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Intelligent competency mapping for improving knowledge management in consulting firms

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Abstract

This study explores the application of competency mapping models, incorporating in knowledge management for consulting firms. It evaluates 15 different models, focusing on their suitability for consulting contexts based on data collection, advantages, risks, and limitations. The findings indicate that AI and ML-enhanced competency mapping models are particularly more effective in consulting firms. Finally, the article proposes three key applications of these models for improving knowledge management in consulting firms via empowering communities and collaboration.

Keywords: knowledge management, data-driven design, competency mapping, consulting firms

1. Introduction

In today's rapidly evolving landscape of technology and the internet, the pace of learning has accelerated, and competencies hold unprecedented value for companies, particularly in the context of knowledge-intensive processes and organizations, such as design teams and consulting firms, with their inherent knowledge-driven approach. The pivotal asset for design teams and consulting firms lies in the expertise and knowledge of their consultants (Sarvary, 1999). When a consultant embarks on a mission, the consulting firm relies exclusively on that individual's knowledge to navigate challenges and build trust within the client's office.

However, a groundbreaking solution exists to amplify the consultant's capabilities and seamlessly overcome any hurdles encountered during their mission. This solution involves the implementation of a robust knowledge management (KM) system, a tool designed to empower consultants by fostering the seamless exchange and acquisition of knowledge within the firm (Mirafzal et al., 2022). By cultivating a collaborative environment where insights are readily shared and acquired, this system becomes a catalyst for enhanced problem-solving, efficiency, and, ultimately, success in client engagements (Alavi and Alavi, 1997). Embracing a proper knowledge management system emerges not only as a strategic advantage but as an indispensable mechanism for consultants to thrive collectively in the dynamic realm of consulting.

Moreover, in any organization, figuring out what your employees know and can do, called competency mapping, leads them to increase efficiency. Thus, competency maps are used by the human resource (HR) department or the folks who bring in new talent (Chouhan and Srivastava, 2014). There are not many examples in the studies about how to use competency mapping to boost how knowledge management works. So, in this study, the authors talk about how competency mapping, or let us call it competency maps, is a tool that can make knowledge management work better in consulting firms by

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empowering groups that share knowledge, called communities of practice, and empowering collaboration.

So, in this study, the authors try to answer these three main questions:

1. What competency mapping methods exist in the literature?
2. What is (are) the best competency mapping method(s) fitted to knowledge management in consulting firms?
3. How can (intelligent) competency mapping improve knowledge management in consulting firms?

In the second section of this article, the authors focus on the literature on competency mapping methods and their case studies in KM. In the third section, the authors argue their methodology to overcome this study. In the fourth section, the authors showcase the study's results. In the fifth section, the authors propose a new approach to using one of the competency mapping methods to create communities of practice and accelerate collaboration and knowledge gain. In the last section, the authors argue through all the accomplishments of this article and wrap it up by highlighting the extra benefits and knowledge gained.

2. Literature review

Competency mapping methods help companies identify and analyze their employees' knowledge, skills, and capabilities. Also, it is a way of presenting companies' competency and identifying improvements. Therefore, it seems rational to use competency maps as a tool to pace up knowledge management. In this section, this article demonstrates the literature on competency mapping methods and their case studies.

2.1. Literature review on competency mapping methods

Competency mapping is a methodical approach aimed at recognizing and evaluating the necessary skills, knowledge, abilities, and behaviors for effective performance in an organization or a particular role. Its goal is to develop an all-encompassing structure that synchronizes individual competencies with the objectives of the organization (Chouhan and Srivastava, 2014; Shiohira, 2021). The beginning of competency mapping comes back to the 1970s when McClelland (1973) proposed to focus on competency instead of employees' intelligence. In the study, he recommends thoroughly examining the specific skills needed for the job at hand instead of examining intelligence scores to improve employees' careers. McClelland's approach to collecting data about people's competency (skills) was simply conducting interviews.

Throughout history, other competency mapping methods have been proposed and examined in different fields of study, primarily human resource management. For instance, Hecklau et al. (2016) use competency mapping as a tool for employee qualification in their work. Competency mapping has been used for other objectives as well. Kipper et al. (2021) argue an out-of-the-box approach of using competency mapping to predict required skills and competencies for Indstry4.0 problems. They carried out a review of existing literature to pinpoint relevant competencies for Industry 4.0. The results underscore the significance of both technical and non-technical competencies for achieving success in Industry 4.0.

Indeed, KM studies have also delved into the arena, with some endeavors attempting to apply competency mapping to address KM challenges. Almost in every KM study, knowledge as an asset to the organization has been argued, especially in consulting firms that are, by nature, knowledge sellers (Mas-Machuca and Martínez Costa, 2012). Therefore, if the main asset of an organization is its employees' knowledge, it would seem crucial to know precisely about their assets in order to better strategize for the future business of the organization. Hence, competency mapping is essential to find the gap between what knowledge the organization must have and what the actual state of knowledge in the organization is (Soliman and Spooner, 2000). Studies also show that not only competency mapping helps KM systems perform better. However, KM practices will also help the competency development of employees in a firm, which totally makes sense. According to Lustri et al. (2007), KM practices provide competency development improvements as well as reduce the time to learn for the participants in competency development. Clearly, there is a two-way relationship between KM and competency mapping.

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2.2. Intelligent competency mapping models

Intelligent competency mapping models are systems that incorporate AI and ML into traditional competency mapping. These models use AI tools to more accurately identify and align individual skills and behaviors with organizational goals. This approach enhances the precision and efficiency of competency mapping, making it a more thoughtful, data-driven process (Gruber, 2005).

Fareri et al. (2021) propose a new competency mapping model called SkillNER for extracting soft skills from resumes using named entity recognition (NER) and machine learning (ML) algorithms. The SkillNER model offers a valuable tool for companies to pinpoint the soft skills of job candidates, evaluate skill gaps, and enhance talent management. Researchers also use competency mapping for their work. In order to map employees' competencies, they use radar charts to visualize their mapping. In another work, Bernabé-Moreno et al. (2019) propose natural language processing (NLP) and semantic matching as powerful methods to extract skills for any job automatically in order to empower human resource management.

These studies underscore the hypothesis presented in this article, advocating the significance of competency mapping as a tool for communities of practice within consulting firms to enhance KM. As highlighted earlier, there have been notable instances where AI or ML applications have been incorporated into competency mapping models. These models, which the authors refer to as "intelligent competency mapping models" in this article, demonstrate the promising potential for AI-based models to integrate with KM systems seamlessly.

In doing so, in this article, first, the authors examine different competency models to identify whether an intelligent competency mapping model performs better than a simpler one or not. Then, the authors tackle the challenge of integrating intelligent competency mapping models as an intelligent tool in KM in order to help KM in performance.

3. Methodology

This section tries first to compare available competency mapping models existing in the literature and then propose an approach in which intelligent competency mapping models could cooperate with KM models in order to enhance the KM's performance. Therefore, the authors scanned through scholars and selected articles from 1983 to 2022 containing the keywords: ("competency mapping" OR "competency management") AND (methodology OR method OR model OR modeling). Google Scholar served as the central article database for this study.

For analyzing the articles, the authors used a table-based technique, where they established separate columns for each article. This method allowed the authors to methodically summarize critical features of each article, including the summary, publication date, keywords, theme (which contains the main points elaborated on in each article), and conclusions. Employing this approach helped the authors concentrate on the most vital information in each article and eliminate irrelevant studies for the sake of this research. As a result, 15 competency management/mapping models were selected after a thorough analysis.

For further comparison of selected models, the authors decided to analyze each model's associated risk, limits, advantages, and data collection method. These 15 models are demonstrated in the table below.

Table 1. Competency mapping models examined in this study

Article Name	Reference	Article Name	Reference	Article Name	Reference
An Automatic Skills Standardization Method Based On Subject Expert Knowledge Extraction And Semantic Matching	(Bernabé-Moreno et al., 2019)	Competency Mapping – A Drive For Indian Industries	(Yuvaraj, 2011)	Construction Of The Competency Model Of The Chief Quality Officer-Based On The Iceberg Model	(Jiang and Gu, 2021)

Holistic Approach For Human Resource Management In Industry 4.0	(Hecklau et al., 2016)	Competency Mapping In Knowledge-based Organizations	(Kansal et al., 2012)	Scientific Mapping To Identify Competencies Required By Industry 4.0	(Kipper et al., 2021)
Building The Knowledge Map: An Industrial Case Study	(Kim et al., 2003)	Contribution a La Modélisation De La Compétence	(Boumane et al., 2006)	Skillner: Mining And Mapping Soft Skills From Any Text	(Fareri et al., 2021)
Knowledge Management Model: Practical Application For Competency Development	(Lustri et al., 2007)	Hope – Holistic & Objective Psychometric Effectiveness In Competency Mapping	(Dutta and Sreenidhi, 2017)	Employability Skills: Profiling Data Scientists In The Digital Labor Market	(Smaldone et al., 2022)
Strategies For Implementing Knowledge Management: Role Of Human Resources Management	(Soliman and Spooner, 2000)	Mapping Knowledge Networks In Organizations: Creating A Knowledge Mapping Instrument	(Lutters et al., 2000)	A Conceptual Model For Organizational Competences	(Hammouch et al., 2021)

As mentioned above, in order to analyze the selected models, the authors set some indicators for associated risk for methods, limits of the methods, advantages of methods, and finally, data needed to be able to trigger the competency mapping. Table 2 illustrates each and every indicator and the reasons why they are essential to this study.

Table 2. Analysis indicators

Aspects	Indicators	Justification	Importance to KM in consulting firms
Data collection:	Individuals' or collective competency	Focusing solely on collective competency might miss valuable information about consultants' capabilities.	KM systems in consulting firms focus on capitalizing on individuals' tacit knowledge (Alavi and Leidner, 2001).
Advantages:	Helps competency development	Aligns competency mapping with actual work requirements, identifying skill gaps and informing targeted training programs.	KM tries empowering consultants to acquire and share relevant knowledge, strengthening the expertise and value proposition of the firm (Davenport and Prusak, 1998).
	Ease of use or simplicity	Reduces implementation barriers and encourages wider adoption within the firm.	KM should increase knowledge contribution and sharing by making the process accessible and user-friendly for consultants (Alavi and Leidner, 2001).
	Flexibility of the model	Adapts to the evolving needs of the firm and industry, ensuring competencies remain relevant and meaningful.	The model should be flexible for easy adoption in KM systems.
Risks:	Hidden competencies	Some critical knowledge or skills might not be explicitly captured, leading to gaps in understanding and development.	Consultants' expertise is often hidden from consulting organizations (Alavi and Leidner, 2001).
	Loss/miss of competencies	Changes in the industry or firm's focus may render some mapped competencies obsolete, leading to wasted resources and outdated knowledge.	KM in consulting firms needs continuous alignment with the current state, optimizing knowledge sharing and development efforts (Nonaka and Takeuchi, 1995).

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Limits:	Time-consuming	Implementing and maintaining the competency mapping process requires dedicated time and resources.	The model should not take time to be implemented as KM implementation is a time-consuming project by itself (Alavi and Leidner, 2001).
	Requires a large number of data	Gathering and analyzing data can be resource-intensive depending on the chosen model and desired level of detail.	The model should be adopted for any type of consulting firm, large, medium-sized, or small consulting firm.
	Requires model-specific training	Learning a new system can add an initial burden, potentially delaying implementation and adoption.	The model should not take time to be implemented as KM implementation is a time-consuming project by itself (Alavi and Leidner, 2001).
	Cost	The implementation and maintenance of the competency mapping process can incur expenses for software, training, and personnel.	Effective knowledge management often leads to cost savings and revenue growth, ultimately justifying the initial investment (Mas-Machuca and Martínez Costa, 2012).
	Accessibility of needed data type	The chosen model might require specific data types that are difficult or expensive to obtain, hindering comprehensive competency mapping.	Consultants are out of the consulting firm's office most of the time. Thus, accessing data for competency mapping is less likely through in-person intervention (Mirafzal et al., 2022).

In the table provided, all four aspects deemed crucial during the authors' analysis are detailed, along with their specific indicators. Each indicator within the table has been chosen to offer insights into how effectively a model can capture and utilize the knowledge and competency assets within a consulting firm. The ultimate goal is to identify the model best suited for implementation in a consulting firm's KM system, enabling better knowledge capture, sharing, and development among consultants.

Analyzing the data collection method helps assess how easily and comprehensively the model gathers individual and collective expertise within the firm. Moreover, despite its apparent simplicity, competency mapping encounters several limitations. Some models demand significant time, resources, and costs. Additionally, the complexity of competency models might require specialized teams or organizational training for implementation. Moreover, depending on the required data type, competency mapping models may have limited applicability across diverse organizations.

In the subsequent section, the authors present their findings and propose an approach to implement intelligent competency mapping models to enhance the performance of knowledge management.

4. Results

The authors in this study try to propose a new approach to utilizing competency mapping in KM for organizations, especially for communities of practice in consulting firms. Thus, it is worth to have a brief study of what consulting firms might need for their communities. According to Mirafzal et al. (2023) and their experiment on communities of a consulting firm, consultants often prefer to reach out to another consultant to ask their questions and solve their problems in a concept of collaboration. Even though cultural issues in consulting firms are the main reason for consultants' unwillingness to share their knowledge and collaborate with others (Lam, 2005), the authors believe that by facilitating collaboration between consultants, these kinds of problems could be solved.

This section first enables the readers and researchers to distinguish why intelligent competency mappings are the answer for consulting firms and then to understand how intelligent competency mappings help communities.

4.1. Identified intelligent competency mapping models

Among all these 15 competency mapping models, there are two models, per se: "An Automatic Skills Standardization Method Based On Subject Expert Knowledge Extraction And Semantic Matching" and

"SkillNER: Mining and mapping soft skills from any text," which are considered intelligent models as said in this article the intelligent models are one using AI and ML solutions.

4.2. Synthesis of results

The "Automatic Skills Standardization" model proved effective, meeting 10 out of 12 criteria in our study. It exemplifies intelligent competency mapping, which is notably adept at extracting skills from readily available documents in consulting firms, a process more efficient than traditional methods like interviews. These models standardize competencies across positions and are adaptable, allowing for automated and customizable applications suitable for various organizational needs and training programs. While versatile and cost-effective, a potential drawback is a need for specialized teams for implementation and the risk of missing nuanced skills, as seen with models like SkillNER that focus on soft skills extraction. Figure 1 demonstrates how each competency mapping model satisfies the authors' indicator in this study. The first outcome will be the fact that all competency mapping models are relatively suitable for improving KM in consulting firms. However, as mentioned earlier, the intelligent competency models serve better in this regard.

Figure 1. Comparison result

5. Proposition of a new approach

In the fast-paced consulting sector, competency mapping and AI tools have been integrated in many cases. Wu et al. (2012), for instance, propose a novel approach of using two different knowledge graphs: a knowledge map that identifies knowledge within documents, such as lessons learned, and a knowledge holder map, or experts map, that holds competency of experts and serves as what in this study is called competency map. Other studies only present the application of text and data mining as an AI tool in knowledge management(Alghanemi and Al Mubarak, 2022). In this study, the authors propose an integrated approach that combines intelligent competency mapping with knowledge management practices to foster growth. This method utilizes AI to build communities, personalize training, and facilitate the finding of expertise, amplifying growth, development, and client service (Figure 2).

Community Building:

According to (Bobrow and Whalen, 2002), communities are one of the most reliable places for consultants to overcome problems collectively. Due to the absence of consultants in the consulting firm's office, it is relatively complex for consulting firms to engage consultants in KM activities. Intelligent mapping, constructed using clustering methods, aligns consultants with similar skills, forming communities and fostering a collaborative environment that bolsters collective knowledge and expertise.

Training Allocation:

The system can employ regression analysis to pinpoint and address specific training requirements, thereby elevating the proficiency of consultants in pivotal aspects of their work and augmenting the organization's knowledge assets.

Referential Knowledge Tool:

This mapping functions as an interactive tool, allowing consultants to submit inquiries about their needs and promptly receive a curated list of in-house experts, streamlining the search process and enhancing the efficiency of problem-solving and decision-making.
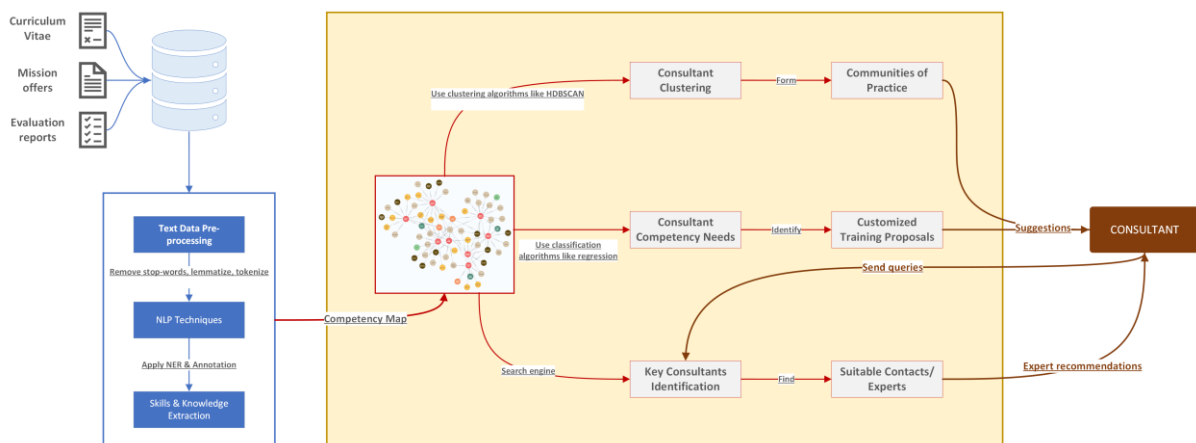

Figure 2. The new framework for competency mapping integration in KM

6. Conclusion

This article underscores the pivotal role of intelligent competency mapping models, which leverage AI and ML, in enriching knowledge management and CoPs in consulting firms. Our comprehensive review and comparison of 15 models affirm that AI-enhanced mapping is particularly apt for the nuanced requirements of consulting contexts. The advocated practices of Community Building, Training Allocation, and creating Referential Knowledge Tools demonstrate the transformative impact these models hold for CoPs and KM processes. Notably, intelligent models are shown to boost efficiency and adaptability in the dynamic technological landscape significantly.

Acknowledging a limitation of this study, the lack of empirical research or case studies is an area poised for future investigation. The research questions posited at the onset were systematically addressed: The literature review tackled the existing competency mapping methods; the comparative analysis determined that, while all competency mapping methods can enrich KM, intelligent models excel in

efficiency and adaptability; and the new proposition section illustrated how intelligent competency mapping can substantively elevate KM in consulting firms.

Moving forward, the authors propose that KM should guide AI tools towards naturally incorporating knowledge-oriented practices rather than knowledge engineers forcing the integration of AI into KM frameworks regardless of fit.

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