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LEVERAGING KNOWLEDGE GRAPHS IN AN ONCOLOGY INSTITUTE: AN INNOVATIVE APPROACH TO ORGANIZATIONAL OPTIMIZATION

HTA298

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INTRODUCTION

The increasing **complexity of healthcare systems demands innovative approaches** to effectively manage and analyze intricate organizational and clinical networks. Knowledge Graphs (KGs) have emerged as powerful tools in health informatics, offering a robust framework to model multifaceted relationships between diverse entities such as clinical departments, resources, and operational processes. Recent studies highlight KGs' potential to enhance organizational insight and support evidence-based decision-making (Peng et al., 2023 [1]). This study applies KG technology in the context of a specialized oncology hospital to simulate and analyze the **effects of structural and operational modifications**, thereby promoting a more transparent and data-driven approach to healthcare management.

OBJECTIVES

This project aims to **leverage Knowledge Graphs to improve the management and simulation of complex organizational data within an oncology hospital**. Through the integration of diverse data sources and the creation of semantically enriched models, the KG framework provides a comprehensive representation of organizational structures and their interdependencies, enabling more **accurate scenario simulations and facilitating strategic planning**. By presenting complex operational data in an accessible format, this approach enhances evidence-based management, supports the adoption of innovative technologies, and ultimately contributes to optimizing healthcare outcomes and strategic alignment with evolving health policies.

METHODS

The project developed a KG to model and represent **key entities within the hospital**, including organizational structures, activities, economic impacts, tools, scope, customers, and suppliers. The KG was constructed using the **Neo4j graph database**, and data visualization was achieved through NeoDash. Each entity was semantically linked using specific relationship types that captured the nature of their interactions.

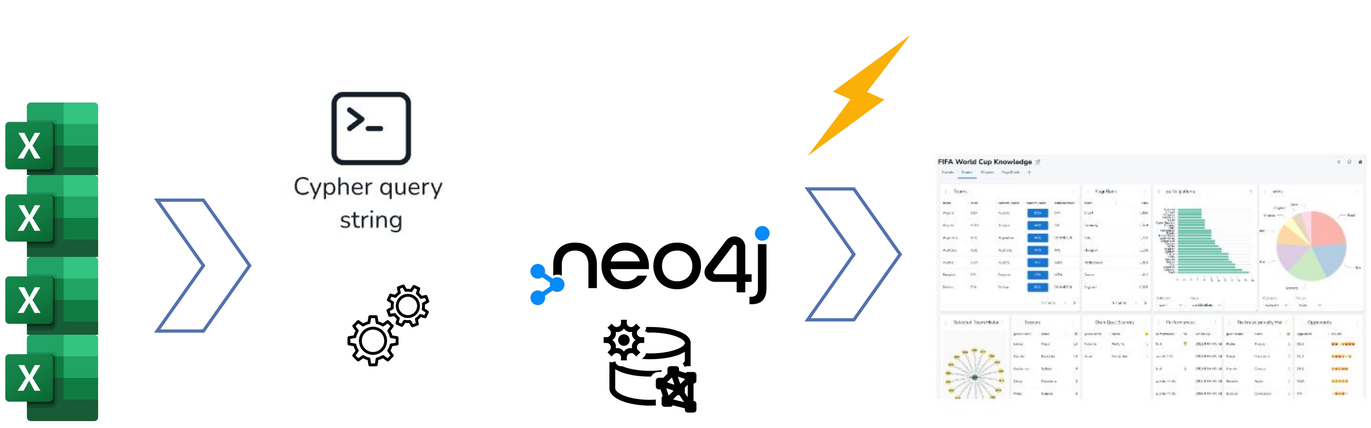

Fig. 1. Pipeline for Creating a Knowledge Graph in Neo4j with Dashboard Visualization in Neodash

The 'Technical Office' node is connected to activities such as 'Periodic property verification', 'Property purchase research', and 'Insurance management' through 'managed_by' relationships. Similarly, the 'Insurance management' activity is linked to the 'Institute' and 'damaged parties' as clients, and to the 'Insurance Department' and 'insurance brokers' as suppliers using 'provides_to' relationships. The 'Legal Area' node is connected to the broader organizational structure through a 'belongs_to' relationship.
The data for this activity was managed using **MS Excel and the internal organizational portal**, ensuring a structured and consistent format for integration into the KG framework.

RESULTS

A comprehensive KG was developed based on insights collected from organizational meetings involving 15 different groups within the hospital. The input data was structured into a single CSV file, capturing **270 distinct activities, 48 organizational units, 21 fields of application** (such as communication, planning, and budgeting), and 97 tools. The implementation of the KG enabled the simulation of multiple business scenarios, providing a robust framework for analyzing the **potential impacts of operational changes**. For instance, the adoption of a new digital tool, such as 'Google Suite', was found to potentially impact 59 activities, 8 business units, and 15 application areas. This highlights the capacity of the KG to support detailed impact assessments and guide strategic decisions in complex organizational settings.

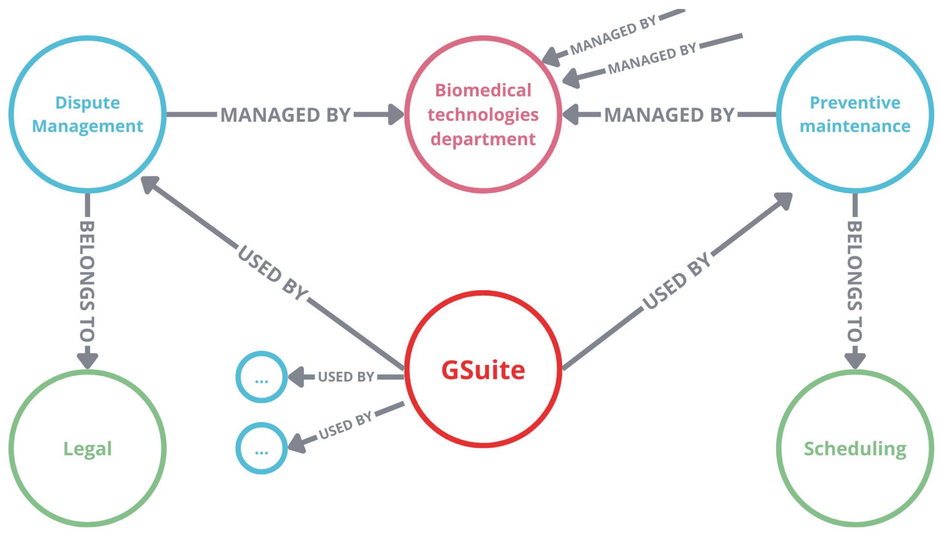

Fig. 2. Relations of the Gsuite tool with activities, business units and application areas.

CONCLUSIONS

The project demonstrates the significant **potential of using Knowledge Graphs** to model and simulate **value-generating business entities** within a healthcare organization. By leveraging graph technology and semantic relationships, the proposed approach provides a powerful yet intuitive tool to capture complex organizational interactions, enabling detailed scenario analyses. This capability not only enhances the understanding of business dynamics but also **supports evidence-based decision-making**, improving overall operational efficiency and resilience. Such an approach can be instrumental in optimizing resource allocation, **anticipating the impact of organizational changes**, and ultimately supporting more effective strategic planning in healthcare settings.

References

[1] JPeng, C., Xia, F., Naseriparsa, M., & Osborne, F. (2023). Knowledge Graphs: Opportunities and Challenges. Artificial Intelligence Review. DOI: 10.1007/s10462-023-10465-9

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