Chapter 2
Digital Transformation Through Ontology Engineering: Implications for Inclusive Economic Development

Rachna Rana
Ludhiana Group of Colleges, Ludhiana, India

Pankaj Bhambri
https://orcid.org/0000-0003-4437-4103
Guru Nanak Dev Engineering College, Ludhiana, India

ABSTRACT

The chapter examines the essential function of ontology engineering in facilitating digital transformation and advancing inclusive economic growth. Ontology engineering, an essential component of the Semantic Web, facilitates the organization and standardization of intricate data, promoting interoperability among digital systems. This chapter analyses the role of ontology-based frameworks in facilitating equitable access to digital resources, especially in underserved areas. Ontology engineering is essential for democratizing technology developments by integrating data silos and fostering inclusive digital ecosystems. The chapter explores practical applications in fields including healthcare, education, and e-governance, emphasizing their capacity to promote socio-economic development. Moreover, it tackles the difficulties of implementing ontologies on a large scale and underscores the necessity of synchronizing digital transformation initiatives with objectives of social equality and economic inclusion.

DOI: 10.4018/979-8-3693-8477-0.ch002

INTRODUCTION OF DIGITAL TRANSFORMATION THROUGH ONTOLOGY ENGINEERING

Ontology is increasingly regarded as crucial facilitators of the digital transformation of knowledge management processes, but their adoption in industrial businesses remains low. Because ontologies and underlying technologies are complicated, Ontology Engineering Methodologies (OEMs) provide a framework for transitioning from an informal to a formal representation of the company's knowledge base. This study compares three agile OEMs, UPON-Lite, SAMOD, and Rapid-OWL, in terms of its process and end aspects, which include the OEM phases and the desired quality of the ontological models created. The evaluation is conducted from the perspective of developers of ontology-based solutions in real-world industrial use cases. The integration of artificial intelligence (AI) and machine learning (ML) with ontology engineering is revolutionizing digital transformation. Ontologies provide structured knowledge that enhances AI systems' ability to reason, learn, and make decisions. For instance, in healthcare, ontologies enable AI-powered diagnostic tools to interpret complex medical data accurately. Similarly, in finance, ontology-driven ML models improve fraud detection by contextualizing transactional data. Emerging technologies like blockchain and edge computing further expand the scope of ontology engineering, enabling secure, decentralized, and real-time knowledge sharing. These advancements underscore the transformative potential of ontology engineering in fostering innovation and inclusivity across sectors. The results reveal that the three agile OEMs have various qualities that successfully enable the digital transformation of enterprises' knowledge management; consequently, they cannot be interchangeable. UPON-Lite is more successful in environments where OE skills are lacking, requiring an organized strategy to engage domain experts and providing documentation. SAMOD necessitates a longer development period, but it includes numerous cycles that allow for the mapping of various forms of knowledge and the use of a “try-and-learn” strategy. Rapid-OWL, on the other hand, lacks a defined sequence of modeling operations and empowers developers to be creative, while also requiring more OE experience. The use of digital technology, as well as a vast volume of heterogeneous data and information, is revolutionizing many firms' decision-making and knowledge management process. Successful information, expertise, and data management is now more important than ever for a successful digital transformation, (Rattan, Bhambri, & Shaifali, 2005).

On the one hand, the creation of interoperable communication models is becoming increasingly important for businesses in order to formalize and exchange information generated by internal resources. On the other hand, digital technology may generate new types of information that give crucial alternatives and complementary insights to existing operations, as well as allow for more systematic exploration of