an are incomplete and/or focused in a limited specific domain. There is no clear consensus on the semantic annotation format, technology to be used, or how to verify or validate the results.

3. Reviewed Criteria

There are some important criteria used to compare between researches in this review paper such as Coverage parts, representation format, Quran text language, Datasets Used for Ontology Development, and dataset name, dataset type, evaluation method, approach used, Verification method used. The table in **appendix (A)** show the comparison between these criteria.

The research answers some important question about criteria. What the objective of the research? What outcomes of this study? What kind of languages is the most used for ontology on Quran? What the most chapters and topics covered in Quran? What kind of datasets is the most used for ontology on Quran? What most tools that used for ontology building, how do the existing ontologies integrate the knowledge of Quran and other resources like Hadith and Tafsir.

How to evaluate the existing Quran ontologies? What is the limitation of reviewed studies?

3.1 Coverage parts and chapters

One of or reviewed researches cover one part of Quran Juz' amma(part 30), ten researches covered all parts of Quran, Five researches covered all parts of Quran but in specific domain or topic such as living creature, nouns of places and time, biological verse, Hajj, Prayers, Zakat, and some of them concentrated in Duaa verse in Quran, two of them reviewed specific chapter(Surah) related to stories of the prophet. Figure (1) shows the variation of the covered chapters.

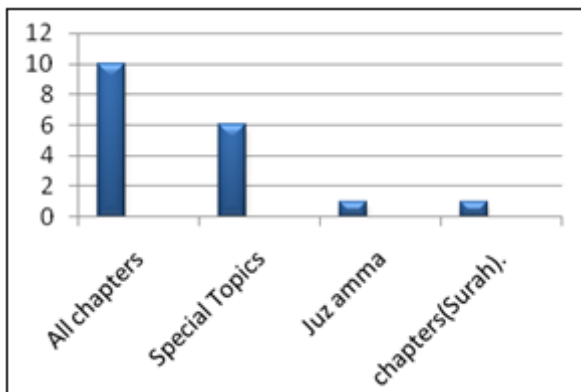


Figure 1: Covered Part of Quran

3.2 Representation Format

This factor is important in reusability and merging existing ontologies to unify them. There are different formats used in these reviewed researches shown in Figure (2), such as plain text, XML representation, Web Ontology Language (OWL), Prompt, Protégé is represented in a RDF. Most of them used protégé in OWL representation format.

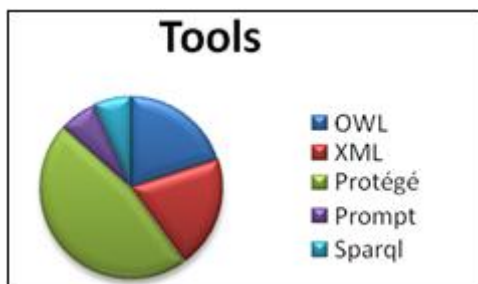


Figure 2: Tools distribution

3.3 Language or translations that used in Quran ontology

There are variation on language used by researchers in Quran ontologies Figure(3) show that most of recent researches used Arabic language (original language in which holy Quran reveled), other used English language translation and Malay language For example (Maha Al-Yahya, et al,2010) and (Mohammed Bakri , et al, 2013) ontologies used Arabic language, while by (Roslina Othman, et al, 2013) used a Malay language, (fandy, et al,2019) used Indonesian translation, and (Yauri Aliyu, et al, 2013) used English language. The variation of language limits merging process of existing Quran ontology.

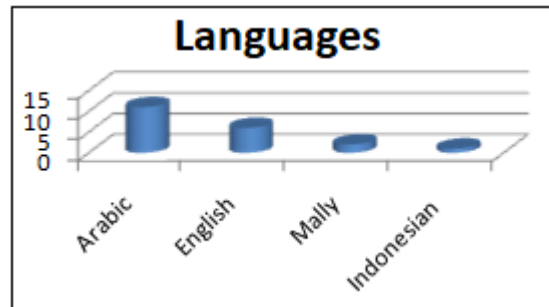


Figure 3: Language distribution

3.4 Datasets Used for Ontology Development

Quranic Arabic Corpus ontology by (Dukes 2013) is the most widely used by researchers to develop their Quran ontology, some researchers used:

- An online annotated linguistic resource: Eric Atwell et al (<http://corpus.quran.com/>)
- Quran and Qurany
- Mushaf Al Tajweed (MAT).
- Hadith and Quran corpus
- Al-Quran knowledge as described in Syammil Al-Quran Miracle the Reference.
- QurTafData (tarsier ibn katheer).
- There are 12 studies used public dataset, and 6 studies used private dataset as shown in figure(4).

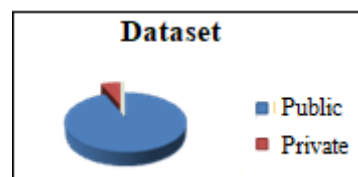


Figure 4: Language Distribution

3.5 Evaluation and its approach

Most of the reviewed study evaluated by using different techniques such as value of precision and recall, computational or comparative Analysis, NLP(Natural Language Processing) method, Term Frequency- Inverse Document Frequency (tf-idf) and A-Priori algorithm with (minsup and minconf), , etc. Most of those researches used precision-recall or NLP method.

3.6 Verification method used:

There are two methods that used for Quran ontology verification:

- Tafseer book for example (Tafsir Ibn Katheer, Tafsir Almoiaser, Tafsir ibn aljawzi) book.
- Scholar or Experts knowledge.

In our reviewed papers only four studies are verified out of twenty as shown in figure (5).

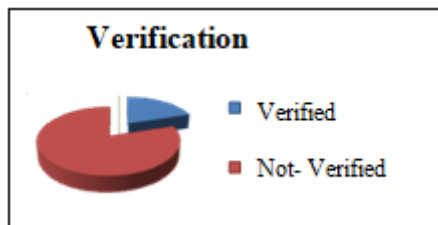


Figure 5: Verification

4. Conclusion

This investigation covers on several aspects such as objective of study, outcomes of this studies, language of the text used (original Arabic text, English text, or Malay text), technologies that used on ontology development, coverage which chapters of the Quran, coverage which topics, Datasets used, ontology testing techniques, and limitations on previous research.

Researches that are mentioned on this review prove that: most of the ontologies built for the Qur'an are incomplete, and most of them focused in specific domain. There are no clear common way to semantic annotation format and no common method for verifying and validating the results. Most of ontologies are not available for free access.

The other limitation is availability of the ontology recourses, the variation of languages that used on ontology, also the variation of ontology representation method generates reusability problem for existing ontology.

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Appendix (A)

No	Title	Covered part	Dataset name	Dataset type	language	Tool	Application (Y,N)	Verification method	Approach used	Covered chapter	Evaluation (Y/N)	limitations
1	Ontology Development for Zikr and Doa Al-Ma’thur at Wisdom Level	Quran, Hadith (Zikr, Doa Al-Ma’thur)	Zikr and Doa al-Ma’thur	public	Arabic	Protégé	Y	N	the value of precision	All chapter	Y	---
2	Using Ontology for Associating Web Multimedia Resources With the Holy Quran	Quran (link the verses of Quran with the multimedia resources)	----	public	Arabic	XML	Y	N	-----	All chapter	N	The initial result reveare that some of the video feeds have a description that does not match the content the of feed
3	Keyword and Chapter Relationship Analysis in the Tafseer of Al-Quran	Tafsir (Malay translated)	----	---	Mally	----	N	N	-----	Six chapters	N	----
4	Mapping of Biological	Quran (Verse	Multimedia-	Public	Arabic	Protégé Using	Y	N	A-Priori algorithm	All chapters	Y	the Ontology for whole verses of

	sciences with Quran and Ahadith: An Ontology Approach	Relevant to biological concept)	Enabled HQ Browser			OWL tool			with (minsup and minconf)	(biological verse)		Quran1 and Hadith not build to bridge the gap of scientific innovation
5	AI-quran themes classification using ontology	Quran (Classified to Iman (faith) and Akhlaq (deed).	Syammil AI-Quran Miracle the Reference.	public	Mally	Protégé OWL	N	Y (By using an expert review technique).	Reasoner tool provided in Protégé-OWL	All chapters	Y	the ontology for the whole knowledge of AI-Quran not completed.
6	Quranic Verse Extraction base on Concepts using OWL-DL Ontology	Quran	Ontology from the University of Leeds, UK	public	English	Protégé is represented in a RDF	Y	N	Precision, Recall	All chapters	Y	-----
7	Building Standard Dataset for Quran Tafseer	Quran, Tafsir books (collect a dataset).	<i>QurTafData</i>	public	Arabic	XML	N	Y (scholars and the knowledge Seekers)	-----	All chapters	Y	The QurTafData contains Tafsir Ibn Kathir book. By extending the dataset to add the other Tafsir books
8	An Ontological Model For Representing Semantic Lexicons: An Application On Time Nouns In The Holy Quran	Quran (time nouns)	-----	Public	Arabic	OWL	Y	Y	componential analysis of word features(NLP)	All chapters (noun in holy Quran)	N	Classifying a new word in the lexicon is very important but not done. visualizations of the ontology are useful for linguists. Also not done.
9	Traditional vs. Chronological Order: Stylistic Distance Analysis in Juz' Amma	Quran (measured Stylistic distance of surahs share same topic)	-----	-----	Arabic	-----	-----	N	Analysis (More frequent morpheme)	Part 30 Juz' Amma	Y	-----
10	Computational ontologies for semantic tagging of the Quran: A survey of past approaches.	Qur'an (reviews the recent researches in Quran ontology)	-----	-----	-----	None (Analysis technique)	N	N	Comparison between criteria	----	Y	----
11	A Proposed Model for Quranic Arabic WordNet	Quran (building semantic connections between words to achieve a better understanding)	Annotated Qur'an Corpus (Brierley et al, 2012)	public	Arabic & English	-----	Y	N	NLP tools (measuring semantic similarity between words by using edge-counting techniques)	All chapters	Y	----
12	Text categorization in Quran and Hadith: Overcoming the interrelation challenges using	Quran, Hadith	Hadith and Quran corpus	Public	English	Supervised machine learning Method	Y	N	Precision, Recall	All chapters (Hajj, Prayer, and Zakat)	Y	the SVM(Support vector Machine) used alone , not used with other classifiers and term weighting, as discussed earlier towards enhancing the classifier and

	machine learning and term weighting											present performance with log (TF-IDF).
13	Ontology Mapping and Merging Aspects in Semantic Web	mapping and merging systems(comparative study).	-----	-----	-----	PROMPT	Y	N	Comparative Analysis	---	Y	Testing according to four mapping criteria (define concept, graph, instance structure and user input) , this provides poor result in comparison
14	New instances classification framework on Quran ontology applied to question answering system	Quran (classification framework on ontology applied (QAS))	Main dataset	Private	Indonesia	SPARQL	N	N	-----	All chapters	N	Testing is not developed. QAS which accesses the Quran ontology not build and not test.
15	Holy Quran Ontology Construction with Semi-Automatic Population	name entity in Quran and Hadith	NEQ-Ontology	public	English	Protégé	Y (not complete)	N	Term Frequency - Inverse Document Frequency (tf-idf)	All chapters (Name entities)	Y	This work cover only sahih Abokhari not (al-Tirmidhi, Ibn Maja...) and Fiqh (Temporal interpretation of Sharia rules (Islamic law).
16	Ontology driven Information Extraction from the Holy Qur'an related Documents	Holy Qur'an, scholarly texts	dataQuest	Public	English	Protégé OWL, Jena API	Y	N	-----	All chapter	N	knowledge base covered special Quran domain not all quranic content available on the web
17	Semantic query for Quranic ontology	semantic search engine for Quran	المعجم المفهرس لالفاظ القران الكريم	public	Arabic	Protégé & Apache Lucene & JAVA	Y	N	precision and recall	All chapters	Y	the accurate results not achieved. _ the ontology is not generalizing to hole arabic text.
18	Towards a Joint Ontology of Quran and Hadith	Quran, Hadith	Quran & Qurany	public	Arabic	OWL & XML	N	Y	corpus-based evaluation	All chapters	Y	a larger portion of Hadith is not covered by this ontology
19	Islamic Knowledge Ontology Creation.	concept based on Al- Quran	----	---	English	----	N	N	----	All chapters (prayer or 'salat')	Y (partially)	The rules generation and thenextract process used. There is no any using for NLP techniques or machine learning techniques.
20	Extraction Approach for (Hadith) using Association Rules using-semantic-approaches-to-	Hadith	----	public	Arabic	OWL KP-Miner2 System(preprocessing)	Y	N	Statistics (Confidence and rules generatio) and linguistics methods	12 surah related to (stories of the prophet)	Y	The study used other predefined concepts as it defines in a given document, and places them as individuals into their already built ontology system.