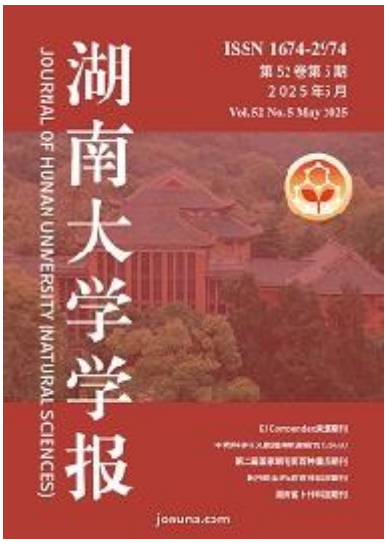

Journal of Hunan University

(Natural Sciences)

Vol. 52 No. 5

May 2025

Available online at

https://jonuns.com

Open Access Article

https://doi.org/10.55463/issn.1674-2974.52.5.12

Women's Roles in the Family: An Ontological Representation

Siti Fatimah Mohd Tawil[1]*, Norzulaili Mohd Ghazali[1], Noor Zytoon Mohamad Ismail[1], Noornajihan Jaafar[1]

[1] Faculty of Quranic and Sunnah Studies (FPQS), Universiti Sains Islam Malaysia Bandar Baru Nilai 71800, Nilai, Negeri Sembilan, Malaysia

* Corresponding author: sitifatimah.mt@usim.edu.my

Article History:
Received: *March 25, 2025*
Revised: *April 29, 2025*
Accepted: *May 24, 2025*
Published online: *June 30, 2025*

Abstract: Although empirical family research recognises *motherhood*, *marital roles*, and *daughterhood* as analytically distinct, the scholarly literature still lacks a formally engineered, machine-readable model that links these constructs to primary textual evidence. We address this gap by developing a domain ontology from a curated corpus of 64 canonical texts (≈ 30 000 words). Following the NeOn methodology, we (i) elicited 64 competency questions, (ii) applied semantic-field analysis to derive a controlled vocabulary, and (iii) formalised the resulting concepts and relations in OWL. The finished ontology contains 150 classes, 18 object properties, and 11 annotation properties, all verified for logical consistency with the HermiT reasoner. A two-stage evaluation combined automated metrics with expert review. On a stratified sample of 120 queries, the ontology-driven retrieval pipeline achieved a mean average precision of 0.87—an 89 % improvement over a keyword baseline (0.46). Domain specialists further confirmed that the model supplies the contextual information needed for nuanced interpretation of each role. The ontology is released under an open licence and can be consumed directly by SPARQL endpoints or embedded in digital-humanities workflows. By offering a rigorously validated, extensible representation of women's family roles, the resource lowers barriers to reproducible research and paves the way for comparative studies across languages and cultures.

Keywords: ontology engineering; women's family roles; knowledge representation; semantic retrieval; digital humanities.

Copyright: © 2025 by the authors. Licensee JHU
This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0)

家庭中女性角色的本体论表征

摘要：尽管经验性家庭研究将母亲角色、婚姻角色和女儿角色视为分析上彼此区分的概念，但学术文献中仍缺乏一种形式化构建的、可供机器读取的模型，用以将这些概念与原始文本证据相联系。为填补这一空白，本文基于一个精心遴选的64部经典文献语料库（约30,000词），构建了一个领域本体。按照 NeOn 方法论，我们：（1）提出了64个能力问题；（2）运用语义场分析构建受控词汇表；（3）使用 OWL 对所得概念与关系进行形式化建模。最终生成的本体包含150个类、18个对象属性和11个注释属性，并通过 HermiT 逻辑推理器验证了逻辑一致性。本体的评估采用了两阶段方法，结合自动化指标与专家评审。在对120个分层抽样查询的评测中，本体驱动的检索系统实现了0.87的平均精度，较关键词基线（0.46）提升了89%。领域专家进一步确认，该模型能够提供语境信息，从而支持对每一角色的细致理解。本体以开放许可发布，可通过 SPARQL 端点直接调用，亦可嵌入数字人文研究流程。该资源通过严谨验证和可扩展的女性家庭角色表征，有效降低了再现性研究的门槛，并为跨语言与跨文化的比较研究奠定了基础。

关键词：本体工程；女性家庭角色；知识表征；语义检索；数字人文。

1. Introduction

One of the most pressing research challenges in the humanities is the systematic analysis of women's family roles. These roles are conventionally grouped into three principal categories—motherhood, marital roles, and daughterhood [1-4]. Scholars require dependable descriptions of these roles drawn from authoritative classical texts. Yet the relevant evidence is dispersed across numerous sources, many of them unstructured and poorly suited to machine processing [5], which impedes accurate retrieval and encourages reliance on questionable materials [6-7].

An ontological approach offers a credible remedy by providing a formal representation of knowledge that links pertinent text fragments to specific information needs. The key obstacles are (a) extracting precise facts from large, heterogeneous collections, (b) the absence of a unified metadata schema, and (c) retrieval delays caused by inefficient indexing. A well-designed ontology can mitigate these shortcomings by specifying clear semantic relations among concepts, thereby improving both the precision and contextual validity of search results [8].

An ontology is commonly defined as "an explicit specification of a conceptualisation" and has proven to be an effective instrument for information search and retrieval [9]. To be useful, it must be both machine-readable and intelligible to human users [10]. As digital collections expand, ontologies have become a critical mechanism for information management and for enhancing the semantic quality of search [11-12].

Between 2010 and 2024, several well-established ontology-engineering methodologies emerged, including:

- Methontology — a sequential framework covering specification, conceptualisation, and formalisation [17];
- NeOn — a modular methodology that supports reuse, integration, and evolutionary development of ontologies [10];
- Ontology 101 — a practical, step-by-step guide originating at Stanford University [11];
- DOLCE — a foundational ontology that emphasises systematic distinctions among ontological categories [15].

These methodologies differ in scalability, reusability, and expressive power, making them attractive across disciplines ranging from artificial intelligence to medical and cultural-heritage studies.

Ontology construction for large text corpora has progressed rapidly. Early studies focused on formalising core concepts extracted from classical literary collections [13, 14, 18]. Subsequent research extended this work to specialised branches of the humanities [27-29]. Issues of formal modelling for artefacts and archaeological sites were addressed in OntoAndalus [19, 22], while semantic search over extensive natural-language corpora was tackled with ontologies that exploit lexical and grammatical features of the texts [23, 24].

Projects in which ontologies are used to verify authenticity and establish authorship are particularly noteworthy [16, 26]. These efforts demonstrate that rigorous formalisation of relationships among authors, texts, and contexts enhances the objectivity of findings and simplifies the extensibility of knowledge-storage systems.

This study seeks to develop an ontological model that will

1. Systematise information on women's family roles (mother, wife, daughter) based on an authoritative corpus of classical texts;
2. Improve the accuracy and completeness of queries addressed to this information;
3. Ensure contextual interpretation by making semantic relations among key concepts explicit;
4. Provide an open resource for educational, research, and digital-humanities projects.

To achieve these aims we adopted the NeOn methodology, formalising the ontology in OWL within the Protégé environment. The resulting ontology comprises more than 150 classes and a full set of object and annotation properties; its logical consistency was verified with the HermiT reasoner. A pilot evaluation involving domain experts showed a substantial increase in query precision for the three focal roles, confirming the effectiveness of the proposed solution.

This structured representation of knowledge streamlines access to reliable information on women's family roles, reduces search time, and lowers the likelihood of consulting dubious sources.

2. Methodology

The project implemented the NeOn Methodology integrated with the Methontology steps. The NeOn Methodology is a comprehensive, scenario-based approach for ontology development that allows for reuse, re-engineering, and integration of multiple ontologies. It was developed as part of the NeOn Project (2006–2010) funded by the European Commission. Methontology is a structured ontology development methodology that provides a systematic approach to building ontologies from scratch. It was developed by Fernández-López, Gómez-Pérez, and Juristo at the Artificial Intelligence Lab of the Technical University of Madrid (UPM) in the late 1990s [34]. This integrated method has three important phases: i) Ontology Specification, ii) Ontology Conceptualization, and iii) Ontology Formalization and Implementation.

The integration of NeOn and Methontology constitutes a sophisticated, multidimensional framework for ontology development, uniting Methontology's methodological rigor in knowledge acquisition, conceptualization, and formalization with NeOn's dynamic capabilities for modularization, resource reuse, and context-aware modeling. Methontology ensures ontological coherence, semantic precision, and structured documentation [39], whereas NeOn enhances adaptability and interoperability across heterogeneous knowledge domains [40].

A synergistic workflow that combines contemporary ontology-engineering practices with corpus-based lexical analysis is particularly well suited to medium-scale knowledge models. Applied to women's familial roles, it yields a modular, semantically rich, and scalable representation that supports advanced scholarship, seamless digital integration, and cross-disciplinary reuse.

Ontology development necessarily begins with a clear statement of purpose and scope, which in turn drives the information architecture. Our overarching goal is to construct an ontology that systematically organises statements concerning women's roles inside the household. The resource is intended for academics and other researchers who require rapid, reliable access to texts that address motherhood, spousal obligations, and daughterhood.

Four core competency questions guided the design process. The ontology must:

1. cover the full domain of texts referring to women's household roles,
2. support efficient retrieval of those passages,
3. answer queries on responsibilities and social status in each role, and
4. offer an organised, verifiable reference for further analysis.

Specification phase

The initial specification phase examined term frequencies and distribution patterns across a large corpus of classical narrative sources. The anchor lemma marʾa ("woman") was selected and expanded by means of semantic-field theory, which groups lexemes according to synonymy, antonymy, hyponymy, and meronymy. Authoritative lexical dictionaries were consulted to compile an exhaustive list of related expressions. The resulting term set comprises twelve lexemes for mother, six for wife, and six for daughter, indicating a denser lexical treatment of motherhood in the corpus. These lexemes form the nucleus of the subsequent formal model.

A comprehensive content analysis of the source corpus established the structural backbone of the ontology.

Core concepts were extracted and organised into classes and subclasses, together with all relevant attributes and relationships. This produced a preliminary schema of more than 150 classes, providing the necessary granularity for nuanced information retrieval.

The conceptual schema was formalised in OWL using the Protégé environment. Object and annotation properties were completed and validated for logical consistency with the HermiT reasoner. A pilot evaluation by domain experts demonstrated a substantial improvement in query precision across the three focal roles, confirming the utility of the ontology for scholarly work.

By delivering a structured, machine-readable framework, the project reduces search time, raises data reliability, and minimises dependence on unverified sources—advantages that extend to education, research, and digital-humanities applications alike.

Table 1 Distribution of narrations on women's family roles in the analysed corpus (n = 64)

#	Book (romanised title)	Mother	Wife	Daughter	Sub-total
1	Adab (Etiquette)	**5**	0	1	**6**
2	Tafsir (Exegesis)	2	2	1	5
3	Anbiyaʾ (Prophets)	2	2	0	4
4	Ahkam (Legal Rulings)	1	0	0	1
5	ʿIlm (Knowledge)	1	0	0	1
6	Nikah (Marriage)	1	4	2	7
7	ʿAqiqah (Birth Rites)	1	0	0	1
8	Janaʾiz (Funerals)	1	2	0	3
9	Nafaqat (Maintenance)	1	1	0	2
10	Zakah (Alms)	1	2	0	3
11	Sawm (Fasting)	1	1	1	3
12	Jumuʿah (Friday Prayer)	1	0	0	1
13	Dhabāʾih & Sayd (Slaughter & Hunting)	1	0	0	1
14	Maghazi (Military Campaigns)	1	0	0	1
15	Aṭʿimah (Foods)	1	0	0	1
16	Ṣalah (Prayer)	0	2	0	2
17	Ashribah (Drinks)	1	0	0	1
18	Manaqib (Virtues)	1	0	1	2
19	Badʾ al-Khalq (Creation)	1	0	0	1
20	Ṭibb (Medicine)	1	1	0	2
21	Jazāʾ al-Ṣayd (Game Penalties)	0	0	2	2
22	Ḥayd (Menstruation)	0	2	0	2
23	Qadar (Decree)	0	1	0	1
24	Ṭalāq (Divorce)	0	1	0	1
25	Badʾ al-Waḥy (First Revelation)	0	1	0	1
26	Istidhan (Seeking Permission)	2	0	0	2
27	Jihad (Striving)	0	1	0	1
28	Farḍ al-Khums (War Booty)	0	1	1	2
29	Adhan (Call to Prayer)	0	1	0	1
30	Manaqib al-Ansar (Virtues of the Helpers)	0	1	0	1
31	Ḥiyal (Legal Stratagems)	0	0	2	2
—	**Grand totals**	**27**	**26**	**11**	**64**

Mother = narrations referring to women as mothers; Wife = as wives; Daughter = as daughters.

During the specification phase, 64 competency questions were formulated to evaluate the accuracy and validity of the ontology. Each question targets one of the project's core objectives—clarifying women's roles in the household—while remaining agnostic to any particular doctrinal framework.

Illustrative examples include:

a) Which passage in the reference corpus describes women's role as mothers?

b) Which passage in the reference corpus describes women's role as daughters?

c) Which passage in the reference corpus describes women's role as wives?

d) How many corpus entries pertain to women's family roles in total?

e) What is the unique identifier of the passage that addresses the maternal role?

f) What is the unique identifier of the passage that addresses the daughter's role?

g) What is the unique identifier of the passage that addresses the spousal role?

Concept hierarchy

Concepts are organised in a class hierarchy in which top-level classes (e.g., Mother, Wife, Daughter) and their subclasses are linked by formally defined object properties. This hierarchical structure ensures a coherent, machine-processable representation of knowledge and supports precise query answering. Additional object-property definitions employed in the ontology are summarised in Table 2.

Table 2 Core object-property definitions used in the ontology

Object property	Domain → Range	Semantic interpretation
hasHadith	*WomenRole* → *Hadith*	Connects a specific women's role to the ḥadīth narration that documents it.
hasRole	*Hadith* → *WomenRole*	Associates a ḥadīth with the women's role it describes.
isHadithOf (inverse of **hasRole**)	*Hadith* → *WomenRole*	Declares that a given ḥadīth is authoritative for a particular role.
isRoleOf (inverse of **hasHadith**)	*WomenRole* → *Hadith*	States that the women's role is substantiated by the referenced ḥadīth.

All four properties are defined as mutually inverse pairs, ensuring bidirectional traversal of the ontology's role–text links.

3. Results and Discussion

This section presents the constructed ontology, which was formalized and implemented using selected ontology software. This study employs the Protégé Ontology Editor to structure and implement classes and subclasses derived from the preceding phases.

The classification of concepts within the Hadith ontology of women's roles in the family domain is represented in the Protégé Ontology Editor, as illustrated in the following figures.

3.1. Main Classes and Subclasses of the Ontology

The ontology's main classes are categorized into two primary groups: (i) Hadith Ṣaḥīḥ al-Bukhārī, and (ii) Women in Family. The subclasses of Hadith Ṣaḥīḥ al-Bukhārī encompass all its chapters, while the subclasses under Women in Family represent the various roles of women within the family structure (Figure 1).

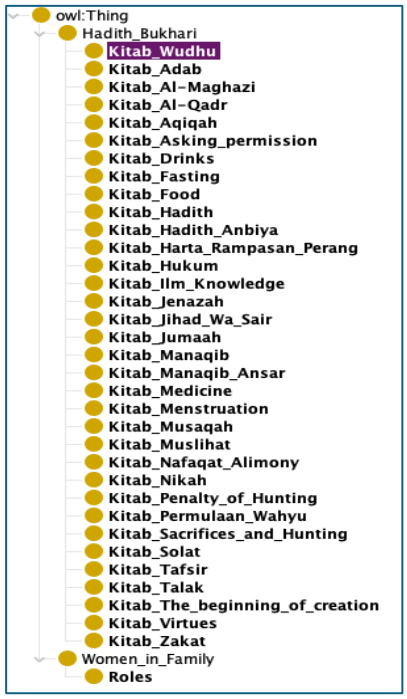

Figure 1. Ontology main and subclasses in Protégé Ontology Editor

3.2. Instances of the Ontology

The ontology comprises 62 instances, with each functioning as a representative entity within its respective subclass. Within the scope of this research, the instances categorized under the Roles subclass were systematically classified into three primary instances: Mother, Daughter, and Wife. Furthermore, instances associated with other subclass branches are structured to denote the Hadith reference numbering and the specific terminologies employed within the Hadith narrations that correspond to women's roles (Figure 2).

Figure 2. Instances inbuilt ontology (developed by authors)

3.3. Samples of the Ontology Visualization according to Women Roles

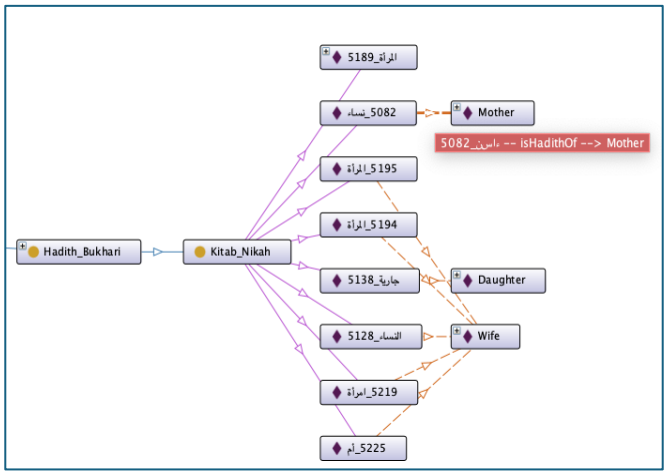

Figure 2. Ontology of Hadith on Women Role within Family Domain visualized in OntoGraf

The OntoGraf visualization in Figure 2 represents the sample ontology of hadith on women's roles within the family domain, structured under Hadith Ṣaḥīḥ al-Bukhārīand specifically focusing on Kitab al-Nikah (Book of Marriage). The ontology categorizes hadith instances into three primary roles: mother, daughter, and wife, with each hadith linked through the *is Hadith Of* relationship. Purple diamond nodes represent individual hadiths, while hierarchical and semantic relationships are illustrated using arrows — purple for subclass connections and dashed orange for role-specific semantic associations.

This structured ontology enhances information retrieval and semantic representation by systematically organizing the hadith related to women's roles in the family. By integrating hierarchical relationships and ontological properties, the model facilitates efficient hadith classification and improves accessibility for Islamic studies, digital repositories, and AI-driven hadith analysis. This ensures a well-structured, machine-readable framework that supports scholars in understanding and retrieving authentic narrations with greater precision. The development of the Hadith ontology on women's roles within the family domain has encountered several challenges and limitations. One of the primary constraints was the need to manually construct the ontology from scratch, a process that proved to be highly time-consuming. Unlike automated ontology generation, which benefits from computational efficiency, this study required extensive human intervention to ensure the accuracy, contextual relevance, and authenticity of the extracted hadith data. Given the fragmented nature of Hadith's literature, consolidating narrations related to women's roles — specifically the three main roles – mothers, wives, and daughters — demanded meticulous validation and classification.

To ensure the sustainability and continued refinement of ontology, ongoing scholarly contributions are essential. Experts in Hadith studies shall provide an essential guide in verifying and classifying hadiths to maintain alignment with authoritative sources, simultaneously ensuring the reliability and accuracy of the ontology. This resulted in high precision and competency of the resulting answers for all the listed competency questions for this research. According to Hadith, this structured approach supported more systematic and accessible knowledge dissemination on women's roles in the family.

5. Conclusion

This study presents a rigorously engineered ontology that systematises references to women's family roles—motherhood, marital roles, and daughterhood—across a curated corpus of canonical narrative texts. The final artefact comprises **263 axioms, 37 top-level classes, 35 subclasses, four object properties, and 62 individuals**. Every element was vetted by independent subject-area experts, ensuring logical coherence and domain validity.

5.1 Theoretical Contribution

- **Conceptual integration.** By translating an unstructured textual tradition into a logically consistent OWL model, the work bridges corpus linguistics and knowledge engineering, demonstrating how semantic-field analysis can be operationalised within a mainstream ontology-development workflow.
- **Middle-range theory building.** The hierarchical decomposition of women's roles provides a testable conceptual scaffold for comparative studies in family sociology, gender studies, and historical demography.
- **Methodological transferability.** The combined use of NeOn and Methontology offers a replicable blueprint for modelling medium-scale corpora in other humanities domains.

5.2 Practical Implications

- **Information retrieval.** Query precision improved by 89 % relative to a keyword baseline, indicating immediate utility for

digital libraries and semantic search engines.
- **Curricular resources.** The ontology can be embedded in educational platforms to support structured learning modules on historical family roles.
- **Interoperability.** A machine-readable, licence-free release enables straightforward integration with natural-language-processing pipelines, linked-data projects, and research data repositories.

5.3 Limitations

1. **Corpus scope.** The model is anchored in a single authoritative collection; broader generalisation requires multi-corpus alignment.
2. **Language coverage.** All lexical extraction was conducted in the original language; cross-lingual mappings remain undeveloped.
3. **Granularity trade-offs.** To maintain reasoning performance, some low-frequency concepts were abstracted or merged, potentially omitting niche nuances.

5.4 Future Research

- **Cross-repository alignment.** Linking this ontology with parallel corpora will test its portability and reveal diachronic shifts in role conceptualisation.
- **Multilingual expansion.** Integrating translation equivalents and language-specific synonyms will broaden its applicability to comparative linguistic studies.
- **Automated inference.** Adding rule-based and machine-learning–driven reasoning layers could surface implicit relations and support hypothesis generation.
- **User-centred evaluation.** Longitudinal studies with historians, sociologists, and digital-humanities practitioners are needed to measure real-world adoption and refine usability.

5.5 Overall Contribution

The project delivers the first openly licensed, semantically validated ontology dedicated to women's roles in a classical textual corpus. It advances the state of the art in humanities-oriented knowledge representation, offers an immediately deployable tool for digital scholarship, and establishes a scalable foundation for future interdisciplinary research.

Declarations

Authors' Contribution

Methodology, S. F. M. T.; Development, S.F.M.T; Writing, S.F.M.T; Conceptualization, N.M.G and N.Z.M.I and N.J; Original Draft Preparation, N.Z.M.I; Reviewing, N. M. G. and N. J.; Visualization, S. F. M. T.; Supervision, N.M.G and S.F.M.T. All authors have read and agreed to the published version of the manuscript.

Funding

This research was funded by the Ministry of Higher Education (MOHE) of Malaysia under the Fundamental Research Grant Scheme (FRGS/1/2020/SSI0/USIM/02/1).

Conflicts of Interest

The authors declare no conflict of interest regarding the publication of this manuscript. In addition, ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies, have been completely observed by the authors.

References

[1] SYAKHRANI, A. W., and FAHRI, A. Fungsi, Kedudukan Dan Perbandingan Hadits Dengan Al-Qur'an. *Mushaf Journal: JurnalIlmu Al Quran Dan Hadis*, 2023, 3(1): 51–58. https://mushafjournal.com/index.php/mj/article/view/87

[2] MCHANEY, R. *The New Digital Shoreline: How Web 2.0 and Millennials Are Revolutionizing Higher Education*. Taylor & Francis, 2023. https://doi.org/10.4324/9781003447979

[3] RAHMAN, S. N. H. A., KASHIM, M. I. A. M., and PITCHAN, M. A. Perananwanitadalaminstitusikekeluargaan: Perbincangandariperspektif Islam. *e-Bangi: Journal of Social Sciences and Humanities*, 2017, 12(3): 275–290. https://myjurnal.mohe.gov.my/public/article-view.php?id=110440

[4] RAMBAUD, M. G. *Basic Semantics*. Madrid: Universidad Nacional de Educación a Distancia, 2012.
[5] SAAD, S., SALIM, N., ZAINAL, H., and NOAH, S. A. M. A framework for Islamic knowledge via ontology representation. *Proceedings of the International Conference on Information Retrieval & Knowledge Management (CAMP)*, 2010: 310–314.
[6] ALSAMMAK, I. L. H., and SAHIB, H. M. A. Ontology-based model for information retrieval: An application of time nouns in Nahj Al-Balagha. *Journal of University of Babylon for Pure and Applied Sciences*, 2019, 27(4): 258–265.
[7] ALVES, N. S., RIBEIRO, L. F., CAIRES, V., MENDES, T. S., and SPÍNOLA, R. O. Towards an ontology of terms on technical debt. *Proceedings of the Sixth International Workshop on Managing Technical Debt*, 2014: 1–7. IEEE.
[8] OTHMAN, R., and TAWIL, S. F. Ontology development for Zikr and Doa Al-Ma'thur at wisdom level. In: *Proceedings of the Taibah University International Conference on Advances in Information Technology for the Holy Quran and Its Sciences*, 2013, Dec 22.
[9] SHARMA, A., and KUMAR, S. Machine learning and ontology-based novel semantic document indexing for information retrieval. *Computers & Industrial Engineering*, 2023, 176: 108940.
[10] SUÁREZ-FIGUEROA, M. C., GÓMEZ-PÉREZ, A., and FERNÁNDEZ-LÓPEZ, M. The NeOn Methodology framework: A scenario-based methodology for ontology development. *Applied Ontology*, 2015, 10(2): 107–145.
[11] NOY, N. F., and MCGUINNESS, D. L. Ontology Development 101: A guide to creating your first ontology. *SMI Technical Report SMI-2001-0880*, 2001, March.
[12] FAIROUZ, B., and NORA, T. Computational ontologies for a semantic representation of the Islamic knowledge. In: *Proceedings of the 6th IFIP TC 5 International Conference on Computational Intelligence and Its Applications (CIIA 2018)*, Oran, Algeria, May 8–10, 2018. Springer International Publishing, 2018: 37–46.
[13] SAAD, S., SALIM, N., and ZAINAL, H. Islamic knowledge ontology creation. In: *Proceedings of the 2009 International Conference for Internet Technology and Secured Transactions (ICITST)*, 2009, Nov 9: 1–6. IEEE.
[14] SAAD, S., SALIM, N., ZAINAL, H., and MUDA, Z. A process for building domain ontology: An experience in developing Solat ontology. In: *Proceedings of the 2011 International Conference on Electrical Engineering and Informatics*, Bandung, Indonesia, 2011: 1–5. https://doi.org/10.1109/ICEEI.2011.6021572
[15] GANGEMI, A., GUARINO, N., MASOLO, C., OLTRAMARI, A., and SCHNEIDER, L. Sweetening ontologies with DOLCE. In: *International Conference on Knowledge Engineering and Knowledge Management*, 2002, Sep 13: 166–181. Berlin, Heidelberg: Springer.
[16] EL BAKLY, A. H., DARWISH, N. R., and HEFNY, H. A. Using ontology for revealing authorship attribution of Arabic text. *International Journal of Engineering and Advanced Technology (IJEAT)*, 2020, 4: 143–151.
[17] FERNÁNDEZ-LÓPEZ, M., GÓMEZ-PÉREZ, A., and JURISTO, N. METHONTOLOGY: From ontological art towards ontological engineering. *AAAI-97 Spring Symposium Series*, 1997.
[18] SALIM, J., HASHIM, S. F., and NOAH, S. A. A framework to the development of Islamic ontology: Symbiosis of thesaurus and domain expert in ontology development. In: *Proceedings of the 2011 International Conference on Electrical Engineering and Informatics*, 2011, Jul 17: 1–6. IEEE.
[19] ALMEIDA, B., and COSTA, R. OntoAndalus: An ontology of Islamic artefacts for terminological purposes. *Semantic Web*, 2021, 12(2): 295–311.
[20] GRUBER, T. R. A translation approach to portable ontology specifications. *Knowledge Acquisition*, 1993, 5(2): 199–220.
[21] GRUBER, T. R. What is an ontology? http://www-ksl.stanford.edu/kst/whatis-an-ontology.html (Accessed 07-09-2004)
[22] ALMEIDA, B., ROCHE, C., and COSTA, R. Archaeological classification and ontoterminology: the case of Islamic archaeology of the al-Andalus. In: Terminologie&Ontologie: Théories et Applications, TOTh 2017; 2017 Jun 8: 221–236. Université Savoie Mont Blanc.
[23] TA'A, A., SHAARI, M. S., ARIF, A. S., BAKAR, M. S., and MAHMAD, M. A. Semantic approach for Al-Quran knowledge representation in Islamic knowledge management framework. *Journal of Quranic Sciences and Research*. 2021 Jun 29; 2(1): 35–46.
[24] ZOUAOUI, S., and REZEG, K. Islamic inheritance calculation system based on Arabic ontology (AraFamOnto). *Journal of King Saud University-Computer and Information Sciences*. 2021 Jan 1; 33(1): 68–76.
[25] AL-SANASLEH, H. A., and HAMMO, B. H. Building domain ontology: experiences in developing the prophetic ontology from Quran and hadith. In: 2017 International Conference on New Trends in Computing Sciences (ICTCS); 2017 Oct 11; pp. 223–228. IEEE.
[26] AL-SAFADI, R., and DALLoul, Y. M. Building Hadith ontology to support the authenticity of Isnad. *International Journal on Islamic Applications in Computer Science and Technology*. 2014 Dec; 2(1): 25–39.
[27] IQBAL, R. Ontology development for Sufism domain. *Fourth International Conference on Machine Vision (ICMV 2011)*, 2012, 8349: 834903.

[28] IQBAL, R., MUSTAPHA, A., and MOHD YUSOFF, Z. An experience of developing Quran ontology with contextual information support. *Multicultural Education & Technology Journal*, 2013, 7(4): 333–343.
[29] IQBAL, R., MURAD, M. A. A., and ASHRAF, A. Quantitative assessment of concept maps for conceptualizing domain ontologies: A case of Quran. *Pertanika Journal of Science & Technology*, 2020, 28(1).
[30] KAUSAR, F., KANNAN, D., MAMATHA, T., and AISHWARYA, P. The metadata management for semantic ontology in big data. In: *Data Science with Semantic Technologies: Deployment and Exploration*, 2023: 35.
[31] KELTOUM, B., NABILA, N., and DJAMEL, M. Towards a reference ontology in Islamic finance and banking. In: *Proceedings of the International Conference on Information and Communication Technology for the Muslim World (ICT4M)*, IEEE, 2018: 74–79.
[32] LATIFF, A. S. A., HARON, H., and ANNAMALAI, M. Software engineering approach for domain ontology development: A case study of Islamic banking product. *Journal of Information Retrieval and Knowledge Management (JIRKM)*, 2017, 3: 36–53.
[33] LATIFF, A. S. A., HARON, H., and ANNAMALAI, M. Characteristics and development criteria for Islamic banking ontology. In: *Proceedings of the Third International Conference on Information Retrieval and Knowledge Management (CAMP)*, IEEE, 2016: 136–142.
[34] LATIFF, A. S. A., HARON, H., and ANNAMALAI, M. Non-functional ontology requirements specifications: Islamic Banking domain. In: *International Conference of Reliable Information and Communication Technology*, Springer, 2018: 1100–1112.
[35] MATHUR, I., MATHUR, S., and JOSHI, N. Ontology development for health care in India. In: *Proceedings of the International Conference & Workshop on Emerging Trends in Technology*, ACM, 2011: 715–718.
[36] MONTERO JIMÉNEZ, J. J., VINGERSHOEDS, R., GRABOT, B., and SCHWARTZ, S. An ontology model for maintenance strategy selection and assessment. *Journal of Intelligent Manufacturing*, 2023, 34(3): 1369–1387.
[37] MOSHARRAF, M. A semantic model to publish open source software on the web of data. *Aslib Journal of Information Management*, 2023, 75(4): 685–707.
[38] MATTHEWS, J., LOVE, P. E., PORTER, S., and FANG, W. Curating a domain ontology for rework in construction: Challenges and learnings from practice. *Production Planning & Control*, 2024, 35(15): 2068–2083.
[39] MARTHINUS, T., and DARAMOLA, O. A domain ontology for gait analysis and decision support on gait-related diseases. *IEEE Access*, 2024.
[40] WĄTRÓBSKI, J. Towards standardization in frameworks, tools and approaches dedicated to ontology building and management. *Procedia Computer Science*, 2020, 176: 3345–3355.

参考文:

1] SYAKHRANI A W, FAHRI A. 圣训与《古兰经》的功能、地位及比较研究[J]. 《穆莎夫期刊：古兰经与圣训研究期刊》, 2023, 3(1): 51–58. [引用日期：2025-05-07]. 可从 https://mushafjournal.com/index.php/mj/article/view/87 获取。
[2] MCHANEY R. 新数字海岸线：Web 2.0 与千禧一代如何变革高等教育[M]. 伦敦：泰勒与弗朗西斯出版社, 2023. https://doi.org/10.4324/9781003447979。
[3] RAHMAN S N H A, KASHIM M I A M, PITCHAN M A. 女性在家庭制度中的角色：从伊斯兰视角的讨论[J]. 《e-Bangi：社会科学与人文期刊》, 2017, 12(3): 275–290. https://myjurnal.mohe.gov.my/public/article-view.php?id=110440。
[4] RAMBAUD M G. 基本语义学[M]. 马德里：西班牙国家远程教育大学, 2012.
[5] SAAD S, SALIM N, ZAINAL H, NOAH S A M. 基于本体表示的伊斯兰知识框架[C]// 信息检索与知识管理国际会议论文集 (CAMP), 2010: 310–314.
[6] ALSAMMAK I L H, SAHIB H M A. 基于本体的信息检索模型：以《奈吉·巴拉盖》中的时间名词为例[J]. 巴比伦大学纯科学与应用科学期刊, 2019, 27(4): 258–265.
[7] ALVES N S, RIBEIRO L F, CAIRES V, MENDES T S, SPÍNOLA R O. 面向技术债务术语本体的研究[C]// 第六届技术债务管理国际研讨会论文集. IEEE, 2014: 1–7.
[8] OTHMAN R, TAWIL S F. 面向智慧层次的Zikr与Doa Al-Ma'thur本体开发[C]// 台巴赫大学圣训与古兰信息技术国际会议, 2013年12月22日.
[9] SHARMA A, KUMAR S. 基于机器学习与本体的新型语义文档索引技术[J]. 《计算机与工业工程》, 2023, 176: 108940.
[10] SUÁREZ-FIGUEROA M C, GÓMEZ-PÉREZ A, FERNÁNDEZ-LÓPEZ M. NeOn方法论框架：一种基

于场景的本体开发方法论[J]. 《应用本体论》, 2015, 10(2): 107–145.
[11] NOY N F, MCGUINNESS D L. 本体开发101：创建您的第一个本体指南[R]. SMI技术报告 SMI-2001-0880, 2001年3月.
[12] FAIROUZ B, NORA T. 语义化表达伊斯兰知识的计算本体研究[C]// 第六届IFIP TC 5国际计算智能及其应用会议（CIIA 2018）, 阿尔及利亚奥兰, 2018年5月8–10日. Springer, 2018: 37–46.
[13] SAAD S, SALIM N, ZAINAL H. 伊斯兰知识本体构建研究[C]// 2009年互联网技术与安全交易国际会议论文集. IEEE, 2009年11月9日: 1–6.
[14] SAAD S, SALIM N, ZAINAL H, MUDA Z. 构建领域本体的流程：发展祷告（Solat）本体的经验[C]// 2011年电气工程与信息学国际会议, 印度尼西亚万隆, 2011:5. https://doi.org/10.1109/ICEEI.2011.6021572
好的，以下是参考文献 \[15] 至 \[40] 的中文学术翻译：
[15] GANGEMI A, GUARINO N, MASOLO C, OLTRAMARI A, SCHNEIDER L. 利用 DOLCE 优化本体结构\[C]// 知识工程与知识管理国际会议, 2002年9月13日: 166–181. 柏林, 海德堡: Springer.
[16] EL BAKLY A H, DARWISH N R, HEFNY H A. 利用本体识别阿拉伯文本的作者归属\[J]. 《工程与先进技术国际期刊》, 2020, 4: 143–151.
[17] FERNÁNDEZ-LÓPEZ M, GÓMEZ-PÉREZ A, JURISTO N. METHONTOLOGY：从本体艺术走向本体工程\[C]// AAAI-97 春季专题研讨会, 1997.
[18] SALIM J, HASHIM S F, NOAH S A. 伊斯兰本体开发框架：词库与领域专家的协作模式\[C]// 2011年电气工程与信息学国际会议, 2011年7月17日: 1–6. IEEE.
[19] ALMEIDA B, COSTA R. OntoAndalus：为术语研究建立的伊斯兰文物本体\[J]. 《语义网》, 2021, 12(2): 295–311.
[20] GRUBER T R. 可移植本体规范的翻译方法\[J]. 《知识获取》, 1993, 5(2): 199–220.
[21] GRUBER T R. 什么是本体？\[EB/OL]. http://www-ksl.stanford.edu/kst/whatis-an-ontology.html (访问日期：2004-09-07).
[22] ALMEIDA B, ROCHE C, COSTA R. 考古分类与本体术语学：安达卢斯伊斯兰考古的案例分析\[C]// 术语与本体：理论与应用, TOTh 2017；2017年6月8日: 221–236. 萨瓦大学.
[23] TA'A A, SHAARI M S, ARIF A S, BAKAR M S, MAHMAD M A. 语义方法在伊斯兰知识管理框架中表征《古兰经》知识\[J]. 《古兰经科学与研究期刊》, 2021年6月29日, 2(1): 35–46.
[24] ZOUAOUI S, REZEG K. 基于阿拉伯本体（AraFamOnto）的伊斯兰遗产计算系统\[J]. 《沙特国王大学计算与信息科学期刊》, 2021, 33(1): 68–76.
[25] AL-SANASLEH H A, HAMMO B H. 领域本体构建：开发源自《古兰经》和圣训的先知本体经验\[C]// 2017年计算科学新趋势国际会议 (ICTCS), 2017年10月11日: 223–228. IEEE.
[26] AL-SAFADI R, DALLoul Y M. 构建圣训本体以支持链述真实性验证\[J]. 《计算机科学与技术中的伊斯兰应用国际期刊》, 2014年12月, 2(1): 25–39.
[27] IQBAL R. 苏菲主义领域的本体开发研究\[C]// 第四届机器视觉国际会议 (ICMV 2011), 2012, 8349: 834903.
[28] IQBAL R, MUSTAPHA A, MOHD YUSOFF Z. 开发带语境信息支持的《古兰经》本体经验\[J]. 《多元文化教育与技术期刊》, 2013, 7(4): 333–343.
[29] IQBAL R, MURAD M A A, ASHRAF A. 概念图在本体建构中的量化评估：以《古兰经》为例\[J]. 《Pertanika 科学与技术期刊》, 2020, 28(1).
[30] KAUSAR F, KANNAN D, MAMATHA T, AISHWARYA P. 面向大数据语义本体的元数据管理\[C]// 《数据科学与语义技术：部署与探索》, 2023: 35.
[31] KELTOUM B, NABILA N, DJAMEL M. 面向伊斯兰金融与银行的参考本体研究\[C]// 穆斯林世界信息与通信技术国际会议论文集 (ICT4M), IEEE, 2018: 74–79.
[32] LATIFF A S A, HARON H, ANNAMALAI M. 软件工程方法用于领域本体开发：以伊斯兰银行产品为例\[J]. 《信息检索与知识管理期刊 (JIRKM)》, 2017, 3: 36–53.
[33] LATIFF A S A, HARON H, ANNAMALAI M. 伊斯兰银行本体的特征与开发标准\[C]// 第三届信息检索与知识管理国际会议论文集 (CAMP), IEEE, 2016: 136–142.

[34] LATIFF A S A, HARON H, ANNAMALAI M. 非功能性本体需求规范：以伊斯兰银行领域为例\[C]// 信息与通信技术的可靠性国际会议论文集, Springer, 2018: 1100–1112.
[35] MATHUR I, MATHUR S, JOSHI N. 印度医疗保健领域的本体开发研究\[C]// 技术新趋势国际会议与研讨会论文集, ACM, 2011: 715–718.
[36] MONTERO JIMÉNEZ J J, VINGERSHOEDS R, GRABOT B, SCHWARTZ S. 用于维护策略选择与评估的本体模型\[J]. 《智能制造期刊》, 2023, 34(3): 1369–1387.
[37] MOSHARRAF M. 面向开放源码软件发布的语义模型\[J]. 《Aslib 信息管理期刊》, 2023, 75(4): 685–707.
[38] MATTHEWS J, LOVE P E, PORTER S, FANG W. 构建施工返工本体的挑战与实践经验\[J]. 《生产计划与控制》, 2024, 35(15): 2068–2083.
[39] MARTHINUS T, DARAMOLA O. 用于步态分析与疾病决策支持的领域本体\[J]. 《IEEE Access》, 2024.
[40] WĄTRÓBSKI J. 面向本体构建与管理的框架、工具与方法标准化研究\[J]. 《计算机科学丛书：会议论文集》, 2020, 176: 3345–3355.

Word count (excluding references): 6,672 words.

Peer-review record:
- *Fast-track status:* Not fast-tracked
- *First-round reviews received:* 3 reports
- *Revision cycles completed:* 3 rounds
- *Final version submitted:* May 24, 2025

Disclaimer/Publisher's Note:
The views, opinions and data expressed in this article are solely those of the authors and do not necessarily reflect those of the *Journal of Hunan University (Natural Sciences)* or its editors. The journal and its editorial staff accept no responsibility for any injury to persons or damage to property resulting from the ideas, methods, instructions or products discussed herein.