SEMAR: A CO-EVOLVING KNOWLEDGE ARCHITECTURE FOR REFLECTIVE INTELLIGENCE IN ACADEMIC ECOSYSTEMS

SEMAR (Sistem Eksplorasi Mandiri Referensi) redefines academic knowledge discovery by combining reflective exploration and semantic interoperability within a dual-layer AI architecture. It transforms static catalogs into meaning-centered and collaborative systems that learn from user interaction. Designed through a Design Science Research approach, SEMAR demonstrates how human cognition and machine intelligence can co-evolve—enabling more transparent, adaptive, and intelligent knowledge infrastructures in Indonesia's academic ecosystem.

UNIVERSITAS BUDI LUHUR

Authors
Tri Ika Jaya Kusumawati[1][0000-0002-3839-9040]
Nur Afrila Megawati[2][0009-0006-8465-6585]

Affiliations
[1] Fakultas Teknologi Informasi, Universitas Budi Luhur, Jl.Ciledug Raya, Jakarta Selatan
[2] Perpustakaan, Universitas Budi Luhur. Jl. Ciledug Raya, Jakarta Selatan

INTRODUCTION

As global knowledge expands, understanding how ideas interconnect becomes increasingly complex. In Indonesia, platforms such as SINTA, Garuda, and Indonesia OneSearch enhance access yet remain semantically fragmented. SEMAR (Sistem Eksplorasi Mandiri Referensi) offers a new approach, transforming static catalogs into reflective, collaborative, and semantically aware systems. By learning from user exploration and linking conceptual relationships, SEMAR connects personal and institutional repositories—advancing collaborative intelligence between humans and knowledge infrastructures.

OBJECTIVE

To design and validate SEMAR (Sistem Eksplorasi Mandiri Referensi)—a dual-layer AI-based catalog that enhances reflective exploration and semantic interoperability in academic ecosystems. The system aims to:

1. Transform conventional repositories into reflective, collaborative, and semantically aware environments.
2. Integrate micro-level user cognition with macro-level metadata interoperability.
3. Enable intelligent discovery, adaptive knowledge mapping, and collaborative information synthesis for academic users.

METHODOLOGY

This study adopts a Design Science Research approach through three stages:

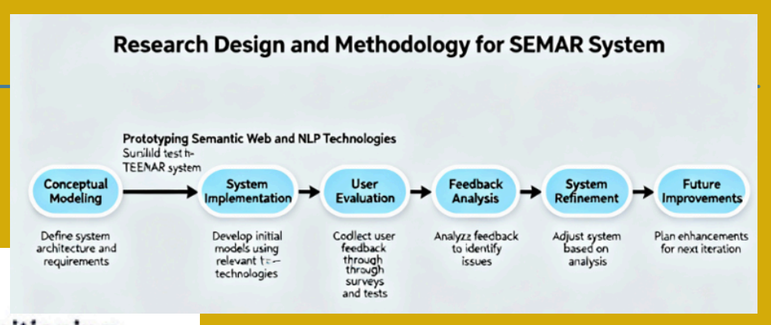
1. Conceptual Modeling – defines SEMAR's dual-layer structure (reflective micro layer + interoperable macro layer).
2. Prototype Development – builds a proof-of-concept using semantic web tools and ontology mapping.
3. Evaluation – involves expert review and user testing to refine visualization, ontology, and adaptive features.

RESULTS

The experiment involved 5 participants (3 librarians, 2 students):

- 100% found SEMAR valuable.
- 60% suggested adaptive display modes.
- 40% requested interactive query features (Ask SEMAR).
- 60% recommended machine learning refinement.

SEMAR demonstrated improved reflective exploration and semantic interoperability, overcoming conventional catalog issues such as weak grouping, limited keyword context, and rigid interfaces.

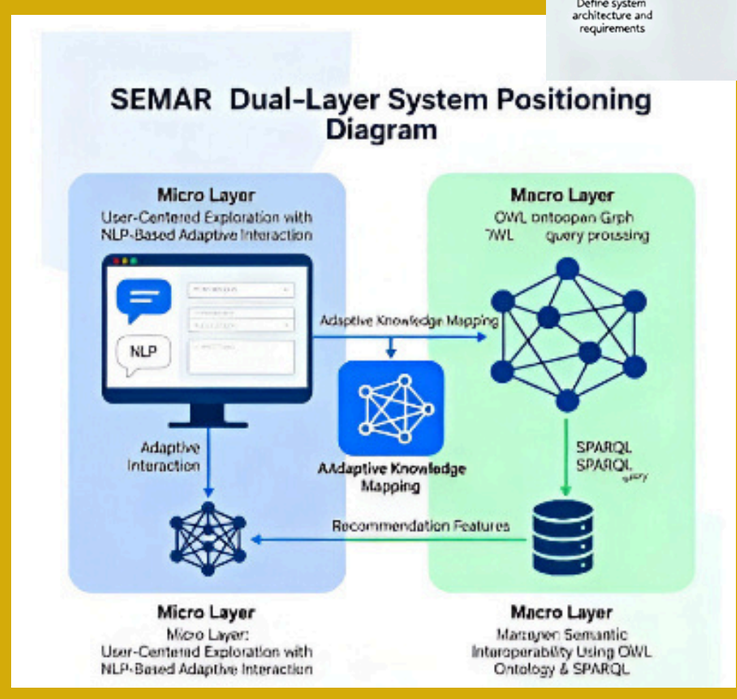


ANALYSIS

The experiment demonstrates that SEMAR's dual-layer architecture effectively links reflective user cognition (micro layer) with semantic interoperability (macro layer).

User interactions indicate that SEMAR not only improves search efficiency but also supports knowledge reflection and adaptive understanding.

These findings confirm SEMAR's role as a co-evolving knowledge architecture, where human interpretation and machine intelligence continuously refine one another—turning data exploration into a reflective, collaborative process.



RESOURCE

CONCLUSION

SEMAR demonstrates how AI-based reflective exploration and semantic interoperability can coexist within academic ecosystems.

Its dual-layer architecture bridges human cognition and machine intelligence, enabling more meaningful, adaptive, and collaborative knowledge discovery.

The system provides a scalable foundation for co-evolving academic infrastructures, showing potential to enhance how researchers connect, interpret, and expand ideas across repositories.

Related literature

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