Radboud University

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Master Thesis

Enhancing Project Allocation Processes at atrain through Competency Mapping: A Structured Literature Review about the Competency Mapping Steps and Methods

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Abstract

In today's dynamic labor market, project-based organizations face the challenge of effectively aligning project demands with the competencies of employees or external facilitators. This thesis explores the role of competency mapping in enhancing project allocation processes, focusing on atrain, a company managing diverse Human Resources (HR) projects. While existing competency mapping frameworks are abundant, they often lack the specificity required for project-based organizations with unique and dynamic needs.

Using a Structured Literature Review (SLR), this study examines competency mapping steps, methods, and practical suggestions to tailor competency frameworks for atrain's nine distinct project profiles. The results section synthesizes insights to address gaps in aligning competencies with project demands, offering actionable applications for developing flexible and dynamic competency frameworks. Key findings emphasize the importance of iterative validation, project specific KSAO analysis, and the integration of computational tools for scalability.

This thesis contributes to both theory and practice by proposing a structured yet adaptable approach to competency mapping for project-based organizations. The developed summary plan aims to optimize project allocation, ensuring facilitators are matched with roles that maximize their potential, ultimately enhancing project outcomes and organizational efficiency. The study also identifies limitations in current research and suggests future directions, including empirical validation of the summary plan and exploring competency mapping across other industries.

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1. Introduction

In today's labor market, characterized by increasing job complexity, allocating a project with specific competency requirements to someone who possesses matching Knowledge, Skills, Abilities, and Other characteristics (KSAOs) is essential for maximizing project success and ensuring organizational efficiency. (Azadegan & Kolfschoten, 2014; International Labour Organization, 2020). A crucial aspect of the project allocation process is the understanding and clear documentation of the KSAO requirements of that project, whether these projects involve tailored leadership development programs, customized training initiatives, or consultancy projects aimed at organizational transformation and team effectiveness (Hickey, 2020). Unfortunately, many organizations neglect the critical importance of clear and detailed project requirement analysis, leading to a project employee mismatch that impacts employee performance and organizational efficiency (Caldwell & O'Reilly III, 1990).

The need for a well-functioning project allocation process is particularly pronounced in the case of atrain, a company that relies heavily on external facilitators (employees) to deliver Human Resources (HR) projects. The competencies these external facilitators possess are less well known to atrain than the competencies of their own employees. Therefore, allocating projects to these external facilitators is more challenging. At atrain, projects are typically client-specific, goal-oriented initiatives designed to address organizational challenges related to leadership, collaboration, and personal development. These projects often involve short-term interventions, workshops, coaching trajectories, or long-term partnerships supporting strategic change processes. Atrain's HR projects span nine distinct project profiles: Leadership Development Journeys, Talent Selection & Onboarding, Coaching, Performance Management, Change Management, Team Development, Diversity & Inclusion, Employee Engagement, and Cultural Transformation (atrain, 2024). Given the diversity and unique requirements of these projects, along with the limited understanding of the competencies of the external facilitators, understanding the specific competency needs of each project becomes vital for effective project allocation.

A recent case study by Meijer and Vale (2024) attempted to address this challenge by applying a general competency mapping framework to project allocation at atrain (Pundkar, 2017; Uddin, Tanchi & Alam, 2012). While this framework helped identify desirable competencies for working at atrain in general, it fell short in specifying the unique competency requirements for each of the nine HR project types. Meijer and Vale (2024) recommend the development of detailed competency mapping frameworks tailored to each HR project type to improve the accuracy of project allocation and ensure facilitators possess the most suitable competencies, thereby maintaining high-quality training deliveries, competitiveness, and productivity (Investopedia, 2023).

Research has extensively developed various competency mapping frameworks, such as the Lominger Competency Model and Clifton Strengths (AIHR, 2024). However, these generic frameworks often lack the specificity required by project-based organizations with distinct and varying project needs, such as atrain. For such organizations, developing tailored competency mapping frameworks becomes essential. This process involves identifying the specific Knowledge, Skills, Abilities, and Other characteristics (KSAOs) needed for each project to

enable more accurate project allocation (Pundkar, 2017; Uddin, Tanchi & Alam, 2012; Meijer & Vale, 2024).

In project-based organizations, competency mapping is particularly important because of the temporary and dynamic nature of projects. Unlike traditional vacancy filling, which focuses on long-term employment and matching a candidate's skills to a permanent role, project allocation requires the precise matching of specialized competencies to short-term needs. This approach ensures that resources are allocated based on immediate project requirements, rather than long-term fit. Developing a competency mapping framework specific to atrain's various project types is therefore critical to improving team performance, project delivery satisfaction, and overall success rates (Pundkar, 2017).

Building on the work of Meijer and Vale (2024), this thesis aims to enhance the project allocation process at atrain through a structured literature review. By comparing competency mapping methods, steps, and suggestions literature, this study will provide applications on how a project-based organization like atrain can best analyze their specific KSAO requirements for each distinct project type, enabling atrain to create nine competency frameworks tailored to their distinct HR project types. This approach will ensure that projects are allocated to facilitators who possess the most suitable competencies, thereby improving project outcomes and organizational efficiency.

The research gap identified in this thesis centers on the need for a comprehensive review of competency mapping literature, specifically its application within project-based organizations like atrain. While existing literature on competency mapping provides some insights, there is an apparent lack of a detailed structured review of the underlying steps and methods/techniques used to analyze project-specific requirements. Most of the current literature focuses on generic, premade competency mapping frameworks, which do not address the unique needs and dynamics of project-based organizations. Because of this project-based organizations cannot make efficient use of competency mapping. Moreover, competency mapping is typically applied in recruitment and selection contexts, overlooking its relevance for existing employees and the allocation of diverse project types. To fill this gap, this study offers a specific summary plan in the conclusion for analyzing competencies tailored to distinct project types, ensuring facilitators are matched to projects based on the most suitable competencies.

The identified research gap regarding literature about competency mapping for project-based organizations is so significant that there was no literature found (table 3.5) regarding the specific use of competency mapping for project allocation, making it difficult to find studies that meet the inclusion criteria for a structured literature review on this topic. To overcome this, the scope of the review will be broadened to include how competency mapping is used to determine job competency needs in areas such as succession planning, reward management, HR planning, job analysis, recruitment, placement, performance management, and training & development (Anthony & Madhumitha, 2018). The insights gained from this broader approach will provide essential applications for developing a summary plan for project-specific competency frameworks in project-based organizations, helping to optimize the allocation of projects to facilitators.

To contribute to addressing the research gap, the following research questions will be explored:

1. What does current literature say about competency mapping steps, methods/techniques, and suggestions for project-based organizations?
2. How can tailored competency frameworks be designed for project-based organizations through the systematic application of steps, methods/techniques, and suggestions aligned with their unique needs?

This thesis aims to significantly contribute to both the academic literature and the practical field of project management, particularly in the context of competency mapping and project allocation in project-based organizations. Competency mapping is a systematic process that can be used for identifying the specific knowledge, skills, abilities, and other characteristics required for effective performance in a particular role or job function (Azadegan & Kolfschoten, 2014; Yuvaraj, 2011).

The study will enhance the theoretical understanding of competency mapping by conducting a structured literature review that synthesizes existing knowledge and provides a comprehensive analysis of competency mapping literature, specifically looking at competency mapping methods/techniques and underlaying steps. For example, different methods like: Assessment/development centers, job observation, psychometric testing, 360-degree feedback, behavioral interviews, competency questionnaires, and expert panels**.** Each of these methods can be used in a unique way throughout the competency mapping process to assess competency requirements for a project type or competencies of a facilitator. The competency mapping process consists of steps like job analysis, identifying core competencies, building a competency mapping model, worker competency assessment, gap analysis, and validating the competency framework. Additionally, the research will, critically analyze the strengths and limitations of these competency mapping methods to determine their suitability for organizations that work with different project types. This theoretical contribution will expand the academic discourse on competency mapping by addressing the specific needs and challenges of project-based organizations, which are often overlooked in current literature.

On the practical side, this research will give a summery plan on how to determine detailed competency frameworks for each of atrain's nine distinct HR project types, utilizing the insights form the competency mapping methods, steps, and suggestions. These tailored competency frameworks will enable atrain to optimize its project allocation process by accurately matching external facilitators with specific project requirements, thereby enhancing project outcomes and organizational efficiency. Furthermore, the study will offer actionable applications for project-based organizations on creating and leveraging competency mapping frameworks, providing a practical blueprint for improving project allocation processes. By addressing the unique dynamics of project-based organizations and employing a structured literature review methodology, this thesis aims to fill a critical gap in the literature and contribute valuable insights to both theory and practice in competency-based project management.

The remainder of this thesis is structured as follows:

Chapter 2: Scope

This chapter defines the boundaries of the research, focusing on competency mapping within project-based organizations, particularly related to short-term demands for dynamic projects. It introduces key definitions and clarifies the inclusion and exclusion of key points. In this way making the thesis applicable to project allocation while excluding traditional, long-term employment applications.

Chapter 3: Methodology of Assessing and Ordering Literature

This chapter outlines the structured literature review methodology used to gather literature (data). It explains the search process, inclusion/exclusion criteria, and adjustments made to address the lack of specific literature on competency mapping for project-based organizations by incorporating broader HR contexts.

Chapter 4: Analysis and Categorization of Research Literature

This chapter describes the process of categorizing and synthesizing the collected data into key themes: competency mapping steps, methods/techniques, and practical suggestions. These themes serve as the foundation for developing tailored competency mapping frameworks for project allocation.

Chapter 5: Results

The findings are divided into three sections:

- **Competency Mapping Steps:** A detailed synthesis for implementing competency mapping, including steps such as job analysis, competency identification, and gap analysis.
- **Methods/Techniques:** Evaluation of tools like 360-degree feedback, interviews, and assessment centers, and their application in project-based contexts.
- **Suggestions:** Applications for optimizing competency mapping, including the use of IT tools and the development of clear, adaptable competency models.

Chapter 6: Conclusions

This chapter presents a summary plan derived from the findings, offering practical guidance for implementing competency mapping in project-based organizations. It outlines what tailored competency frameworks look like when steps, methods/techniques and suggestions are systematically applied for project-based organizations.

Chapter 7: Reflection

This chapter addresses the broader implications of the research:

- **Discussion:** Highlights distinctions between traditional competency mapping and the project-specific framework developed in this thesis, focusing on flexibility, dynamic methods, and computational tools.

- **Recommendations:** Guidance and suggestions for researchers to explore future applications and test the efficacy of tailored frameworks.
- **Limitations:** Discusses the narrow focus on HR projects at atrain, the lack of empirical testing, and challenges posed by the limited availability of project-specific competency mapping literature.

2. Scope

2.1 Introduction

The recent case study by Meijer and Vale (2024) led to a focus on competency mapping methods and the underlying competency mapping steps, forming the foundation of the structured literature review. Additionally, more general suggestions about competency mapping were identified in the literature, leading to the inclusion as a separate category. The structured literature review aims to assess how competency mapping can be effectively applied to project-based organizations and these suggestions help with that.

2.2 Definitions

Two important aspects for having a successful competency mapping process are the steps and methods/techniques (Azadegan & Kolfschoten, 2014; Yuvaraj, 2011).

The steps in competency mapping provide a structured approach to ensure that the right competencies are identified and applied effectively. These steps generally include conducting a job analysis to understand the role's requirements, identifying the relevant competencies, and then organizing them into a competency model. Once the competencies are established, the next step is to assess the current workforce against the competency model to determine alignment or identify gaps. The last step is to validate and refine the competency model to ensure it meets the organization's needs and can be applied consistently across various functions, such as recruitment, project allocation, and employee development (Brandao & Bahry, 2005).

The methods/techniques refer to the various approaches used to gather data and assess competencies. These typically include qualitative and quantitative tools designed to evaluate individuals' competencies and determine project competencies requirements. Methods/techniques may involve feedback mechanisms, structured assessments, or observational techniques. These methods and techniques help ensure that the competency mapping process is thorough, objective, and aligned with project goals (Brandao & Bahry, 2005).

The suggestions' part refers to general useful remarks for applying competency mapping. Some examples of these suggestions are focused on how to formulate and create the right competencies (Brandao & Bahry, 2005). While others focus on the use of IT to make competency mapping more successful (Rout, Misra, & Samanta, 2015).

2.3 Scope of this research

This research will include an analysis of different competency mapping methods/techniques, suggestions, and steps within a broader competency mapping context, this will be discussed in depth in chapter 5. Due to the lack of specific literature on competency mapping for project allocation, the scope of the analysis will include how competency mapping is traditionally used for long-term recruitment and its applications in areas such as succession planning, reward management, HR planning, job analysis, recruitment, placement, performance management, and training & development. These broader contexts will be covered in the results sections with a critical review on applicability for project-based organizations, to extract insights that can inform competency mapping practices.

However, the conclusion section will explicitly focus on competency mapping for project-based organizations. It will not cover application of competency mapping for long-term employment, as this area falls outside the scope of this thesis. The results will center purely on how competency mapping can be adapted to project allocation in short-term, dynamic environments, ensuring that the right competencies are matched with the specific demands of each project. This narrowed focus will provide targeted guidance for improving project facilitator matching processes, rather than addressing long-term recruitment for organizations overall.

3. Methodology of Assessing and Ordering Literature

3.1 Structured Literature Review

This thesis employs a Structured Literature Review (SLR) as the primary research methodology to investigate competency mapping steps, methods, and suggestions. These insights are used to provide practical applications for project-based organizations, such as atrain. The SLR approach is particularly well-suited for this study as it ensures an organized process for reviewing literature while maintaining the flexibility necessary to adapt to the complexity of the research context. Unlike a Systematic Literature Review, which is characterized by more strict and rigid protocols primarily suited for answering narrowly defined research questions, a Structured Literature Review offers a more adaptable framework. This flexibility allows for a broader and more interpretative synthesis of literature, which is essential for exploring the context-specific field of competency mapping in relation to project-based organizations (Armitage, 2007). By structurally identifying, categorizing, and analyzing relevant studies, the Structured Literature Review in this thesis ensures a thorough exploration of existing research while emphasizing practical relevance and actionable outcomes. This methodology supports the development of targeted applications for enhancing project allocation processes at atrain, aligning theoretical insights with organizational needs.

3.2 Conducting the Assessment and Ordering

This study employs a Structured Literature Review (SLR) rather than a traditional Systematic Review, however key principles from the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were applied to ensure a transparent, reproducible, and systematic approach (Moher et al., 2009). The methodology aligns with the four key PRISMA stages, integrated into the specific steps outlined in the table sections 3.1, 3.2, 3.3, and 3.4 of this thesis.

According to the PRISMA methodology the initial step (identification) involved conducting extensive searches across three databases to gather a broad range of studies related to competency mapping for project-based organizations (Moher et al., 2009). However, this yielded very low outcomes. That is why there was chosen to focus more broadly on competency mapping in general. Two digital libraries for scientific papers are used Web of Science and Business Source Complete, since both are well known, for their various filters and peer-reviewed articles which helps in simplifying the structured search. Because the number of found articles is low also Google Scholar was included to increase the number of found articles. In Google Scholar, the filter reviewed articles is applied. So, in total three sources for data extractions are chosen:

- Web of science
- Business Source Complete
- Google Scholar

The plan for the data extraction is to firstly gather as many different studies and articles as possible related to steps, methods/techniques, and suggestions for competency mapping. The first search strings were defined in table 3.2a, 3.2b, 3.2c constructed from a set of keywords, presented under primary and secondary keywords, in table 3.1. Initially, the decision was made

to include keywords related to both skill mapping and competency mapping because these terms are often used interchangeably in certain academic and professional literature.

Table 3.1: Keywords Used When Creating Query Strings

Primary Keywords	Secondary Keywords
Competencies Mapping	Job analysis
Competence Mapping	Project assessment
Competency Mapping	Project analysis
Skills Mapping	Project
Skill Mapping	

Table 3.2a: Search strings used when searching for articles on Web of Science

1	All Fields "Competenc* mapping" OR "Skill* mapping" And Topic "Project assessment" OR "Project analysis" OR "Job analysis" OR “Project”	Results 27
2	All Fields "Competenc* mapping"	Results 104

The digital library of Web of Science was used with search strings 1 and 2 from Table 3.2a. Entering search string 1 yielded 27 articles. Due to the low number of results and the limited relevance of some articles, the decision was made to broaden the search string and focus less specifically on the project aspect. As a result, search string 2 was developed for the structured literature review, yielding 104 articles. Upon further evaluation, it became clear that articles related to skill mapping were not sufficiently relevant to the research focus. Therefore, the choice was made to drop the term skill mapping from the final search string (table 3.2a, 3.2b, and 3.2c.

Table 3.2b: Search strings used when searching for articles on Business Source Complete

1	All Fields "Competenc* mapping" OR "Skill* mapping" And "Project assessment" OR "Project analysis" OR "Job analysis" OR “Project”	Results 10
2	All Fields "Competenc* mapping"	Results 64

The digital library of Business Source Complete was used with search string 1 and 2 of table 3.2b. Entering search string 1 resulted for Business Source Complete in 10 articles. Due to the low number of results and the lack of relevance in some of the articles, the decision was made to broaden the search string and focus less specifically on the project aspect. As a result, the

search string for the structured literature review has been broadened resulting in search string 2. Using search string 2 resulted for Business Source Complete in 64 articles.

Table 3.2c: Search strings used when searching for articles on Google Scholar

1	"Competency mapping" And "Project assessment" OR "Project analysis" OR "Job analysis" OR “Project	Results 14
2	“Competency mapping”	Results 23

The digital library of Google Scholar was used with search string 1 and 2 of table 3.2c. For Google Scholar specifically was looked at reviewed articles to make the articles more scientifically credible, this lowered the output from the original 480 to 14 articles. Because of this low number of results in combination with not all of them seeming relevant is the choice made to make the search string more general. As a result, the search string for the structured literature review has been broadened resulting in search string 2. However, to make the search more precise the choice was made to put “competency mapping” in the title. In this way the text will more likely be about competency mapping. Search string 2 in combination with only searching for articles that have “competency mapping” in the title lowered the amount from 275 articles to 23.

The articles retrieved during the search process are then filtered through three phases, with different inclusion and exclusion criteria, presented in table 3.3, are applied. Here the first step (screening) and the next two steps (screening and eligibility) of the PRISMA methodology are applied (Moher et al., 2009). Firstly, the criteria, type of publication and language, are applied to the articles and the book. Language is filtered for English and one text is translated from Portuguese to English with the use of DeepL. When the articles have gone through the first step and some have been filtered out, a new criterion will be applied. This criterion will review the titles of the selected studies and filter out the articles with titles that are not of interest to this thesis. Lastly, the abstracts and introductions of the articles that got through the first two phases will be read, to decide which of the articles should be included in the literature review.

Table 3.3 Inclusion and Exclusion Criteria for Article Selection

Phase	**Inclusion Criteria**	**Exclusion Criteria**
1st	- Proceeding paper - Article - Review article - Academic journal -Reviewed articles (Google Scholar) -Book	- Not in English (OR not possible to translate with DeepL) **-** Is a duplicate
2nd	Title is related to competency mapping that can be used for job analysis.	

3rd	Abstract or conclusion state that the articles have studied competency mapping (Framework, plans, guides, methods, techniques, suggestions, or steps) that can be used for job analysis.	-Not accessible

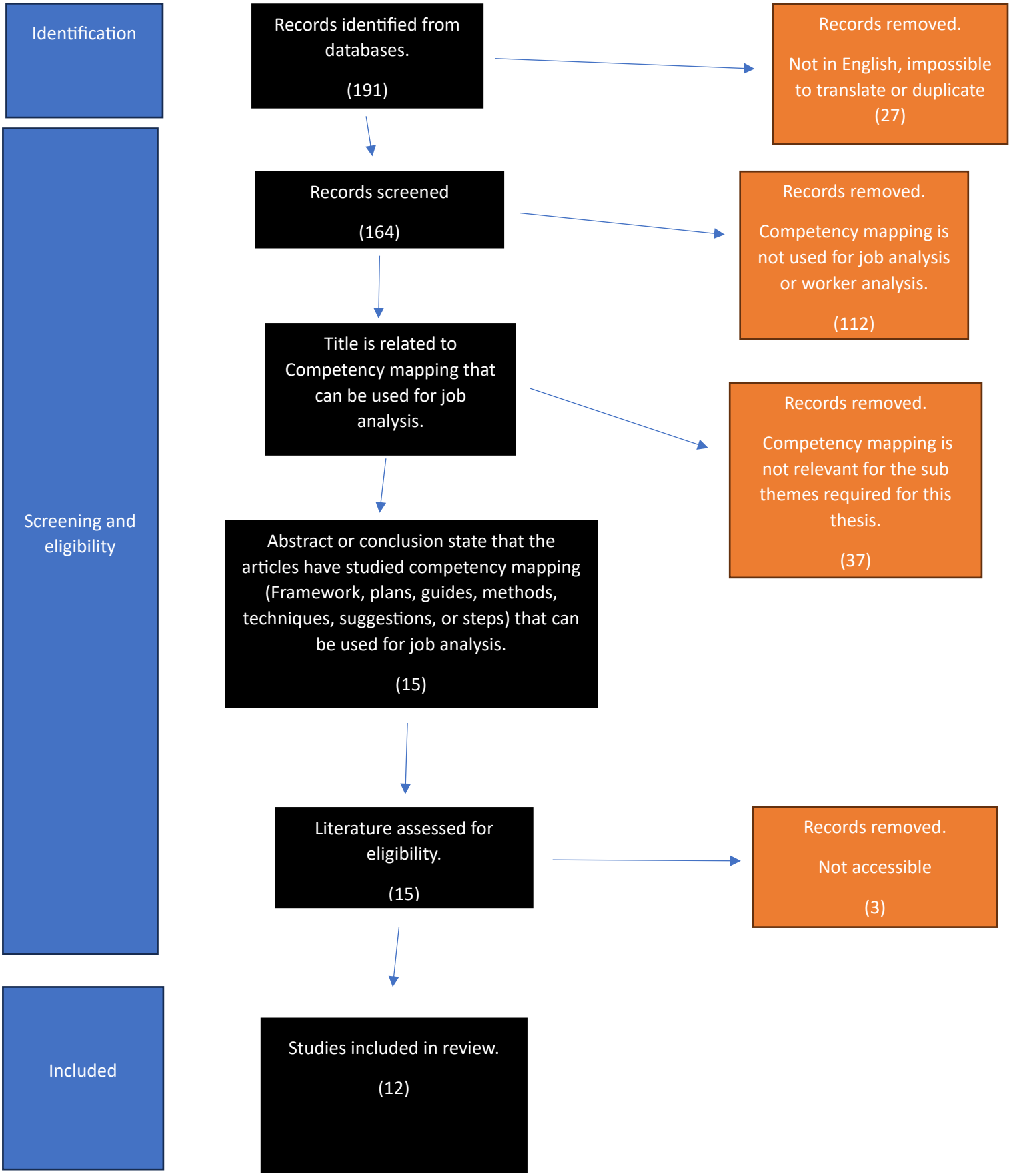
During the initial search, the goal was to collect as many articles related to the subject as possible. This was done by using the databases advanced search functionalities, and conduct searches using the constructed string queries listed above in the 3.2 tables. Initially the search generated a total of 648 articles, which were filtered down to 12 studies when going through the three inclusion and exclusion phases shown in table 3.3. Table 3.4 shows the final step of literature selections for the SLR according to the PRISMA methodology the Included part (Moher et al., 2009).

Table 3.4 Results from literature research

Database	Initial	Phase 1	Phase 2	Phase 3
Web of science	104	96	21	2
Business Source Complete	64	45	17	6
Google Scholar	23	23	14	4
Total	191	164	52	12

Shown on the next page is the PRISMA Flow Diagram table 3.4.1, this diagram gives a visual presentation for the literature filter process, according to the PRISMA methodology based on the previous described steps shown in table 3.1, 3.2, 3.3, and 3.4 (Moher et al., 2009).

Table 3.4.1 PRISMA Flow Diagram



After this process is completed the number of articles is reduced and 12 relevant articles remain. These articles will then be read and summarized using a data extraction form, presented in table 3.5. Kitchenham and Charters (2007) mentions the importance of analyzing and evaluating each article in the same way, reducing the possibility for bias. They recommend constructing a data extraction form to answer a few questions regarding the research questions. This is done to decide if the studies are relevant or not. All studies will be classified based on a wide range of questions, such as type of publication, if they contain the stated keywords, and if the articles answer the research questions or not.

Table 3.5: Data Extraction Form

Name of article	Authors	Type of publication	Year of publication	Librar	Keywords	Steps	Methods	Suggestions	Project based organizations
Competence-based management: methods and techniques of competence mapping	Brandao, Hugo Pena; Bahry, Carla Patricia	Article	2022	Web of Science	People management, competency-based management, competency mapping.	Yes	Yes	yes	No
Identification of the competency gaps of the employees : DMRC	Kumari, Neeraj	Article	2017	Web of science	Design, Generic, Implementation, Knowledge, Planning.	Yes	Yes	No	No
Competency Mapping as a Strategic HR Tool in Manufacturing Industry	Johri, Anuja	Academic article	2014	Business source complete	-	Yes	Yes	Yes	No
Competency Mapping in Project Management: An Action Research Study	Takey, Sílvia Mayumi; Carvalho, Marly Monteiro de	Academic article	2014	Business source complete	Project management; Individual competence; Competency management; Project manager	Yes	Yes	No	No
Competency Mapping and Managing Talent	Naqvi, Farah	Academic article	2009	Business source complete	-	No	No	Yes	No
Competency Mapping - A Strategic	Dalvi, Neha	Academic article	2016	Business source	Competency, Competency Mapping.	Yes	Yes	No	No

Approach in Human Resource Management				complete					
HRM Analytics in Competency Mapping	Mukherjee, Ananya; Bhattacharya, Diptarup; Chatterjee, Sounami; Majumdar, Aindrila; Dey, Tonmoy	Academic article	2021	Business source complete	HRM Analytics in Competency Mapping	No	Yes	No	No
The Handbook of Competency Mapping - Understanding, Designing and Implementing Competency Models	Akundi, Lalitha	Academic article	2021	Business source complete	-	Yes	Yes	No	No
Competency Mapping & Management-A Comprehensive Survey Report	Warier, S. U. D. H. I. R.	Book	2021	Google Scholar	-	Yes	Yes	Yes	No
A Review Study On Employees' Competency Mapping And Output Management: With Reference Nagpur Based Small Scale Manufacturing Industries	Waiker, V., Siddiqui, M. A. A., & Ansari, M. S. A.	Reviewed article	2022	Google Scholar	Competency Mapping, Employee Development, Employee Performance, Employee competencies, Organizational Growth.	Yes	Yes Talks about the article of takey	No	No
Computational Approaches to Competency	Rout, S. S.	Reviewed article	2015	Google Scholar	Competency mapping, computational approaches,	No	Yes	Yes	No

Mapping: A review of literature					evolutionary computing.				
HOPE – HOLISTIC & OBJECTIVE PSYCHOMETRIC EFFECTIVENESS IN COMPETENCY MAPPING	Dutta, S. U. M. A. D. R. I. T. A., & Sreenidhi, S.	Reviewed Article	2017	Google Scholar	(Competency Mapping, Psychometric Tests, Succession Planning, Recruitment, Battery of Assessment, Psychometric Analysis)	No	Yes	Yes	No

The articles/books eventually chosen for the structured literature review are presented in table 3.6. The article has been given an ID and are stated with their references. As evidenced by Table 3.5 and reinforced by the previously identified research gap, there is no existing literature found directly addressing the application of competency mapping specifically within project-based organizations.

Table 3.6 Primary articles used in the literature review.

ID	Title	Reference
A1	Competence-based management: methods and techniques of competence mapping **(translated from Portuguese)**	Brandao, H. P., & Bahry, C. P. (2005). Competence-based management: methods and techniques of competence mapping. *REVISTA DO SERVICO PUBLICO*, *56*(2), 179-194.
A2	Identification of the competency gaps of the employees: DMRC	Kumari, N. (2017). Identification of the competency gaps of the employees: DMRC. *The Journal of Economics, Marketing and Management*, *5*(1), 38-43.
A3	Competency Mapping as a Strategic HR Tool in Manufacturing Industry	Johri, A. (2014). Competency Mapping as a Strategic HR Tool in Manufacturing Industry: An Empirical Study. *IUP Journal of management research*, *13*(3).
A4	Competency Mapping in Project Management: An Action Research Study	Takey, S. M., & de Carvalho, M. M. (2015). Competency mapping in project management: An action research study in an engineering company. *International Journal of Project Management*, *33*(4), 784-796.
A5	Competency Mapping and Managing Talent	Naqvj, F. (2009). Competency Mapping/N and Managing Talent.
A6	Competency Mapping - A Strategic Approach in Human Resource Management	Dalvi, N. (2016). Competency mapping–a strategic approach of human resource management. *Tactful Management Research Journal*, *1632*, 50-51.
A7	HRM Analytics in Competency Mapping	Mukherjee, A., Bhattacharya, D., Chatterjee, S., Majumdar, A., & Dey, T. (2021). HRM Analytics in Competency Mapping. *Globsyn Management Journal*, *15*(1/2), 193-201.
A8	The Handbook of Competency Mapping - Understanding, Designing and Implementing Competency Models	Sanghi, S. (2003). *The handbook of competency mapping: understanding, designing, and implementing competency models in organizations*. Sage.
A9	Competency Mapping & Management-A Comprehensive Survey Report	Warier, S. U. D. H. I. R. (2014). Competency Mapping & Management-A Comprehensive Survey Report.
A10	A Review Study On Employees' Competency Mapping And Output	Waiker, V., Siddiqui, M. A. A., & Ansari, M. S. A. (2022). A Review Study On Employees'

	Management: With Reference Nagpur Based Small Scale Manufacturing Industries	Competency Mapping And Output Management: With Reference Nagpur Based Small Scale Manufacturing Industries. *Journal of Positive School Psychology*, *6*(7), 4105-4111.
A11	Computational Approaches to Competency Mapping: A review of literature	Rout, S. S. Computational Approaches to Competency Mapping: A review of literature Sushri Samita Rout, Bijan Bihari Misra b, Sasmita Samanta c.
A12	HOPE – HOLISTIC & OBJECTIVE PSYCHOMETRIC EFFECTIVENESS IN COMPETENCY MAPPING	Dutta, S. U. M. A. D. R. I. T. A., & Sreenidhi, S. (2017). Hope-holistic & objective psychometric effectiveness in competency mapping. *International Journal of Human Resource Management and Research*, *7*(1), 11-28.

4 Analysis and Categorization of Research Literature

In this chapter, the focus shifts from the literature selection and organization discussed in *Chapter 3* to a systematic and structured categorization of the collected research data. The aim is to organize and classify the data in a way that allows for meaningful analysis and interpretation.

After reading the full texts, the articles/books are categorized according to their content in three categories. Two of these categories were made before the structured literature review started. These are the competency mapping steps and competency mapping methods/techniques. These categories are based on the subjects that were most widely discussed in research literature and suggestions by the recent case study by Meijer and Vale (2024). However, while conducting the structured literature review, these two categories where not encompassing enough to categorize all the useful information found during the review. That is why a third category is included “competency mapping suggestions”.

The literature ranged from only mentioning one of the three categories up to literature that mentioned all the categories. Appendices 1, 2 and 3 show which categories the included studies/articles/books wrote about.

- Competency mapping steps
- Competency mapping methods/techniques
- Competency mapping suggestions

Articles and books with the categorization competency mapping steps, competency mapping methods/techniques and competency mapping suggestions were analyzed in detail in the next chapter (5). Literature directly writing about competency mapping for project-based organizations are not found. That is why the results chapter (5) will use the insights of the data analysis to make practical applications about competency mapping for project-based organizations like atrain.

4.1 Structured Categorization for Data Analysis

To analyze the selected texts, a structured categorization method is used that allows for identifying recurring themes or patterns across studies. This categorization process helped in organizing and understanding the data to draw meaningful conclusions about competency mapping. The categorization steps followed are outlined below:

1. Initial categorization: Each article or book was reviewed in detail, and relevant segments of this literature were assigned to one or more of the following categories:
    - Competency mapping steps
    - Competency mapping methods/techniques
    - Competency mapping Suggestions

This initial categorization was documented in Excel, where relevant parts of each text are mapped out specific to its respective categories.

2. Focused categorization: Within each category, the relevant parts were grouped into sub-themes. For example, the category of "Competency mapping steps" consisted of the sub-themes:
    - Job Analysis and Competency Identification to create the competency model.
    - Worker Competency Assessment and gap analysis
    - Validating the Competency Framework

Similarly, "Competency mapping methods/techniques" focused on two main subjects:

- Methods for Job Analysis: Understanding KSAO Requirements, which includes techniques such as interviews, expert panels, and job observation.
- Methods for Worker Competency Assessment, which includes approaches such as 360-degree feedback, behavioral interviews, and psychometric testing.

Lastly, “Competency suggestions” focused on three main subjects:

- Usage of (Premade) Tools.
- Competencies and Competency Model Quality.
- Scope and Multiple Process Usage.

These subthemes were made with personal judgement by connecting underlaying themes within the three categories.

3. Synthesis and Interpretation: The last step was synthesizing the insights gained from the categorization. The insights from the texts were summarized in tables (see Appendices) that reflect what each article or book said about sub-themes within the competency mapping categories. These tables provided a structured overview of the competency mapping approaches and are used to draw conclusions.

These conclusions are presented in chapter 5 (Results). In this chapter, each focused category (subtheme) is systematically explored, providing an overview of what the relevant literature reveals about those specific subthemes. This structured approach ensures clarity and allows for a comprehensive understanding of the key insights derived from the analyzed data.

These conclusions focus on identifying:

- A comprehensive overview of the steps for competency mapping processes.
- The suitability of different methods/techniques for project-based organizations.
- Practical suggestions for implementing competency frameworks for atrain.

The conclusions presented in the results chapter from the understanding for answering the first research questions. Additionally, a summery plan (chapter 6.2) for atrain will be presented. In this summery plan an overview is given about how a tailored competency

framework can be made focusing on the steps, methods/techniques, and suggestions. This summery plan answers the second research question.

5 Results

The data analysis reveals several important insights into competency mapping. This section highlights the essential steps, methods/techniques, and suggestions for implementing effective competency mapping within project-based organizations. The findings address specific methods and suggestions to competency mapping that project-based organizations, like atrain, can apply for project allocation**.**

5.1 Competency mapping Steps

Competency mapping is a structured approach that includes several steps to ensure alignment between the competencies of employees or facilitators and the organization's requirements. For organizations, following a structured process ensures that both company wide and job specific competency requirements are captured, allowing for more precise project allocation. Based on the structured reviewed literature, the key steps involved in competency mapping differ per source however usually include a structure like conducting a job analysis, identifying core competencies, building a competency mapping model, worker competency assessment, gap analysis, and validating the competency framework. Appendix 1 provides a clear understanding of how specific parts of the literature relates to specific sub-themes (these steps). Although the sources agree on what the steps should look like there are also differences in usefulness and applicability for project-based organizations.

5.1.1 Job Analysis

All sources recognize the need for a thorough job analysis as the initial step in competency mapping, but they vary in their focus, detail, and strategic alignment.

- **A1 (Brandão & Bahry) and A9 (Warier)** present job analysis as directly tied to the organization's overall strategy. A1 emphasizes job analysis in the context of strategic competency-based management, linking competencies with the organization’s objectives to ensure high performance and sustainability(A1)(A9). A9 highlights the importance of aligning competencies with broader organizational goals, suggesting that competency mapping is an integral part of strategic human capital management (A9). A1 and A9 are more strategic, focusing on long-term organizational goals, making their approach more suitable for hiring long-term employees in alignment with business objectives. Project allocations within project-based organizations like atrain require more specific competencies and therefore a more focused job analysis. As a result, the insights of these texts are less useful for project-based organizations.
- **A2 (Kumari) and A3 (Johri)** focus more on operational details. A2 suggests that job analysis should result in comprehensive job descriptions and competency maps, which can later inform recruitment, selection, and training decisions(A2). A3 outlines a more practical, task-oriented approach, emphasizing the importance of job descriptions in day-to-day HR processes like recruitment and performance management(A3). A2 and A3 take a more granular, operational perspective, better suited for technical roles where task-specific competencies are critical. This perspective ensures that project-based organizations capture all relevant competencies that are required for specific projects. For atrain, adopting this project specific operational approach that focusses

on details, will ensure that there is a focus on KSAO requirements that are project specific.

- **A10 (Waiker et al.) and A4 (Takey & Carvalho)** incorporate a dynamic element into job analysis. They emphasize continuous review and adaptation of job roles to the changing business environment, which is especially useful in industries that rely on project-based work, such as engineering or consultancy(A4)(A10). A4 and A10 emphasize the importance of continuous adaptation, acknowledging that roles and required competencies may change frequently, which is particularly relevant for challenging environments like project-based organizations. For atrain, adopting this dynamic application will ensure that competency requirements remain aligned with evolving project demands, complementing the project-specific focus suggested by A2 and A3 while maintaining the flexibility highlighted by A10 and A4.

5.1.2 Competency Identification

All sources agree on the necessity of accurately identifying competencies as a critical step in competency mapping, but they present varying methods and levels of emphasis on how to approach this task effectively.

- **A1 (Brandão & Bahry) and A9 (Warier)** offer a broad, strategic view on competency identification. A1 emphasizes a holistic approach, advocating for a balanced mix of knowledge, skills, and attitudes (KSA) that align with the organization's long-term goals and sustainability efforts (A1). Warier, in A9, focuses on aligning competencies with both organizational and individual development objectives, stressing the importance of integrating this process into strategic human capital management (A9). While comprehensive, the strategic nature of these approaches makes them less applicable to project-based organizations that require more precision and specificity in their competency identification processes.

- **A2 (Kumari) and A6 (Dalvi)** present a more structured and operational approach to competency identification. A2 introduces the concept of competency grading, categorizing competencies into generic, core, and differentiating levels to facilitate targeted decision-making in recruitment and training (A2). Similarly, A6 outlines a systematic process for identifying skills and behaviors that are essential for job performance, focusing on both technical and soft skills (A6). These structured frameworks are well-suited for project-based organizations, ensuring that competencies are precisely graded and tailored to specific roles and project needs. For atrain, implementing a structured competency identification process as outlined by A2 and A6 will allow for the classification of competencies into distinct levels. This ensures that competencies are specifically tailored to the requirements of different project types, enhancing the precision of project allocations, and enabling more targeted training and recruitment decisions.

- **A3 (Johri) and A4 (Takey & Carvalho)** emphasize a process-driven methodology that addresses the unique needs of project-based work. A3 highlights the importance of including both emotional intelligence and technical skills in the competency

identification process to ensure a comprehensive approach that enhances organizational performance (A3). A4, on the other hand, discusses the multi-step method of competency identification that ties competencies directly to project goals (A4). Both A3 and A4 emphasize the necessity of detailed competency frameworks that are relevant for dynamic, project-based environments. For atrain, complementing a structured approach with the insights from A3 and A4 will ensure the inclusion of both technical and emotional intelligence competencies.

5.1.3 Building the Competency Model

The literature provides diverse perspectives on how to effectively build competency models, with variations in emphasis on flexibility, structure, and alignment with organizational needs.

- **A4 (Takey & Carvalho) and A10 (Waiker et al.)** advocate for highly structured and detailed competency models. A4 suggests that competency models should have clearly defined roles, responsibilities, and expected competencies, which is particularly beneficial for organizations that must deal with complex competency requirements (A4). Waiker et al. (A10) emphasize integrating performance criteria into the model to support professional development and guide career progression (A10). These structured models ensure a high degree of precision and are ideal for environments that require clear role delineation and assessment criteria. For atrain, a project-based organization, adopting a well-detailed model could be crucial for managing the diversity and complexity of different HR projects.
- **A1 (Brandão & Bahry) and A6 (Dalvi)** propose a more flexible approach to building competency models. A1 highlights the importance of continuous refinement, suggesting that models should be updated frequently to reflect changes in the business environment (A1). Similarly, A6 discusses designing adaptable frameworks that can be tailored to various roles and evolving organizational needs (A6). These flexible models are highly relevant for atrain, as the organization must respond to shifting project requirements while ensuring that competency models remain aligned with current and future needs. Atrain could focus on building a competency model that is created out of structure but gives flexibility for a fast-adapting environment.

5.1.4 Worker Competency Assessment

Assessing worker competencies is a crucial step in ensuring that facilitators are appropriately matched to the specific demands of each project. Different methods for competency assessment are discussed in the literature, each offering unique benefits for project-based organizations like atrain.

- **A1 (Brandão & Bahry), A2 (Kumari), and A4 (Takey & Carvalho)** emphasize the use of multi-source feedback systems, such as 360-degree feedback, as an effective means of assessing worker competencies. A2 highlights how feedback from peers, supervisors, and subordinates provides a well-rounded evaluation of both technical and interpersonal skills (A2). A4 adds that using such comprehensive feedback allows organizations to identify strengths and development areas that are critical for project success (A4). A1 also underscores the value of integrating multiple perspectives to

achieve a balanced assessment of competencies (A1). For atrain, incorporating 360-degree feedback could ensure a holistic understanding of each facilitator's KSAO's, which is essential for effective project allocation.

- **A6 (Dalvi) and A9 (Warier)** advocate for ongoing performance assessments that are integrated into daily project work. A6 suggests that competency assessments should be a continuous process, allowing for real-time adjustments to ensure facilitators remain aligned with project needs (A6). Warier (A9) supports integrating assessments into regular project evaluations to maintain a high level of performance and responsiveness to project dynamics (A9). This continuous assessment approach is particularly valuable for atrain, where project requirements may evolve, and facilitators should be evaluated regularly to ensure ongoing suitability.
- **A12 (Dutta & Sreenidhi)** highlights the role of psychometric testing in assessing competencies, particularly for evaluating cognitive abilities and personality traits that influence job performance (A12). While this method offers objective insights, its relevance to atrain might be limited compared to more dynamic, project-focused assessment methods like 360-degree feedback and continuous evaluations.

More about which methods are best for project-based organizations in the methods/techniques part 5.2.

5.1.5 Gap Analysis

Gap analysis is an essential step in identifying discrepancies between the current competencies of facilitators and the competencies required for specific projects. This step enables atrain to design targeted training programs that bridge these gaps, ensuring facilitators are well-prepared for successful project delivery.

- **A1 (Brandão & Bahry) and A3 (Johri)** emphasize that gap analysis should be an ongoing process, feeding data directly into training and development initiatives. A1 suggests that after assessing worker competencies, gaps must be continuously analyzed to inform training programs and skill-building efforts (A1). Similarly, Johri (A3) highlights the need for gap analysis to be tied closely with workforce development, ensuring that facilitators are regularly upskilled to meet evolving project needs (A3). For atrain, adopting this iterative approach will ensure that any KSAO deficiencies are addressed promptly, keeping facilitators aligned with project requirements.
- **A4 (Takey & Carvalho) and A6 (Dalvi)** recommend linking gap analysis with immediate training interventions. A4 suggests that once gaps are identified, training and development actions should be initiated without delay to enhance competency levels (A4). Dalvi (A6) supports this view, emphasizing that gap analysis should directly lead to the design of targeted training programs that address identified weaknesses. This proactive approach is particularly important for atrain, where immediate action can enhance facilitator readiness and project success.
- **A9 (Warier)** adds that gap analysis should also consider aligning competencies with both current and future atrain project type requirements. This forward-looking

perspective helps ensure that facilitators are not only meeting the present needs but are also prepared for upcoming challenges and projects (A9).

5.1.6 Validation of the Competency Framework

Validation of the competency framework is a critical step to ensure that the framework remains effective, relevant, and aligned with the evolving needs of the organization and its projects. This process helps guarantee that the competencies identified are contributing positively to project outcomes and that adjustments can be made as needed.

- **A1 (Brandão & Bahry) and A3 (Johri)** emphasize the importance of continuous validation and refinement of the competency framework. A1 highlights that the competency framework should be regularly evaluated to determine whether it still meets organizational needs and is applicable to current job roles (A1). A3 supports this by suggesting that feedback from facilitators and project managers should be integrated into the validation process, enabling a responsive approach that adjusts the framework based on real-world experiences and challenges (A3). For atrain, this means creating a feedback loop that allows for iterative improvements to ensure the framework remains practical and effective.
- **A6 (Dalvi) and A9 (Warier)** also stress the importance of validating competency frameworks by incorporating real-world project performance data and ensuring alignment with evolving project needs. A6 emphasizes the value of adjusting competency models based on project-specific feedback, while A9 suggests aligning validation efforts with both present and anticipated project demands to ensure continued relevance (A6) (A9). Atrain could include integrated validation feedback, in this way can atrain make better adjustments to changing requirements typical for project-based organizations.
- **A4 (Takey & Carvalho) and A10 (Waiker et al.)** recommend that validation should also focus on aligning the competency framework with performance outcomes. A4 suggests that performance metrics be used to determine if the competencies outlined are directly contributing to successful project execution (A4). Waiker et al. (A10) argue for the use of measurable performance indicators as part of the validation process, ensuring that competencies are not just theoretical but are linked to tangible project success (A10). This performance-based validation approach is particularly valuable for atrain, as it allows the organization to determine which competencies are most impactful for specific project types and adjust the frameworks accordingly.

5.2 Competency Mapping Methods/Techniques

Competency mapping methods and techniques serve two primary purposes: first, to conduct a job analysis by understanding the Knowledge, Skills, Abilities, and Other characteristics (KSAO) required for a specific role or project; and second, to analyze the competencies of workers, ensuring that their competencies align with these requirements. The literature presents a variety of methods/techniques used in these two phases, offering both qualitative and quantitative tools.

5.2.1 Methods for Job Analysis: Understanding KSAO Requirements

a. Interviews and Expert Panels

Interviews and expert panels are qualitative techniques widely used for job analysis. They involve gathering insights from subject matter experts, managers, or current facilitators to identify the KSAO requirements of a role.

- **A1 (Brandão & Bahry)** emphasizes the role of expert panels in job analysis, particularly for understanding the technical and strategic competencies required for specific roles (A1). The use of structured interviews is also highlighted to gain insights into job-specific knowledge and skills. For atrain, leveraging expert panels will allow project managers and facilitators to share their insights on technical and strategic competencies, ensuring a comprehensive understanding of each project types unique requirements.
- **A4 (Takey & Carvalho)** supports the use of expert panels and interviews to determine the relationship between job tasks and required competencies (A4). This method helps in defining both hard and soft skills required for various positions. For atrain, utilizing structured interviews could facilitate the identification of both technical and interpersonal skills.
- **A9 (Warier)** advocates for a combination of interviews and focus groups (expert panels) to gather job-specific competency data. This approach allows for a deep exploration of the nuances involved in a particular job role (A9). For atrain, combining interviews and focus groups will enable the organization to gather nuanced insights into competencies, ensuring detailed and project-specific understanding of KSAOs for their diverse project types.

b. Competency Questionnaires and Surveys

Surveys and competency questionnaires are quantitative methods used to collect structured and standardized data about job roles and competencies. However, due to the complex and nuanced nature of project-based organizations requirements, these tools may not be suitable for capturing the depth and complexity of the specific competencies required.

- **A6 (Dalvi)** highlights the structured nature of competency questionnaires, which can systematically collect data on essential job tasks and competencies. However, the standardized format may fall short in addressing the unique and varied requirements of different project types at atrain (A6).
- **A8 (Sanghi)** supports the use of surveys for gathering reliable data on job-specific competencies but acknowledges that these methods are better suited for roles with uniform competency requirements. For atrain's diverse project needs, surveys may not provide the detailed, project-specific insights necessary (A8).

c. Job Observation and Work Diaries

Job observation and work diaries are practical techniques used to gather real-time insights into the KSAO requirements of job roles. These methods involve either directly observing employees as they perform their duties or having employees document their daily tasks and

responsibilities. Both methods are valuable for identifying competencies, especially behavioral and contextual ones that might not be easily articulated in interviews or surveys. In this way by focusing on one project within one of the nine project types general requirements for that specific project type can be determined.

- **A1 (Brandão & Bahry)** discusses job observation as a key method for collecting real-time data about the tasks and competencies required for job roles. It highlights that direct observation is especially effective for identifying nuanced behavioral skills that are crucial but often overlooked in traditional analysis methods (A1). For atrain, using job observation will provide practical and actionable insights into the requirements of both technical and behavioral competencies within specific projects.
- **A7 (Mukherjee et al.)** introduces the concept of work diaries, where employees maintain detailed logs of their daily activities, decisions, and interactions. This technique provides an in-depth understanding of the cognitive and emotional skills used in real-time situations, offering a richer perspective on job requirements (A7). For atrain, encouraging facilitators to maintain work diaries will complement job observation by capturing reflective insights. This approach will help define the KSAO competencies necessary for effective project execution.

5.2.2 Methods for Worker Competency Assessment

a. 360-Degree Feedback

360-degree feedback is one of the most used methods for assessing the competencies of employees. It gathers feedback from multiple sources—peers, supervisors, subordinates, and sometimes clients.

- **A2 (Kumari) and A4 (Takey & Carvalho)** both emphasize the use of 360-degree feedback as a comprehensive method for assessing competencies from various perspectives. It provides a well-rounded view of both technical and interpersonal skills, ensuring that workers' competencies align with job requirements (A2, A4). For atrain, adopting 360-degree feedback will ensure that technical and interpersonal competencies are evaluated from multiple perspectives, helping to match facilitators with the specific needs of each project effectively.
- **A10 (Waiker et al.)** advocates for the integration of 360-degree feedback with other assessment tools to provide a balanced evaluation of both hard and soft skills (A10). For atrain, combining 360-degree feedback with other methods will further enhance the accuracy and reliability of competency evaluations. This integrated approach will ensure facilitators are assessed comprehensively, supporting more effective project allocations and training programs.

b. Psychometric Testing

Psychometric tests are used to measure cognitive abilities, personality traits, and behavioral tendencies. These tests provide objective, standardized data about employees' competencies.

- **A12 (Dutta & Sreenidhi)** emphasizes the role of psychometric tests in competency assessment, particularly for evaluating personality traits, decision-making skills, and cognitive abilities. These tests offer an objective measure of competencies that are often difficult to assess through interviews or observation alone (A12). This would align well when searching for people that are a good performer in general but is not specific enough for project-based organizations. For atrain, psychometric testing is less useful they may not provide the depth required for project-specific needs. It can serve as a supplementary tool to gain general insights into facilitator traits but could better not be the primary method for competency evaluation.
- **A2 (Kumari)** also supports the use of psychometric assessments, especially when combined with other methods, to ensure a comprehensive evaluation of worker competencies (A2). For atrain, psychometric tests can complement other qualitative methods to enhance the overall evaluation process. By integrating these tools as supplementary assessments, atrain can obtain a broader understanding of facilitator competencies while still prioritizing more context-specific evaluations.

c. Behavioral Interviews

Behavioral interviews assess how individuals have performed in past situations to predict future behavior, particularly in competencies related to leadership, teamwork, and problem-solving.

- **A3 (Johri)** emphasizes the importance of behavioral interviews in evaluating competencies such as leadership, teamwork, and problem-solving. This method focuses on real-life examples of how individuals have demonstrated key competencies in their past roles (A3). For atrain, incorporating behavioral interviews will provide valuable insights into how facilitators have applied critical skills in previous project settings within a specific project type. This approach ensures that KSAO competencies are assessed based on concrete past experiences, aligning facilitators with the demands of specific HR project types.
- **A11 (Rout et al.)** also supports the use of behavioral interviews to explore competencies that may not be easily captured through surveys or tests, particularly in assessing how workers manage complex interpersonal situations (A11). For atrain, using behavioral interviews to delve into facilitators' ability to handle interpersonal challenges will ensure facilitators are well-prepared to navigate the complexities of diverse project environments. This method allows atrain to gain a practical understanding of facilitator competencies, ensuring alignment with project requirements and needed adaptability.

d. Assessment/Development Centers

Assessment centers use a variety of techniques (e.g., simulations, role plays, in-basket exercises) to assess competencies in a structured setting. Development centers, on the other hand, are focused on improving employees' competencies through training.

- **A1 and A7** support the use of assessment centers to evaluate both technical and soft skills through simulations and structured exercises. These centers allow for a hands-on evaluation of competencies in a controlled environment (A1, A7). For atrain, implementing assessment centers will enable the organization to simulate project environments realistically, providing practical insights into facilitators' technical and interpersonal skills. This approach ensures facilitators are well-prepared to meet the specific demands of diverse HR projects.
- **A6 (Dalvi)** mentions the role of development centers in identifying gaps in competencies and providing targeted training to address these gaps (A6). For atrain, utilizing development centers will allow the organization to address identified competency gaps effectively by offering tailored training programs. This ensures continuous competency improvement, enabling facilitators to adapt to the challenges of different project types.

5.3 Competency Mapping Suggestions

Competency mapping suggestions consist of practical applications and considerations that can enhance the effectiveness of the competency mapping processes for (project based) organizations. Unlike the structured steps or specific methods used in competency mapping, these suggestions focus on refining the quality and applicability of competency models, focusing on the scope of competency mapping, and usage of (premade) tools. The reviewed literature highlights several ways to optimize competency mapping, such as using standardized tools, developing high-quality competency descriptions, and ensuring future-focused models that can adapt to changing organizational needs. Based on the insights presented in Tables 1, 2, and 3 of Appendix 3, these suggestions provide guidance on creating more robust and flexible competency frameworks. Although these suggestions are all important in their own way, the sources emphasize different strategies and best practices, depending on the organizational context. For this analysis, the focus is on highlighting the most important points for project bases organizations like atrain.

5.3.1 Usage of (Premade) Tools

Premade tools and competency models provide a useful starting point for organizations aiming to implement competency mapping efficiently. These standardized resources can streamline the process, ensure consistency, and save time. However, the literature emphasizes that the effectiveness of such tools varies based on the organization's specific context and needs.

- **A9 (Warier)** highlights the value of using standardized competency models. These models can promote consistency in competency mapping and serve as a foundation for developing tailored frameworks, particularly for organizations that are not overly complex. However, for organizations or parts of an organization that require a more nuanced analysis, such as project-based organizations, it is recommended to develop customized competency mapping frameworks that address their unique needs (A9). For atrain, focusing on customized frameworks will ensure the specific requirements of each HR project type are effectively captured. This application avoids the limitations of

standardized models and supports the development of tailored solutions for diverse project needs.

- **A11 (Rout et al.)** introduces the concept of computational approaches, where data-driven algorithms assist in mapping and managing competencies. Take for example artificial neural networks. These models work well for finding relationships and/or connections, which can be used for competency identification (5.1.2). These methods offer precision and scalability, making them especially valuable for large organizations or organizations that have the same format in many different versions, for example project-based organizations. When the network of analyzing is developed for one, the use of computational approaches could be extended organization wide. However, Rout et al. caution that these approaches must be carefully integrated to ensure they remain relevant and adaptable to specific project needs (A11). For atrain, leveraging computational approaches can enhance efficiency, especially after developing a network for one project type. These tools can then be scaled across the different HR project type, allowing atrain to apply its customized competency frameworks more broadly while maintaining relevance and adaptability.

5.3.2 Competencies and Competency Model Quality

The quality of competencies and the development of distinct competency models for each project type are crucial to ensure that competency mapping effectively supports project allocation. The literature provides several suggestions for enhancing the quality and applicability of competency models, ensuring they are practical, consist of concrete competencies, and are benchmarked for comparison.

- **A1 (Brandão & Bahry)** emphasizes that competencies must be clearly defined and described in terms of expected performance or behavior. Competencies should include action verbs and specific goals, making them easily understandable and applicable. (A1) further caution against using vague descriptions, technical jargon, or ambiguous terms, as these can make competencies less actionable and harder to implement effectively. They also recommend consulting with key people in the organization to identify inconsistencies and ensure that competencies are aligned with practical requirements (A1). For atrain, focusing on creating clear, specific, and actionable competency descriptions could ensure the competencies are practical and applicable to project needs. Avoiding vague or ambiguous terms, as suggested by A1, could enhance the usability of the competency models.

- **A3 (Johri)** highlights the importance of continuous assessment and refinement of competencies to ensure they align with organizational needs. This includes regular evaluations to determine whether competencies still meet the requirements of the roles with which they are associated. A3 suggests that the assessment of competencies should be an ongoing process, ensuring they remain relevant in a changing environment (A3). For atrain, implementing an ongoing process of evaluating and refining competency models will ensure they remain relevant in the dynamic, project-based environment. This approach will help the organization adapt to changing project requirements and maintain effective competency alignment over time.

- **A5 (Naqvi)** argues that the competency model should be effective in distinguishing superior performance. The model should not be vague; abstract concepts must be translated into observable behaviors that can be objectively assessed (A5). For atrain, ensuring competency models translate abstract concepts into observable behaviors will help objectively evaluate facilitators and identify superior performance effectively.
- **A9 (Warier)** also suggests implementing benchmarking initiatives to ensure that competency models are aligned with industry standards and best practices. Benchmarking can provide valuable insights and serve as a reference point for continuous improvement, helping organizations keep their competency models competitive and effective (A9). For atrain, incorporating benchmarking initiatives will align their competency models with industry standards. These benchmarks can be other project-based organizations or organizations working in specific fields related to those projects.

5.3.3 Scope and Multiple Process Usage

The scope of competency mapping and the application of multiple processes across different contexts play a vital role in enhancing the overall effectiveness of competency models. By defining the boundaries of competency mapping, project-based organizations can narrow down their scope and achieve the precision needed for specific project types. Project-based organizations can ensure that competencies are aligned with current roles as well as future requirements. The literature provides valuable insights into the scope and processes involved in competency mapping.

- **A3 (Johri)** emphasizes the importance of defining the scope of competency mapping to cover various categories of employees, including individual contributors, managers, and leaders. A3 suggests that by defining competency sets relative to the level of employee contribution, organizations can create more targeted and effective competency frameworks that serve the needs of various roles. For atrain, this would involve creating competency frameworks specifically for facilitators that are tailored to the different project types, ensuring that the competencies align with the specific requirements of each type of project. Furthermore, A3 suggests that industrial trends and laws should be considered in the competency mapping process to ensure the frameworks remain compliant and relevant in the industry. Additionally, A3 points out that the results of competency assessments should be utilized across multiple HR functions, such as recruitment, training, and succession planning, to maximize their value (A3).
- **A5 (Naqvi)** emphasizes the importance of developing competency models through effective communication and involving stakeholders across all levels of the organization. However, for atrain, the focus should be on creating competency mapping profiles that are specific to the project needs, rather than overly emphasizing alignment with the overall business strategy, as this can be too general. The perspectives of key stakeholders should be applied to ensure the models are comprehensive, but specificity is crucial to effectively support project-based roles.

Additionally, the model should be future focused to anticipate and prepare for upcoming KSAO requirements (A5).

- **A9 (Warier)** suggests that organizations should develop an organizational competency dictionary that serves as a reference for defining competencies across distinct roles and functions. This dictionary can help standardize competency definitions and ensure that competencies are consistently applied across the organization and between the different competency mapping models for the specific HR project types.

To summarize and provide an overview of the answer to Research Question 1 (What does current literature say about competency mapping steps, methods/techniques, and suggestions for project-based organizations?), this chapter has systematically explored key insights from existing literature. Each subtheme was examined in detail, offering a clear description of what the literature reveals about competency mapping practices and their potential application within project-based organizations. Specific attention was given to identifying actionable insights, highlighting both strengths and limitations of traditional approaches when applied to dynamic, project-oriented environments. Through this analysis, it became clear how tailored adaptations of competency mapping, ranging from steps and methodologies to practical suggestions, can better address the unique and often temporary nature of project requirements. These findings provide a foundation for developing competency frameworks that align with the fast-paced and goal-specific demands of project-based organizations.

6 Conclusion

6.1 Introduction

The findings of this research provide applications for enhancing competency mapping in project-based organizations like atrain. By synthesizing the existing literature on competency mapping steps, methods/techniques, and suggestions, this thesis has developed actionable applications tailored to the unique requirements of project allocation. This chapter integrates the theoretical insights and practical applications into a plan designed to guide atrain in developing HR project type specific competency models, optimizing its project allocation processes.

The structured literature review highlights the importance of a systematic yet flexible approach to competency mapping. It emphasizes the need for specificity in defining competencies, the continuous validation of competency frameworks, and the integration of innovative methods such as computational tools. By adopting these practices, atrain can address the inherent challenges of managing diverse project types and external facilitators, ensuring a higher alignment between project demands and facilitator competencies.

The subsequent sections present a summary plan for implementing these findings at atrain, structured around key competency mapping steps and methods. This plan is designed to provide a clear roadmap for developing and applying competency frameworks that are both dynamic and aligned with the project's requirements, enabling more effective project allocation and improved project outcomes.

6.2 The summary plan

The answer to research question 2 (How can tailored competency frameworks be designed for project-based organizations through the systematic application of steps, methods/techniques, and suggestions aligned with their unique needs?):

1. Job Analysis: Interviews and Expert Panels & Job Observation

- **Interviews and Expert Panels**: Conduct detailed, project-specific interviews to gather insights into the technical and interpersonal competencies required for each project type. These methods are essential for understanding the unique needs of each project (A1, A4, A9).
- **Job Observation and work diaries**: Utilize real-time observation to capture how facilitators apply their competencies in different project settings, providing a practical understanding of their strengths. This is highly valuable for capturing real-time, practical insights (A1, A7).
- **Avoid Competency Questionnaires and Surveys**: These methods lack the depth and flexibility needed to capture the distinctiveness of atrain's project types (A6, A8).

2. Competency Identification: Structured Frameworks Atrain should implement a structured competency identification process, as outlined by A2 and A6, to classify competencies into distinct levels and ensure they are specifically tailored to project types. This approach should

be complemented by incorporating insights from A3 and A4, emphasizing both technical and emotional intelligence competencies and utilizing a multi-step methodology that aligns with atrain's project-based needs. This combined approach will ensure both precision and relevance, enhancing project allocation efficiency.

3. Building a Competency Model: Flexible and Adaptable Models Atrain should develop a competency model that strikes a balance between structure and flexibility. Drawing from A4 and A10, the model should include clear roles, responsibilities, and performance criteria, ensuring that facilitators are well-matched to project demands. At the same time, it is crucial to incorporate the adaptability advocated by A1 and A6, allowing the model to be refined as project requirements evolve. By doing so, atrain can maintain an agile and effective approach to competency management.

4. Worker Competency Assessment: 360-Degree Feedback, Behavioral Interviews, and Assessment Centers

- **360-Degree Feedback**: Implement multi-source feedback systems to evaluate both technical and interpersonal skills from multiple perspectives, ensuring the best facilitator-project match (A2, A4, A10).
- **Behavioral Interviews**: Use behavioral interviews to understand how facilitators have applied competencies in previous projects, providing a clear picture of their future potential (A3, A11).
- **Assessment Centers**: Utilize assessment centers for practical evaluation in simulated project environments, ensuring facilitators are well-prepared for the challenges they will face (A1, A7, A6).
- **Psychometric testing**: avoid because of its general nature, which may not provide the depth required for project-specific needs. (A12, A2).

5. Gap Analysis: Regular Competency Gap Analysis Atrain could implement an ongoing gap analysis process, as highlighted by A1 and A3, to continuously identify competency deficiencies and ensure facilitators are upskilled as needed. Additionally, atrain could follow the applications from A4 and A6 by linking gap analysis directly to targeted training programs, initiating these interventions immediately upon identifying gaps. This approach could ensure facilitators are well-prepared to meet both current and future project demands, enhancing the overall effectiveness of project allocation and delivery.

6. Validation: Ongoing Validation of Competency Framework Atrain could implement a continuous validation process for its competency framework, as advocated by A1 and A3. This could include regular evaluations to assess the relevance of competencies and integrating feedback from facilitators and project managers to ensure the framework is aligned with real-world needs. Additionally, atrain could incorporate performance-based validation methods, as suggested by A4 and A10, using measurable performance metrics to determine the effectiveness of the competency framework. This combined approach could ensure that atrain's competency framework remains dynamic, relevant, and aligned with both current and future project demands, enhancing the effectiveness of project allocation and delivery.

7. Competency Mapping Suggestions: Remarks from Section 5.3

Usage of (Premade) Tools: Atrain should focus on developing customized competency mapping frameworks tailored to the specific requirements of their HR project types. Premade tools and competency models are not advisable to use specificity is crucial for effective competency mapping in project-based organizations. Additionally, computational approaches could be explored for scaling competency mapping across similarly structured projects (A9, A11).

Competencies and Competency Model Quality: Competencies must be clearly defined, using specific, actionable language with concrete action verbs to ensure they are practical and easily understood. Continuous assessment and refinement of competencies could be implemented to maintain their relevance in a dynamic project environment. Benchmarking against industry standards is also recommended to ensure atrain's competency models remain competitive and effective (A1, A3, A5, A9).

Scope and Multiple Process Usage: Atrain could clearly define the scope of competency mapping to focus on facilitators' requirements for each project type. The involvement of stakeholders across various levels is important, but the emphasis should be on creating specific competency profiles tailored to project needs and not to organization wide strategy requirements. The competency models could also include a future-focused element to anticipate and prepare for upcoming KSAO demands (A3, A5, A9).

7 Reflection

7.1 Discussion

This section evaluates the summarized step plan developed in this thesis against existing literature on competency mapping in traditional organizations. The comparison highlights key differences in the practical applications introduced to address the unique requirements of project-based organizations like atrain. Four areas of distinction that were notable: (1) the scope and focus of competency mapping, (2) the flexibility of the framework, (3) the integration of dynamic methods, and (4) the integration of computational tools, were chosen because these factors determine the effectiveness of competency mapping in dynamic, project-based environments. These areas emerged as recurring themes during the literature review and data analysis, reflecting challenges and opportunities specific to project-based organizations. Each area captures an aspect of how traditional competency mapping frameworks fall short in addressing the flexible and temporary nature of project work, while the proposed step plan aims to bridge these gaps.

1 Scope and Focus on Project-Specific Needs

Traditional competency mapping frameworks often emphasize long-term role alignment, focusing on recruitment, performance management, and succession planning (Johri, 2014; Brandão & Bahry, 2005). These approaches aim to align employee competencies with static organizational roles. However, project-based organizations face short-term, dynamic requirements. The proposed step plan emphasizes competency mapping for specific projects, requiring granular analysis of Knowledge, Skills, Abilities, and Other characteristics (KSAOs) tailored to distinct project profiles. For example, while traditional approaches use general job descriptions to frame competencies, this thesis recommends methods like expert panels and job observation to capture the nuances of each project type. By focusing on project specific KSAOs, the step plan ensures precise alignment between facilitators' competencies and project demands, which is rarely emphasized in traditional literature.

2 Flexibility in Framework Design

Traditional competency mapping frameworks prioritize standardization and long-term application (Dalvi, 2016; Warier, 2014). While effective for permanent roles, this approach lacks adaptability for project-based environments, where project needs evolve rapidly. The proposed plan incorporates flexibility by advocating iterative validation of competency frameworks. Feedback loops with project managers and facilitators ensure continuous updates to competency models based on real-world challenges and performance metrics. This dynamic approach deviates from static traditional frameworks, enabling project-based organizations to respond to shifting client and organizational demands more effectively.

3 Dynamic and Multifaceted Methods

Traditional organizations often employ standardized methods like surveys, competency questionnaires, and psychometric tests (Sanghi, 2003). These methods are cost-effective but insufficiently detailed for the complex and temporary nature of project requirements. The proposed plan prioritizes dynamic methods such as:

- **360-degree feedback** for comprehensive assessments of technical and interpersonal competencies.
- **Behavioral interviews** to evaluate past performance in project-specific contexts.
- **Assessment centers** to simulate project environments and evaluate facilitators' readiness for real-world challenges.

These methods provide a more nuanced understanding of facilitator competencies, aligning them with the multifaceted demands of project-based organizations.

4 Integration of Computational Tools

Traditional competency mapping rarely integrates computational methods due to their focus on standardized applications (Rout et al., 2015). In contrast, this thesis suggests leveraging data-driven approaches, such as machine learning algorithms, to analyze competency patterns across project types. Computational tools enable scalability and precision, particularly for organizations managing diverse but structurally similar project types.

7.2 Recommendations

This section provides actionable recommendations for researchers and scientists based on the findings of this thesis. The goal is to guide future research in the field of competency mapping, particularly for project-based organizations. The insights presented in this study highlight the need for tailored, dynamic, and data-driven approaches to competency mapping, opening opportunities for further scientific exploration and application.

1 Expand Theoretical Frameworks for Project-Based Competency Mapping and Test Efficacy

Researchers are encouraged to developing comprehensive competency models that specifically address the dynamic needs of project-based organizations. Traditional frameworks often overlook the temporary and specialized nature of project roles, creating a gap in academic literature. By developing models that emphasize project specific KSAOs and iterative validation processes, future research can deepen the theoretical understanding of competency mapping in dynamic environments. Conduct longitudinal studies to examine the long-term efficacy of tailored competency mapping frameworks in project-based organizations compared to standardized competency mapping frameworks.

2 Investigate Scalability of Methods and Frameworks

This study highlights the importance of dynamic methods such as 360-degree feedback, behavioral interviews, and assessment centers in competency mapping. These methods provide in-depth assessments of facilitator competencies, aligning them with the specific needs of project-based organizations. However, researchers should explore how these approaches can be effectively scaled for use across multiple projects without losing their depth and effectiveness. A valuable direction for future research involves developing case studies that compare the efficiency and outcomes of these dynamic methods across various project-based industries. Such studies would provide insights into how these methods perform in different settings and help identify best practices for their implementation. Additionally, there

can be tested for adaptability of these methods in diverse cultural, organizational, and sectoral contexts. By doing so, researchers can uncover universal principles that ensure their broad applicability while also identifying variable factors that influence their success. This approach will help refine these methods, making them more impactful across a range of project environments. In line with evaluating methods, it is essential to validate competency mapping frameworks in a range of project environments to ensure their generalizability. Comparative studies could assess the effectiveness of these frameworks across sectors with varying project complexities, lifecycles, and scopes. Moreover, understanding how organizational size and project requirements impact the success of competency mapping frameworks would refine their applicability. By combining insights into methods and framework validation, researchers can develop more robust solutions tailored to the evolving demands of project-based organizations.

3 Leverage Computational Tools in Competency Mapping Research

The integration of machine learning and data analytics in this thesis is presented as an application to enhance scalability and precision in competency mapping. By using computational tools, researchers could advance the field by focusing on automation, pattern recognition, and predictive analytics to address the dynamic needs of project-based organizations. One potential research project could be the development and testing of algorithms capable of identifying project-specific competency requirements. These algorithms could analyze historical project data alongside facilitator performance metrics, enabling organizations to anticipate and match competencies with project demands more effectively.

4 Explore the Role of Flexibility in Competency Mapping Models

This thesis underscores the role of iterative validation and adaptability in competency mapping frameworks, particularly in dynamic, project-based environments. Flexibility ensures that competency models remain relevant and responsive to shifting project demands, yet achieving this without compromising rigor or consistency presents a challenge. Future research should focus on systematically integrating flexibility into these frameworks by exploring methods that balance adaptability with structural integrity. A key area for investigation involves developing metrics to evaluate the effectiveness of iterative validation processes. These metrics would provide a standardized way to assess how well competency models are updated in response to real-world feedback and evolving project needs. Additionally, researchers could examine the impact of real-time adjustments to competency mapping models on project success and facilitator performance. Understanding how such adjustments influence outcomes will offer valuable insights into the practical benefits and limitations of incorporating flexibility. By addressing these aspects, future studies can enhance the utility and applicability of competency mapping models in project-based settings.

7.3 Limitations

While this thesis provides valuable insights into competency mapping for project-based organizations, several limitations should be acknowledged. These limitations relate to the scope of the research, methodological constraints, and potential areas for improvement in future studies.

1 Narrow Organizational Focus

The study focuses primarily on HR projects at atrain, a specific project-based organization. While the findings offer actionable insights for similar organizations, the frameworks and methods proposed may not fully address the needs of other industries with distinct operational dynamics, such as technology, construction, or healthcare. This narrow focus limits the generalizability of the findings to broader contexts.

2 Limited Empirical Validation

Due to this thesis being a structured literature review, the proposed competency summary was not empirically tested in live project environments. While the structured literature review provides a theoretical foundation, the absence of real-world application leaves room for uncertainty regarding the practical effectiveness of the summary plan in atrain and other organizational settings.

3 Dependency on Literature Quality

The structured literature review relied on the availability and quality of existing research, which presented challenges due to the lack of specific studies addressing competency mapping for project allocation. To address this gap, broader competency mapping applications were incorporated, but this approach may have diluted the specificity of the findings for project-based contexts. Additionally, despite employing a systematic methodology, the selection of literature could reflect inherent biases based on the databases and keywords used, potentially influencing the comprehensiveness of the review and the robustness of the synthesized frameworks.

4 Computational Tools in Early Stages

The integration of computational tools, such as machine learning and data analytics, in competency mapping remains at a theoretical stage in this thesis. While these tools offer significant potential for enhancing scalability and precision, their practical implementation requires further investigation. Key areas for future research include evaluating their feasibility, accuracy, and fairness in real-world applications. Additionally, the use of such tools introduces ethical concerns, particularly regarding biases in data and the transparency of algorithms. These issues were acknowledged in this thesis but not explored in depth. Addressing these challenges is essential to ensure that computational methods in competency mapping are both effective and efficient, ensuring responsible and impactful applications.

5 Expanding the Scope

The research places significant emphasis on project allocation based on individual competencies, for external facilitators. However, this approach may overlook critical aspects such as team cohesion and organizational culture, which are essential for effective project execution regardless of whether facilitators are internal or external. These dynamics play a vital role in project success and should ultimately be integrated into competency mapping frameworks to ensure a complete approach. For this research, however, these elements were purposefully taken out of scope to allow a specific focus on aligning individual competencies

with project requirements. This deliberate narrowing of scope enabled a deeper exploration of individual alignment, while recognizing that future research should incorporate team and organizational dynamics for a more comprehensive framework.

6 Limited Consideration of Organizational Scale and Complexity

While the proposed framework addresses varying project requirements, it does not deeply consider how organizational size or complexity might influence the effectiveness of competency mapping step plan. Small organizations may lack the resources to implement dynamic methods, while larger organizations may face scalability challenges.

Appendices

Appendix 1 analysis of competency mapping steps

Table 1

	Description	Companywide analysis	Job specific analysis and building the model
Job Analysis and competency identification to create the model	This step involves identifying the core tasks, responsibilities, and competencies required for specific roles within the organization. By analyzing the job's requirements, both technical and behavioral competencies are mapped to ensure the right fit between the role and the candidate. This will be done using methods and techniques	A1 Formulation of the organization's strategy A3 Understanding the Vision and Mission of the organization: Translating into time-bound and specific goals. A4 Analysis of the organization A9 Define the purpose and put a team together for the analysis. A9 Link the business objectives.	A1 Identify the necessary competencies needed for the job. A2 Frame the Competence Map for a job role, Understanding Job Positions, Data Collection, Role definition and job detailed job descriptions with Job Factors, Competency Map. A2 Job Competency Assessment; through methods and techniques A3 Competency identification: outline the roles and responsibilities of the position and short-term goals, Skills set required for the job, and soft skill sets required for the job plus interactions with other units/personal. A3 Generating a competency model and benchmarking various skills specific for specific positions. A4 Panel of experts to determine competency requirements. A4 Relationship between experiences and competencies designing of a relational map. A4 Determining proficiency levels. A6 Identify Competency Required for Job/Role A6 Design Competency Mapping Tool A8 Conduct of a Job Analysis A8 Development of a Competency based Job Description A9 Gather: Competency identification. A9 Construct: Grouping the statements, create subgroups, Refine subgroups, Identify, and name the competencies. A10

			a description of competence and performance criteria A 10 the establishment of expected profiles A 10 the identification of competence levels that differentiate professional categories. A10 an assessment of the current proficiency levels A12 Psychometric tests

Table 2

	Description	Worker competency assessment	The Gap analysis
Worker Competency Assessment and gap analysis	In this phase, the current competencies of employees or facilitators are evaluated against the identified job requirements. Assessment methods like 360-degree feedback, psychometric testing, and behavioral interviews are used to measure the skills, knowledge, and behaviors of individuals.	A1 Identify the competencies of (new) workers. A2 Competency Assessment; through methods and techniques A2 Competency Grading: Grades are allotted to each employee at various levels, based on the competency map and the assessment. A percentage grid would be designed. A4 Assess worker competencies. A6 Select Individuals for Competency Mapping A10 an assessment of the current proficiency levels	A3 Assessment of the current or future employees keeping in mind the competencies required for that position. A6 Apply Competency mapping Tool. A6 Identify Competency Gaps or Deficiencies A8 Mapping those competencies throughout the HR processes. A 10 a gap analysis and the association between experience and competency development

Table 3

	Description	Hiring or training	Evaluation and reward
Validating the competency framework	After assessing competencies, a gap analysis is conducted to identify areas where individuals fall short of the required competencies. Based on this analysis, specific training programs are designed to close these gaps, ensuring employees or facilitators acquire the necessary skills for successful project execution.	A1 Competency acquisition or competency development A2 Training needs would be identified for departments. A4 Develop training paths. A6 Post Competency Mapping Applications (recruitment, placement, and development) A9 Coaching mentoring	A1 Monitoring and evaluation A1 Retribution pays by competence. A3 Analyzing the results of benchmarking and using them in various HR practices for development A6 Post Competency Mapping Applications (reward, job redesign, career planning, succession planning and performance management) A9 Reward and recognition.

Appendix 2 analysis of competency mapping steps

Table 1: Job Analysis Methods

Job Analysis Methods	Description	A1 (Brandão & Bahry)	A4 (Takey & Carvalho)	A6 (Dalvi)	A7 (Mukherjee et al.)	A8 (Sanghi)	A9 (Warier)

Interviews and Expert Panels	Interviews and expert panels are qualitative techniques widely used for job analysis. They involve gathering insights from subject matter experts, managers, or current job incumbents to identify the KSAO requirements of a role.	Emphasizes the role of expert panels in job analysis, particularly for understanding the technical and strategic competencies required for specific roles. The use of structured interviews is also highlighted to gain insights into job-specific knowledge and skills.	Supports the use of expert panels and interviews to determine the relationship between job tasks and required competencies, helping to define both hard and soft skills.				Advocates for a combination of interviews and focus groups to gather job-specific competency data. This approach allows for a deep exploration of the nuances involved in a particular job role.
Surveys and Competency Questionnaires				Highlights the use of competency questionnaires to identify the key tasks, responsibilities, and competencies required for specific roles. This method allows for systematic data collection from multiple employees or managers, providing a comprehensive view of the KSAOs required for the job.		Supports the use of structured surveys as part of job analysis, suggesting that these tools can be used to collect standardized data on the skills and abilities necessary for job performance.	
Job Observation and Work Diaries	Job observation involves directly observing employees as they perform their duties, while work diaries are maintained by employees to record their daily tasks and responsibilities. Both methods help in identifying the competencies required to	Discusses job observation as a key method for capturing real-time data on the tasks and skills needed for specific job roles. Observations are especially useful for identifying behavioral competencies that may not be easily articulated in interviews or surveys.			Suggests the use of work diaries to help employees document tasks, interactions, and decision-making processes, offering a more in-depth understanding of the skills and abilities required for job success.		

	perform specific jobs.						

Table 2: Worker Competency Assessment Methods

Worker Competency Assessment Methods	Description	A1 (Brandão & Bahry)	A2 (Kumari)	A3 (Johri)	A4 (Takey & Carvalho)	A6 (Dalvi)	A7 (Mukherjee et al.)	A10 (Waiker et al.)	A11 (Rout et al.)	al.) A12 (Dutta & Sreenidhi)
360-Degree Feedback	360-degree feedback gathers feedback from peers, supervisors, subordinates, and sometimes clients, providing a comprehensive evaluation of both technical and interpersonal competencies.		Emphasizes the use of 360-degree feedback for assessing both technical and interpersonal skills, ensuring workers' competencies align with job requirements.		Emphasizes the use of 360-degree feedback as a comprehensive method for assessing competencies from various perspectives.			Advocates for integrating 360-degree feedback with other assessment tools to provide a balanced evaluation of both hard and soft skills.		
Psychometric Testing	Psychometric tests measure cognitive abilities, personality traits, and behavioral tendencies, offering objective and standardized data about employees' competencies.		Supports the use of psychometric tests, particularly when combined with other methods, to ensure a comprehensive evaluation of competencies.							Emphasizes the role of psychometric tests in competency assessment, particularly for evaluating personality traits, decision-making skills, and cognitive abilities.
Behavioral Interviews	Behavioral interviews focus on evaluating an			Emphasizes the importance of behavioral intervie					Supports the use of behavioral	

	individual's competencies based on past behavior, particularly for leadership, teamwork, and problem-solving skills.			ws in evaluating leadership, teamwork, and problem-solving competencies by exploring past performance in similar situations.					interviews to explore competencies that may not be easily captured through surveys or tests, particularly in assessing how workers manage interpersonal situations.	
Assessment/Development Centers	Assessment centers use a variety of techniques (e.g., simulations, role plays, in-basket exercises) to assess both technical and interpersonal competencies in a structured setting. Development centers focus on improving employees' competencies through training.	Supports the use of assessment centers to evaluate both technical and soft skills through simulations and structured exercises.				Mentions the role of development centers in identifying competency gaps and providing targeted training to address these gaps.	Supports the use of assessment centers for evaluating competencies in practical simulations, providing a hands-on evaluation.			

Appendix 3 analysis of competency mapping suggestions

Table 1: *Usage of (premade) tools*

A9 (Warier)	Use Standard Competency Models	Develop your own Organizational Competency Framework

A11 (Rout et al.)	Use computational approaches	

Table 2: Competencies and competency model quality

A1 (Brandão & Bahry)	The description of a competence must represent a performance or expected behavior, indicating what the professional should be able to do. Should be described using a verb and an action goal. Do this with condition and criteria.	Avoid construction of exceedingly long descriptions and the use of technical terms that make it difficult to understand for people	Avoid ambiguities.	Avoid irrelevant and obvious	Avoid duplicates	Avoid abstractions.	Do not use nonconcrete action verbs. Use verbs that express a concrete action.	Consult with key people in the organization to identify inconsistencies.
A3 (Johri)	Assessment of the competency should be continuous or on yearly basis, and again by whom the assessment of competencies would be done— e.g., by evaluation of job description, by experts or by assessment centers—is important.	Time involved in the development of competencies, i.e., it is a periodic or continuous effort depending on the need of the organization and changing environment.						
A5 (Naqvj)	The model should not be vague; the abstract concepts must be translated into observable behavior.	The model should be effective in distinguishing superior performance						
A9 (Warier)	Establish Benchmarking Initiatives							

Table 3: Scope and multiple process usage

A3 (Johri)	The results of assessment of competencies are	Strategies used to describe or map competencies are	Scope of competency mapping, i.e., the	The sources for the identification and development	Identification of the competencies is in accordance	The goal of developing the

	utilized by the organization for different purposes; so, that purpose must be explained.	to be organization wide (often called 'core competencies or job, family or business unit competency sets, position-specific competency set, or competency sets defined relative to the level of employee contribution, i.e., individual contributor, manager, or organizational leader).	categories of employees who would be covered in the process should be defined;	of competencies information such as by assumption, law, industrial trends or background information, work group, etc., for any job title.	with the current scenario, or they must be recognized on a future basis;	competency model;
A5 (Naqvj)	The model should be future focused.	It should be established through a process, maximizing effective communication and involvement across all levels in the organization	The competencies must support the business strategy by ensuring identification of all skills required to implement the strategy effectively			
A9 (Warier)	Develop Organizational Competency Dictionary					

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