Headcount Model for Data Centre Construction

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Abstract

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This thesis work explores and examines the methods of workforce planning and management utilised in the Finnish data centre construction industry. The main objective of this work is to evaluate existing approaches to staff management, and whether these approaches meet the requirements for reliability, efficiency and adaptability. The thesis work also provides options for improving communications and process improvement for companies that manage a workforce on data centre construction projects.

The framework utilised in this work is theoretical, and it analyses project life cycle management and HR forecasting principles. This thesis reviews common approaches used in data centre construction in order to assess their effectiveness. Some of the main aspects of staff management on such projects include the utilization of advanced and tailored technologies, meeting of tight deadlines, high collaboration between departments in construction and managing staff with lean engineering principles in place. The diverse skill sets that are needed to succeed in construction projects of this scale are also addressed, where leadership and risk management prove crucial to effective workforce planning.

The study employs a mixed-methods approach, providing a pragmatic and holistic perspective. The research is tested using a survey that was conducted on a data centre project, and with additional input from interviews of construction managers on the project. These two sources are used to test and determine the efficiency of staffing processes in place on this project and other projects alike, and whether those processes meet the demands of lean engineering. The aim is to determine the main challenges faced and which tools can be used to improve the efficiency of staffing on hyperscale construction projects.

The findings show that any future headcount model must meet the differing needs of different stakeholders, change based on lifecycle phases, and note of risks considerations specific to commissioning and labour of varying skill levels.

The thesis concludes that the Data Centre construction sector has both the capacity and motivation to improve its workforce planning practices. The recommendations include developing structured communication processes, improving early-phase planning and increasing visibility of labour requirements across teams. These improvements would help organisation transition from reactive to proactive workforce planning, thereby reducing risk and strengthening project delivery reliability.

Keywords
Construction, Data Centres, Headcount Model, Workforce Planning, and Human Resources

Table of Contents

Figures

Tables

1 Introduction

Data Centres are fundamental to today's digital world, supporting vital services like cloud computing, data storage, and artificial intelligence. As the internet and digital information continue to grow quickly, a rapid development of data storage and processing capabilities will be required to satisfy the demand.

The workforce involved in Data Centre construction is essential for timely project delivery. Without the correct number of skilled workers at each project stage, there is potential for delays that pose a significant risk to the timely completion of projects. Project managers and HR professionals in the sector often struggle to accurately forecast workforce requirements, which can lead to projects running over budget due to a high number of workers. This can lead to insufficient collaboration. Since data centre construction is growing at a fast rate, an efficient plan or model needs to be put in place to ensure smooth operations during the full project life cycle.

The above issues are further complicated when considering the rapid growth of Data Centres as it is apparent that there is a skills shortage in the Data Centre construction industry. This has resulted in the construction workforce being selected from various populations of workers and a variance will be present in terms of their skills composition, who they are, their cultural background, and their previous working experiences.

This thesis aims to find solutions to the above problems. It will also create a better methodology to plan how many workers are needed in the early project stages of Data Centre construction and, therefore, improve efficiency at all stages of the project lifecycle.

The above issues are further complicated when considering the rapid growth of Data Centres as it is apparent that there is a skills shortage in the Data Centre's construction industry. This has resulted in the construction workforce being selected from various populations of workers and a variance will be present in terms of their skills composition, who they are, their cultural background, and their previous experiences.

The author wants to encourage the implementation of workforce planning, specifically using a headcount model, to accurately manage staffing levels and lower the risk of construction projects exceeding budgets due to overstaffing. A headcount model is a quantitative methodology to align levels directly with business objectives and project milestones. (Bechet, 2008). A headcount model provides a structured, quantitative approach to forecasting and managing the number of employees required at each phase of a project.

Furthermore, workforce planning itself is a broader strategic process that ensures an organisation has the right number of employees, with the appropriate skills, in the right roles, at the right time. According to Vulpen (2024) effective workforce planning enables organisations to anticipate future staffing needs, close talent gaps, and remain agile in responding to evolving business challenges. By planning, companies can respond more quickly to unexpected changes such as shift in project timelines, shortages of skilled workers, or new technologies. The kind of planning is especially important in large and complex projects like Data Centre construction, where delays or overstaffing can be very costly.

The company that the author works for (Company XET Tech) is a company that designs, engineers, and builds high-tech facilities, such as servers, storage drivers, and network switches. To protect the confidentiality of the organisation and its internal operations, a pseudonym has been used in place of the company's real name throughout this thesis. Data centres are used to store, process and manage critical data and applications. Data Centres are in a large demand, with organisations starting to build in Finland especially, thanks to the cold winters. The cold winter allow data centres to use cold air or water, to fuel the major cooling systems within the data centre building (Markets & Research, 2025). Company XET Tech a rapidly growing construction company based in Germany, with numerous other regions, including Finland as new region.

The author's professional experience as a Cost Controller on a data centre construction project at Company XET Tech, consists of several responsibilities. Some responsibilities include invoice tracking, vendor management, checking employee timesheets, and budget tracking. The construction project has given the author a direct understanding of these challenges. The company works on complex, large-scale projects, and their job has given the author firsthand experience how bad headcount can lead to project costing too much and being delayed. The author will gather some data from their company, which will allow them to gain more clarity on the research.

The main goal of this thesis is to develop a model that will help Data Centre construction project managers calculate how many workers they need and to manage their workforce effectively. This model seeks to provide Data Centre construction organisations with a more reliable tool for forecasting labour needs, moving beyond current challenges in workforce estimation. The headcount model will help managers use resources more efficiently, reduce costs and avoid delays.

To achieve the main goal of creating a practical and accurate headcount model, this research will focus on the following specific objectives:

1) To research different methods of planning a workforce and conclude how well it fits Data Centre construction
2) To research the most important metrics that influence how many workers are required for Data Centre construction projects.
3) To build a headcount model that is practical and easy to use for Data Centre construction projects.

This research aims to find answers to the following research questions about planning workers for Data Centre construction:

Q1: What are the key disciplines (such as mechanical, electrical, or civil engineering) required for building a Data Centre, and how can we accurately predict the requirements for these specific disciplines?

Q2: How can workforce planning methods be improved to make the process of building Data Centres more efficient, faster and safer?

Q3: How will new technologies and automation impact the number of workers, the types of jobs and required disciplines for building Data Centres in the future?

2 Theoretical Framework

Due to the rapidly expanding requirement for underlying cloud computing, data storage and artificial intelligence, data centres can be considered foundational to the modern digital world. This expansion requires the efficient storage and processing of large amounts of digital data and the major technology companies such as Google, Meta and Microsoft are investing billions of dollars collectively to ensure the rapid increase of Data Centre construction. To ensure that the construction of the new data centres is completed in a timely manner that will ensure that supply can keep up with demand, it is critical that consideration is given to the efficiency of the construction process of the data centres.

When considering the building of Data Centres, the workforce executing the work should be considered critical to the construction process. If a company were not to have the required number of operatives available at each stage of the project, then timely completion of a project is put into risk. Due to rapid growth in data centre requirement and the need to complete their construction as quickly as possible, Project Managers and Project Planners are being increasingly challenged to ensure that that projects are completed within budget and on time. It is essential that a project plan is put in place to ensure that the project is executed efficiently at all stages of the project lifecycle.

The issues discussed above are further compounded when we consider that the future data centre construction workforce will be selected from various populations of workers and a variance will be present in terms of their skills composition, who they are, their cultural background, and their previous working experiences. This variety will likely cause complications as the operatives' expectations with relation to working conditions and contractual details will vary widely.

The above issue is highlighted by Maskuri et el. (2019) who *states "Construction is a collaborative effort involving many people with different interests and backgrounds, who will undertake complex project lifecycle processes which include planning, designing, construction, market study, and procurement, with humans at the centre of these activities"* (Maskuri, et al., 2019, p. 45). Fischer (2016) iterates the importance of project planning for elevating the human resource problem by stating *"Proper human resource planning is particularly important in companies operating in a high-risk and uncertain environment, such as the construction industry"* (Fischer, 2016, p. 102).

2.1 Importance of Human Resource Workforce Planning

Human Resource planning for construction projects can be described as a way of managing human resources within the growing nature of the construction industry. Nonetheless, management

of human resources is an extremely stimulating task. However, despite the substantial resources assigned to construction planning, there are rising concerns over its failure to achieve its goals and different applications of planning strategies. It is against this backdrop that this research was carried out to examine the sustainability of Human resource planning for construction projects to justify the previous statement. Sustainability of Human Resource means creating HR strategies that can regularly provide the right people, adapt to new situations, and keep the workforce strong, engaged and skilled over a long time. Making sure HR plans consistently help the organisation get the people it needs. Developing HR strategies that can quickly change and respond to new industry trends, technologies and changes in the types of workers available (Komm, et al., 2021).

Finally, the research results (Komm, et al., 2021) indicated that through improving the practicality of Project HR planning by construction organisations, it would contribute significantly towards improving performance both at organisational and project level. The findings recommended guidelines for improving the visibility and adaptability of sustainable HR planning for construction projects and further provided justification for implementing its policies and procedure.

Wong et al. (2012) developed a model for workforce demand planning in construction projects. They used the Employment Multiplier Model, and they gathered information during construction projects such as daily labour intensity and project expenditure. The employment multiplier was extracted in terms of terms of a unit of man-hours per one million dollars, and organised for different types of construction projects, such as public, rails, and other types of construction (Wong, et al., 2012).

Wong et al, (2012) also extended their model by incorporating a non-linear relationship between employment and construction costs, enhancing the accuracy of manpower demand predictions. This approach aligns with their earlier work, where they developed a computer-based model to estimate the demand for different categories of construction personnel in Hong Kong. This model utilised the labour multiplier approach, deriving relationships between the number of workers required and project expenditure over a given duration. They calculated multipliers for 61 project types across 38 labour trades using completed project data.

Even though there are good ways to plan for workers in traditional construction, like building roads or train lines, these methods usually don’t include data centres. This is an important point because Data Centres are a very new type of building, but they are growing very quickly. Data Centres are differed from older types of building work, like houses, hospitals, and schools, which have been built for hundreds of years with clear labour needs. They need a very specific set of skills that most people don’t have yet. Because data centre technology changes quickly , requirement is so urgent,

simply using old planning methods or worker estimates form other kinds of construction won’t give us an accurate picture.

2.2 Issues Associated with Current Workforce Planning

Effective workforce planning is essential for minimising risk in construction projects. According to (Dainty & Loosemore, 2012), human resources are fundamental to the operational success of all industries, with the construction sector being no exception. In construction organisations, the attraction and maintenance of skilled employees are critical for both successful project delivery and long-term organisational development. The integrally complex network of human interactions within the construction environment, covering multiple trades, diverse project stakeholders, and often temporary or temporary employment structures gives rise to unique, sector-specific challenges in human resource planning. These complexities highlight the necessary for modified HR strategies that respond effectively to the individual dynamics of the built environment. (Dainty & Loosemore, 2012).

The construction industry is very important for the economy, but it's not especially well known how to manage those who work in it. Studies in the business world has shown that people are often seen as just another resource to manage, and sometimes even as a cost that must be cut down on, instead of as a key part of the organization's success. It's harder to come up with good HR practices when you think this way. Also, people often use general HR methods for construction projects, even though each project has its own needs that need to be solved with specific solutions. (Huemann, 2019)

According to Brandenburg & Haas (2006) in the construction industry, human resource management has often grown in an unplanned way instead of within planned strategic actions. This has made it hard to use effective workforce planning methods. Because there isn't any structured HR planning, the performance of employees is not reliable. Chances to increase productivity means decrease employee turnover and have been missed support long-term workforce development on construction projects.

According to Loosemore (2000) a lot of problems in construction happen not only because of technical problems, but also because of bad management of people and communication problems. Poor workforce planning, such as not having enough skilled workers or not being able to communicate clearly can rise quickly to big delays, cost overruns, and even project failure. Loosemore says that to avoid these kinds of risks, especially in fast-paced fields like Data Centre construction, it's

important to plan before, know how your team works, and how to be ready for unexpected problems with your workers.

As highlighted in (Del-Aguila-Obra, et al., 2025) workforce planning in modern industries including construction requires a strategic and data-driven approach. This study highlights the importance of advanced methods such as: econometric estimation, forecasting, and optimization algorithms. These are needed in order to figure out what skills and roles will be needed in the future. The journal also has useful advice on how to use demand forecasting and supply analysis tools in the real world of business. The theoretical foundations often focus on better using resources, reducing on labour shortages, and making businesses more adaptable in changes in the market.

As stated by Del-Aguila-Obra and colleagues (2025) workforce planning is a modern industry including construction requires a strategic and data-driven approach. This publication looks at workforce planning from an organizational and human-focused perspective, highlighting the human factors that significantly impact on the efficacy of workforce planning. Some of these things are how motivated and engaged the employees and how to keep them and how the organization's culture affects how workforce is flexible. Personnel review also shows how well-planned workforce strategies can help a business do well by making sure it has a skilled, stable, and motivated workforce. It highlights that effective workforce planning must involves modules focused on building internal talent and establishing well-defined career plans and preparing for succession planning.

The journal also talks on the psychological contracts that exist between individuals and organisations and how these effect employee skill improvement and the overall performance of human resource activities. The article talks about to find out what skills and jobs will be needed in the future is important it is to use modern methods like econometric estimation and optimization algorithms. These methods, including the employment multiplier model explored by Wong et al. (2012), are especially good at predicting labour power based on project costs.

The publication also shows us how to use labour planning tools like demand planning with supply analysis in real business situations. The publication goes into detail about different workforce planning models and methods, focusing on how well they work in the real world and the problems that come up when they are used in different types of businesses.

The theoretical of foundations often focuses on making the best use of resources, reducing the number of workers needed, and how make organizations more adaptable to changes in the marketplace.

Because of developments in technology and changes in organisational operations recent studies investigated the constant change of workforce planning strategies. Businesses require flexible and

easy-to-change workforce planning approaches since the environment around them is becoming less stable and changing more quickly. These models should help companies deal with fluctuating workforce requirement, make better use of the data they already have, and make sure that every individual working on the project is working toward its objective. These kinds of versatile solution help businesses deal with risks and be ahead in the competition market that is always variable.

The article by Komm et al. (2021) says that the COVID-19 pandemic did big changes in the approach of people work. This shows that we need a workforce model that is more adaptable and versatile. The article makes it clear that we need a more flexible and dynamic model for our workforce environment. The authors believe that the traditional ways of putting people in hierarchies based on consistency don't work anymore since the pandemic. Companies need to focus on speed, connection, and adaptability to stay ahead in the competition. Recognising how purpose and identity affect an organization's culture and make its workers perform best is important. HR directors should make sure that the organization’s values are reflected when they hire, train, and plan for future workforce. This will make sure that the company's goal is adhered and performed on day-to-day purposes.

The article also suggests about how important it is for people ability to grow. It says that businesses should not have stringent hierarchies and instead of hiring the best people for the jobs that will make them the more profitable, good analytics needs to be done, using of data to organise employees, and start seeing HR as a strategic partner instead of just a job that needs to be done.

The employee experience is another important task, and it is seen as a key element in how well a business is done. The authors note that companies that prioritise personalised, meaningful experiences established in shared purpose see stronger engagement and performance outcomes. HR is seen as a central architect of this experience.

Finally, leadership and culture are highlighted as foundational elements for sustainable organisational change. Role-modelling by senior leaders and a clear, consistent approach to culture transformation are shown to significantly develop the success rate of change initiatives.

2.3 Summary of Theoretical Framework

Currently in the construction industry, there are very few structured workforce management programs. If any human resource development is conducted on a project, it is usually in the form of on-the-job training, with very few resources available at the project level for further training and

development of the workforce. There are extensive strategies and programs available in the Human Resource Development industry.

There is also a need for a structured workforce management strategy in construction that can be used to effectively manage a workforce regardless of its skill level. The construction industry has experienced a shortage of skilled craft workers and will continue to experience the short age unless revolutionary methods are put in place to address the problem.

The quality of management decisions at the tactical and operational planning levels can be improved with dedicated optimisation methods and computerised decision support systems. Using optimisation techniques and computerised decision support systems can help improve workforce planning. These tools allow managers to make better decisions, plan resources more effectively and reduce risks, especially in complex projects like Data centre construction.

There is not enough study on human resources planning in Data Centre development. Some problems, such bad forecasts, short deadlines, and not enough trained labour, have been highlighted up in past research, but not in detail. It is imperative that these problems are understood and addressed in a timely and effective manner.

Based on research that has been conducted, it has been determined that traditional construction practices must be combined with modern human resource approaches that have been introduced into the industry in recent years. The industry can utilise modern workforce management strategies, supported by digital tools in order to ensure the right staff are hired at the right time, an improvement in overall productivity and an improvement in construction site safety. These aspects will ensure that the project is construction is completed in a timely manner.

3 Methodology

3.1 Research Approach

This part describes about the study's design, methodologies, and methods for collecting data. It also suggests how both primary and secondary data were gathered and the problems that came up along the way. This section explains the reader what the research's goals and objectives are and how they will be reached. The study addresses workforce planning problems in Data Centre development and adopting a mixed-methods approach to obtain both important statistical trends with significant insights.

This thesis applies a mixed-methods research approach, integrating both qualitative and quantitative methodologies. This method was chosen because it combines the depth of qualitative insights with the breadth and validation of quantitative data to give a full picture of workforce planning in Data Centre construction. It primarily employs design-based research principles to develop a practical solution to a real-world problem. This combination is well-suited for exploring complex organisational experiences and building context-specific tools, allowing for an in-depth understanding of human factors.

Kandel (2020) defines qualitative research as '*the collection, and interpretation of data by observing what people do and say'*. Qualitative research can be collected from case studies, in-depth interviews, and focus group discussions. The nature of qualitative research is exploratory and open-ended, unlike quantitative research (Kandel, 2020). It helps us to understand the world that we live in, by understanding social phenomena and human behaviour. Some types of qualitative research are narrative research, grounded theory and case studies (Kandel, 2020).

Quantitative research is the collection of data that is analysed using mathematically based methods (Kandel, 2020). Quantitative is controlled and product oriented, and not open-ended and exploratory the qualitative research. Quantitative data is usually collected from questionnaires and surveys. Some questions to ask in quantitative research are: How many? How much? How often? The main disadvantage to quantitative research is that it is not exploratory and is unable to deal with specific questions, it often lacks a human element, and the participants are seen as numbers (Kandel, 2020).

A common distinction between qualitative and quantitative research lies in the nature of the data and the types of questions used. Qualitative research typically focuses on words and meanings, employing open-ended to explore participants' experiences and perspectives. In contrast, quantitative research emphasises numerical data, often relying on closed-ended questions to test hypotheses and measure variables. (Creswell, 2009).

Mixed research methods make use of both qualitative and quantitative research methods. The researcher collects, analyses, and interprets both qualitative and quantitative data. Mixed research methods allow the researcher to provide a more comprehensive understanding of a research question, to increase the reliability of their research finding.

Creswell (2009) suggests that mixed methods research is an approach in which the researcher collects analyses and interprets both quantitative and qualitative data, integrates the two approaches in various ways and frames the study within a specific design. The target audience for the surveys and interviews will be specific to data centre construction only. The roles will include human resource coordinators/managers, project managers, project schedulers, commercial teams, and some others. It is important that the author reaches the target audience to prove that there are issues with workforce planning within that industry.

3.2 Choice of Methods

The author selected the mixed methods approach, to achieve the outlined objectives of this thesis. It combines both the benefits of quantitative and qualitative research. The author aims to use the information gathered from the Theoretical Framework in Chapter 2, to explore gaps and issues using surveys and interviews. After all the information has been gathered, the author will then analyse the results and give recommendations and a conclusion, as shown in Figure 1 below:

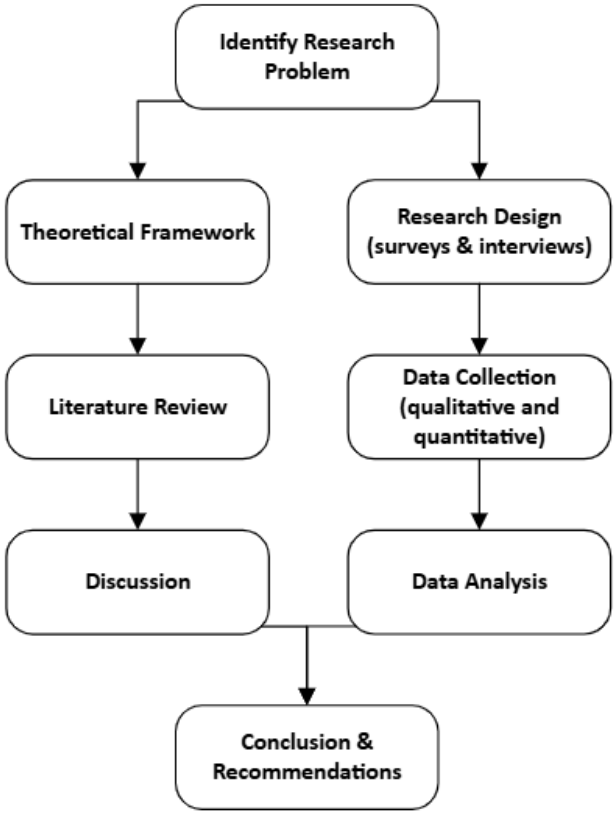

Figure 1. Research Methodology of this Study

3.3 Survey and Interview Design

The survey was designed as the primary tool for collecting workforce planning data. A survey is defined as a structured set of questions completed by respondents to provide their views, experiences, or opinions (Creswell, 2009). In this study, the survey collected both qualitative and quantitative data by asking respondents about their experiences and perceptions of workforce planning in Data Centre construction. The survey's purpose was very similar to the research goals, which made sure that the information collected would be useful for figuring out how well workforce planning practices are working.

The way the question was presented was a key part of this research. The results depend on asking the right questions in a clear way. The structure and order of the questions were all carefully chosen to make sure that the answers would be useful for research. This allowed the results to be more reliable and accurate.

The survey was sent to professionals who works in Data Centre construction in Finland, since their experience makes their answers directly relevant to the research. The target group included project

managers, schedulers, and human resources from different construction companies. Project managers look at the big picture of the project, schedulers make sure that things happen on time and that workers are available, and human resources professionals handle hiring and making sure that workers are willing to work. By combining different points of view, the study was able to gain a completer and more balanced picture of the problems and best practices in labour planning.

The survey questions were designed to align with the goals of the thesis so that the data collected would be valuable and essential. The author selected Google Forms because it's simple to use, accessible and everyone can get access to it. This made it easy for people from other companies to share the forms. Before the survey was sent out, it was tested to make sure that the arrangement of the questions made sense and was easy to follow.

After the survey, a semi-structured interview was taking place to get additional information into the workforce planning challenges in Data Centre construction. The author selected semi-structured interviews because they provide rich, detailed qualitative data from constructional management. This method is highly versatile, allowing participants to share their thoughts, experiences, and perspectives in their own words (Goffi, 2019). This method is particularly useful for uncovering factors that impact workforce planning, especially those that are not easily detected through survey data.

The professionals interviewed by author were managers who had worked on a lot of important construction projects like Data Centres. It was primarily important to have this kind of knowledge to check and add to the results data. Their point of view was very helpful because they were responsible of checking the project's quality and hiring people. They were also involved in many parts of the project and decisions about who to hire. The questions were about the interviewee's job title, their experience with different parts of a project, how they made hiring decisions, and the problems they had with staffing levels, productivity, and planning for the workforce. The interview was able to give more explanations and examples that backed up and built on the survey results because the questions were set up this way.

This research successfully presented multiple workforces planning methodologies in the expansion of Data Centre construction by integrating a systematic survey framework with the broad range of interviews. This integration ensured that the results would highlight not only general issues but also the specific challenges and strategies affecting workforce planning.

3.4 Research Problem and Development Task

The key goal of this thesis is to create an efficient and accurate headcount model that will assist Data Centre building project managers with estimating the necessary number of workers and their management. This model asks developers to give them a more accurate way of estimating how many workers they will need, which will improve project planning, lower risks, and help get complex Data Centre facilities built on time and within budget.

The main research question of this thesis is about the specific constantly changing nature of building Data Centres, which makes it hard to plan for a traditional workforce. Data Centre construction is different from other types of building, such residential, commercial, or public infrastructure projects, in that it has very tight deadlines and strict deadlines for completion (Jaillet, 2021). The rapid global demand of digital services means that data centre must become operational with considerable speed, shifting project timelines from flexible schedules to critical imperatives driven by market readiness.

Furthermore, these projects are essentially complex due to their specialised technological requirements, particularly concerning high energy demands and complicated cooling system (Jaillet, 2021). Data Centres are built to run all the time, so they need strong power systems, advanced cooling systems, and strict rules for how IT equipment should work together. To do this level of work, you need workers with very specific skills that are different from those needed for general construction.

The development task, therefore, involves the creation of a headcount model specifically tailored of data centre construction staffing. This model will serve as a practical output of the research, designed to improve workforce planning for these specialised projects by addressing the unique complexities and tight constraints identified in the research problem.

3.5 Data Collection and Analysis

Data for this research was collected using two primary sources: anonymous online surveys and a semi-structured interview:

Anonymous Surveys

The online survey was designed to gather quantitative data related to workforce planning in data centre construction. The survey was administered using Google Forms, which allowed for anonymous participation. The survey link will be distributed via email with a clear statement about the purpose of the research, the voluntary nature of participation, and the assurance of anonymity. The

data collection period will extend from September 1st to September 14th. A total of 50 participants were sent the survey and responses were automatically stored in Google Sheets.

Semi-Structured Interview

After the survey, a semi-structured interview was held with a manager who had worked on Data Centre projects before. The interviews were held in a private office and lasted about 45 minutes. The answers were written down and typed up in Microsoft Word.

The data was analysed in the following way:

- Survey Data Analysis

Quantitative data was used in Microsoft Excel. Descriptive statistics (e.g., frequencies, averages) were calculated to summarise responses. In addition, cross-tabulations were used to look relationships between categorical variables, such as workforce levels and project phases. (Alberti, 2024)

- Interview Data Analysis

The thematic analysis method was used to look at the qualitative interview data. We used this method to find patterns, themes that came up repeatedly, and important insights about planning the workforce. Thematic analysis was very helpful for putting together and breaking down the rich qualitative data that was gathered during the interview. (Goffi, 2019).

The study used both qualitative and quantitative methods to get a full picture of workforce planning in Data Centre construction. This method integration allows the study to confirm its results from different data sources providing both useful information and data-driven proof for making the Headcount Model.

3.6 Research Limitations

Several limitations were identified in relation to the survey distribution. First, there is the possibility of a low response rate, as some potential participants may not have the time or interest to complete the survey, or may perceive the questions as not fully relevant to their professional context. Second, the scope of the survey was limited to professionals within the construction industry, which may restrict the inclusion of alternative perspectives from other stakeholders who also influence workforce planning in Data Centre projects.

4 Results

This chapter shows the primary study results from two semi-structured interviews and a survey of professionals who work on construction Data Centres. The analysis points out important ideas about the number of workers, their productivity, and how well they were chosen. The results give a balanced view of the problems and chances of managing labour on complicated construction projects in Finland by combining the detailed insights of experienced professionals.

The results suggest that there are both similar difficulties, such inaccurate scheduling and not enough qualified workers, and differences in how workforce problems show up in different projects and industries. These data are a good starting point for ideas and talks about how to improve productivity and staff planning.

The purpose of this chapter is to offer a balanced and evidence-based evaluation of the present condition of workforce planning in Finland's Data Centre construction industry. The next part of the discussion and the suggestions are based on what we learnt from the research. They prioritise on pragmatic methods to enhance workforce planning, elevate project performance, and ensure the industry's long-term sustainability.

4.1 Semi-structured Interview Results and Findings

Two semi-structured interviews took place with experienced individuals in the field of large construction project management. The same group of open-ended questions was used in both interviews to make sure they were fair and to let the interviewers compare their experiences in a meaningful way. Both participants had been senior managers on complex projects, which taught them how to get the most out of workers, deal with staffing issues, and hire the right individuals for challenging construction jobs.

The first person who was asked about their previous project, which they concluded in 2024. It took a long time and was quite hard to build this big biopharmaceutical factory from a technical point of view. The participant was in the project as the Project Quality and Turnover Manager. They were the people in charge of the project from the start of the design process to the end. You had to be active in the hiring process all the time in this job, notably in the quality department, where specialists were hired and sent to other trade sectors. The person being interviewed could observe how decisions about how to manage people affect the success of projects and the results of delivering projects since they were so busy.

The individual who participated in the interview said that the productivity of the workers during the main construction phase was "fantastic," especially given how often the designs and engineering shifted. Even with these problems, the team was able to keep up a high level of productivity by communicating well and planning their work in a flexible way. Productivity of project had to up during the commissioning phase. One strategy to meet deadlines is to add more personnel to the commissioning team. It highlighted how important it was to transfer resources around to meet the needs of the new project.

Changes of the project's design were one of the biggest difficulties that made it hard to move from one phase of the project to the next. These modifications typically meant that work had to be done again, more planning was needed, and personnel plans had to be adjusted, which means will take more time and money. There were times when there were too many staff members to handle the pressure of the schedule, especially when important deadlines were coming up. Included night and back shifts to help lower traffic on site, to keep safety standards high, and keep productivity high without overworking the resources that are available during the day.

There were also times when there weren't enough workers on the project. This was mostly because there weren't enough skilled workers in the construction sector. The company hired more people from other parts of the country and from other countries to solve the problem. This solution was necessary for keeping things moving forward, but it could make planning and getting things done quite difficult. The person being interviewed said that the shortages were partly because the workforce wasn't planned well at the beginning of the project and partly because there weren't enough qualified workers when construction was at the highest level.

Quality control was another important topic that came up through the interview. The person interviewed said that there were strict quality control measures in place and check installation work in all parts of construction. Even though the project had strict limitations and the number of workers could change, these processes were essential to keeping construction standards high.

There were also a few of problems that made the project less successful. The interviewee said that the teams had trouble working together because they couldn't plan beforehand, had trouble scheduling resources, and had to deal without warning with equipment that broke down. These problems often made the work duration longer and made the overall performance worse. The results show that better use of planning tools and more accurate workforce forecasting could have helped avoid many of these problems.

The second person interviewed talked about what they learned while working on a big Data Centre development project that included both new construction and renovations. It was one of the biggest commercial construction projects in the area, and it took a lot of planning, advanced technical skills, and careful coordination of the workers. The person being interviewed had important executive duties. In the beginning, they were the Building Management System (BMS) Package Manager. Then they became the Commissioning Manager, which meant they were control of moving the project from construction to commissioning. The participant claimed that they were only indirectly involved in planning staffing and human resources during the building phase. But during the commissioning phase, they had a lot more to do with arranging the personnel, assigning resources, and keeping an eye on how well things were going. After this change in responsibilities, the individual being interviewed could plainly understand how staffing decisions effect the outcome of a project and how productive it is.

The person being interviewed said that the workers' productivity during the construction phase was very low and not what they planned for. They thought that only four of the twelve hours they worked each day were useful. There were a few big reasons why this didn't work out. It was very hard to deal with the makeup of the workforce. Because of the project's needs and the contract, many people had to be hired locally, even though many of them didn't have the technical skills needed for such a specialized Data Centre project. The limitations required comprehensive on-site training and mentoring, which delayed progress and decreased the overall quality of the work.

The project also hired people from all over the world, which gave it a workforce with a wide range of cultural and professional backgrounds. This diversity made the team stronger by helping workers learn new skills, but it also made it harder for them to talk to each other because of language differences and different ways of doing things. At first, it was hard to work together because of these cultural and language differences. But as time went on, workers got better at their jobs as they learned more about how to communicate with people from other cultures, project standards, and what was expected of them.

During the commissioning phase, productivity went up a lot compared to the construction phase. The person who was interviewed said that this improvement was because the workforce was more stable and experienced. The project kept trained workers from the construction phase and hired new, highly skilled specialists who knew a lot about Data Centre technologies. Even with these changes, the commissioning phase was still three months behind schedule. The interviewee said

that the main reason for the delay was that problems with quality were found during construction and had to be fixed before the facility could be used. They said that many of these problems could have been avoided if there had been better quality control and more active supervision during construction.

The quality of the workers and the way they were chosen were also big problems. The person who was interviewed said that the hiring process was bad and that some workers lied about their skills and experience. Because of this, some workers had to be fired and replaced, which slowed down progress and pushed back deadlines even more.

Overall, the interviews showed that running a big Data Centre or industrial project with a lot of workers is hard because of things like planning, finding the right skills, dealing with cultural differences, and meeting project-specific needs. Both professionals stressed that good planning, accurate forecasting, and clear communication at all stages of a project are necessary for getting good results and keeping up productivity. Using strategic workforce planning frameworks that bring together human resource management, project scheduling, and quality assurance practices can help organizations work better and do better in the long term.

4.2 Survey Results and Findings

To verify the qualitative insights collected through the semi-structured interviews, a survey was disseminated to 60 experts in the Data Centre building sector, yielding 35 completed replies and resulting in a response rate of roughly 58%. People who answered came from many different types of organizations, including primary contractors, sub-contractors, engineering firms, and even from client side. This made sure that there were a lot of various points of view. Some of the participants worked in the field as project managers, HR and recruitment specialists, procurements and health and safety coordinators. This highlights how different and cross-disciplinary may be Data Centre construction projects.

The answers to the survey were different because each person answered based on their own experiences. Question 12 in Section 1 asked. "Did you help decide how many people would work on this project?" People who said "Yes" were forwarded to Section 2, and people who said "No" were

referred to Section 3, which featured questions that were related to their participation. Everyone who took the survey finished Section 4, despite which way they proceeded through Sections 2 or 3. The survey collected the proper information from each person since it asked different questions based on their function and level of experience.

The purpose of the study was to gather data on key aspects of workforce development and management, including staff numbers, productivity, knowledge sets, and work quality. The primary objective of the study was to identify common patterns and balance them with the qualitative findings from the interviews.

4.2.1 Workforce Planning Gaps

The survey brought to light a number of major problems with workforce planning in data center development projects. Many people who answered said that their hiring practices were often informal, didn't work, and were based more on the experience of the person or team than on systematic, data-driven methods.

About 65% of the people who took part said that their companies either didn't have a clear plan for their workforce or mostly used "experience-based" methods that project managers came up with. A smaller group said that their companies used formal tools like Primavera P6 or resource-management software. This shows that planning for labour is mostly reactive and based on the needs of the current project, not on long-term predictions and models.

Even though there were these problems, the people who answered said they were very willing to use new tools and methods. Most said they would be willing to use models like the Headcount Model, which shows that they are ready to change how they hire and train people if they get the right tools and training.

Overall, the results show that workforce planning in the Data Centre construction industry is still not very developed and is not always consistent. There is not much use of formal planning methods or digital tools. The results also indicate that professionals recognise these shortcomings and show willingness to adopt more systematic models, such as the Headcount Model, to improve forecasting accuracy, resource allocation, and overall project efficiency.

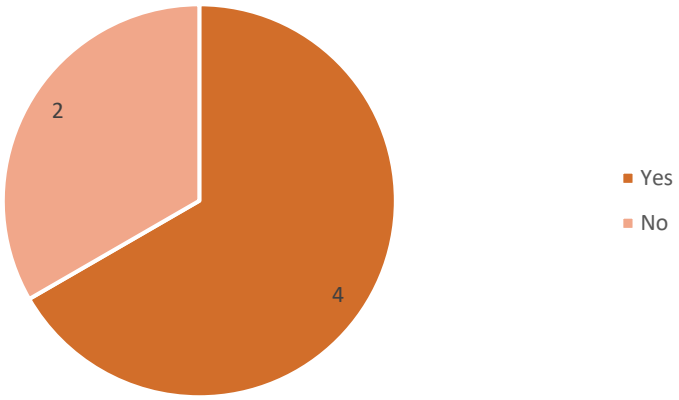

Figure 2: Section 2 Q22 - Have you heard of a Headcount Model used for workforce planning?

As shown in Figure 2 above, “when asked whether they were familiar with the concept of a Headcount Model, a structured analytical tool designed to forecast workforce requirements based on project scope and timelines” only 67% respondents answered “Yes”. This indicates limited awareness of formal workforce planning models among professionals working in Data Centre Construction.

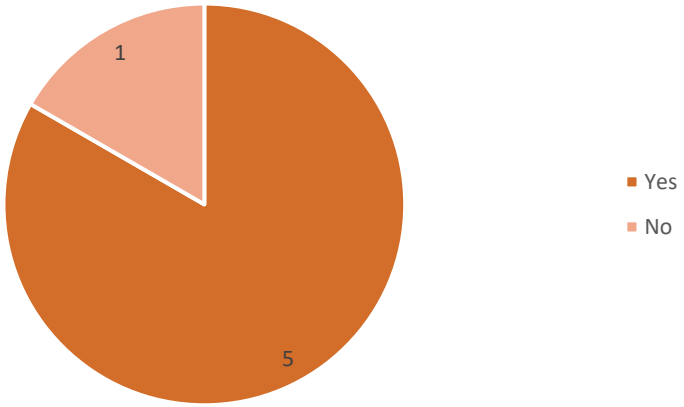

Figure 3: Section 2 Q23 - Would you or your colleagues (that are involved in workforce planning) be open to using new tools, such as the Headcount Model?

However, there was strong openness to adopting new tools and approaches. In response to whether they or their colleagues would be willing to use innovative solutions such as the

Headcount Model, 83 % respondents answered “Yes” and only 17% respondents said “No”. (see Figure 3). This suggests a positive attitude toward modernising workforce planning, provided that appropriate tools and training are made available.

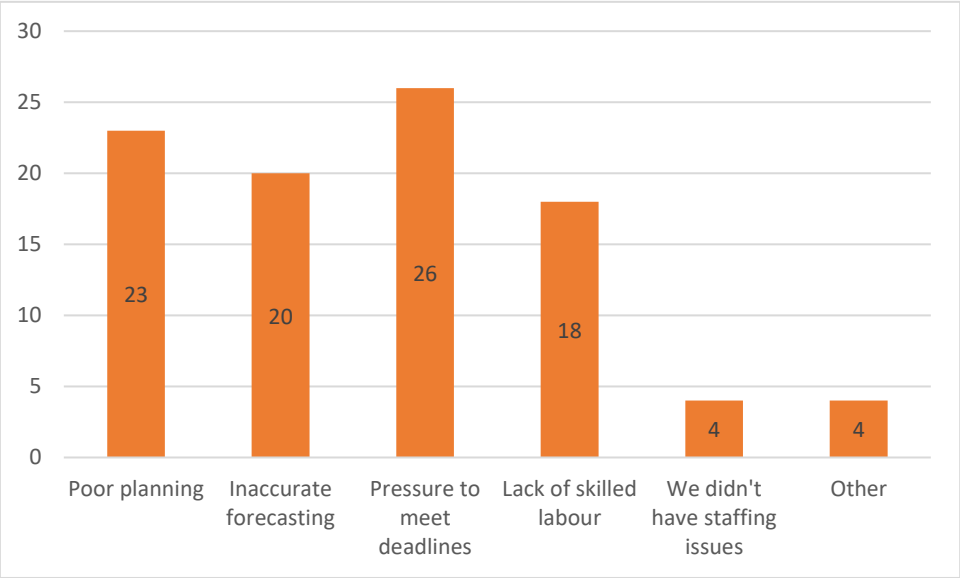

Figure 4: Section 2 Q18 & Section 3 Q31 - In your opinion, what are the primary drivers of staffing issues in data centre construction. Select all that apply.

As shown in Figure 4 above, respondents were also asked to identify the primary drivers of staffing issues in Data Centre construction. Some frequently selected factors were:

1) Poor planning and inaccurate forecasting,
2) Pressure to meet project deadlines
3) Lack of skilled labour in specialised technical areas.

These responses are consistent with the interview findings, where both professionals cited poor forecasting, unbalanced staffing levels, and skill shortages as major constraints to productivity and project delivery.

A large weighting can also be seen to respondents who cited staffing issues to those that “didn’t have staffing issues”. This indicates that “staffing issues” are prevalent and experienced on most projects.

4.2.2 Causes of Staffing Issues

The survey results showed that there were several factors that were related to each other that made staffing difficult on Data Centre construction projects. These results support what was said in the interviews, where both participants said that bad forecasting, planning problems, and a lack of workers were all ongoing problems that made it hard to keep the workforce stable and productive.

Figure 4 shows that the most common reasons for staffing problems were bad planning and wrong forecasting. More than half of the people who answered said that bad planning was the main cause of workforce imbalances same number suggested that incorrect forecasting was also a significant factor. Many of the people who answered Figure 4 said that staffing decisions were often made on the fly, based on the needs of the project at the time, rather than on long-term planning or predictive modelling. This agrees with what the Workforce Planning Gaps report said earlier: many people said there were no formal headcount models or structured planning tools.

Another important thing that was found was how stressful it is to meet project deadlines. Respondents said that managers often had to make quick staffing decisions because projects moved quickly and construction phases overlapped. This made it possible to hire too many people at times. This strategy reduced the possibility of schedule delays temporarily, but it frequently resulted in overstaffing, increased expenses, and decreased overall efficiency. The people who were interviewed said the same things that these results showed. They both said they made choices based on the schedule and that resources didn't match up between the different stages of the project.

Individuals hired by subcontracting companies noted the difficulty in locating qualified workers. Figure 4 indicates that around one-third of respondents reported a frequent shortage of skilled labour. It was stated that expertise in electrical systems, mechanical systems, and commissioning is essential for working on Data Centre projects. Respondents indicated that while locating general labour may not be excessively challenging, identifying individuals with the requisite skills and certifications remains difficult.

The data demonstrates that staffing challenges arise from weak forecasting methodologies, the necessity for rapid decision-making under time constraints, and lack of functionally trained personnel. These problems show that we need to do more systematic workforce planning, use digital forecasting tools like headcount models, and work more closely together on Data Centre projects between planning, procurement, and human resources.

4.2.3 Staffing Patterns

The responses to the survey showed that different persons had different experiences with the number of workers on the Data Centre development projects. Some people who responded stated that they noticed evident incidents of too many workers, while others said the number of workers was mainly balanced or sometimes too few during of high activity. This difference shows that staffing problems aren't the same for all Data Centre construction projects. Instead, they depend a lot on how big the project is, how tight the schedule is, and how many skilled workers are available.

The survey data showed that a lot of projects had too many workers at the beginning of construction, with many of them doing the same or similar tasks. People who answered said that having too many staff members often caused delays, poor task assignment, and roles that were too similar. Also, having too many people on staff made housing, transportation, and site facility costs go up. These problems show that a lot of projects still use gut feelings instead of data-driven methods to plan their workforces, which leads to wrong estimates of how many workers are needed.

On the other hand, some people responded that there weren't enough workers during the later stages of construction or commissioning. This was especially true for subcontractors, who had a hard time finding qualified workers as the project deadlines got closer. In a lot of cases, not having enough skilled workers made work less productive, took longer to finish projects, and put more stress on the workers who already existed workforce.

Overall, the data reveal that the way personnel is used changes a lot at different stages of the project. In many situations, not being able to predict and respond to changes in the schedule led to cycles of both overstaffing and understaffing. This modification made the project less efficient and proved that planning for workers and resources is still a concern when it comes to managing major Data Centre projects.

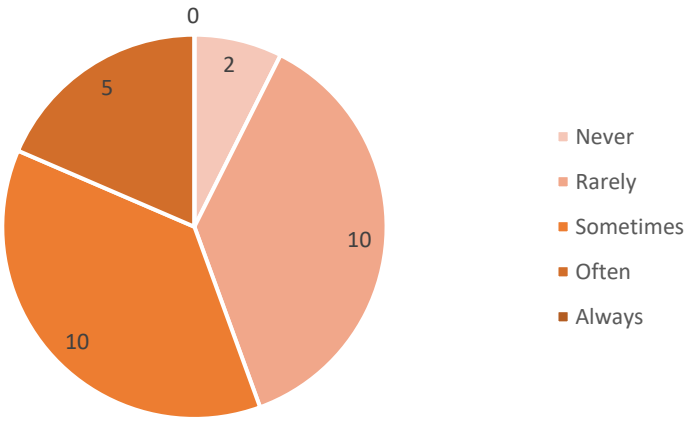

Figure 5: Section 3 Q26 - How often did you see your colleagues waiting around for instructions or work?

Figure 5 above shows that 74% of respondents said that workers often sat around doing nothing, waiting for instructions or tasks, during Data Centre construction projects.

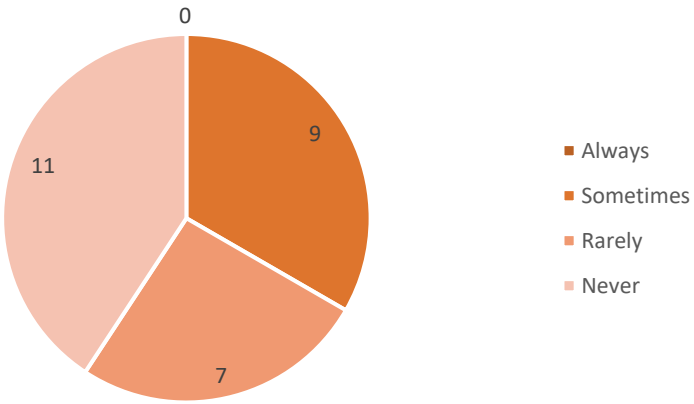

Figure 6: Section 3 Q28 - Did you experience any downtime due to too many workers being present on-site?

As shown in Figure 6, most respondents reported that they rarely experienced downtime caused by having too many workers on-site. This may reflect situations where project schedules changed suddenly or where staffing levels were not well adjusted to daily site needs, leading to short periods of reduced productivity.

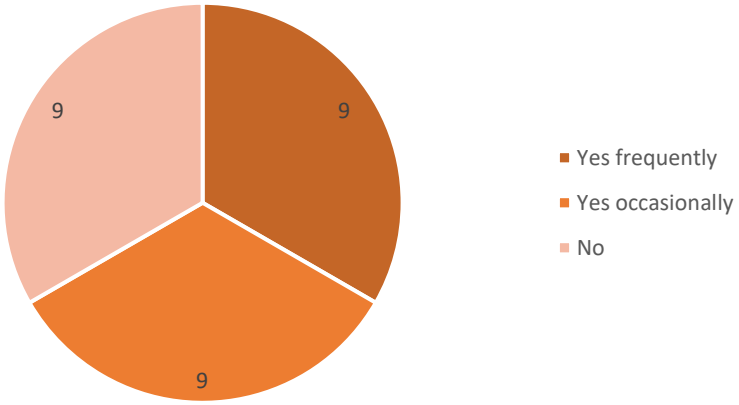

Figure 7: Section 3 Q29 - On the project, did you notice duplicate roles? (E.g. two administrators doing over-lapping tasks)

As shown in Figure 7, 66% responses were evenly distributed regarding the presence of duplicate roles on Data Centre projects. The results show that job duties may not always be clearly defined or well-coordinated, which can lead to inefficiencies like two people doing the same thing. This finding confirms previous observations that erratic workforce planning and insufficient collaboration among departments can lead to unneeded job losses.

4.2.4 Project Phases Most Affected

The survey results showed that workforce-related issues had the greatest impact during the construction and commissioning phases of Data Centre projects. the individuals who answered noticed that these stages often had problems including too much time off, everyone doing the same work, and not knowing who was expected to do what.

Many people said that these problems were caused by poor coordination between trades, late design updates, and changes to the schedule at the last minute, which made it hard to accurately plan labour needs.

Most people rated the productivity of the workforce between 3 and 5 on a scale of 1 to 5, which means that the work was generally good. But some people who answered said that productivity went down during the commissioning phase, when projects got more complicated and needed more coordination. Since commissioning involves technical testing and integration of multiple systems, even small design or planning delays were said to slow down progress.

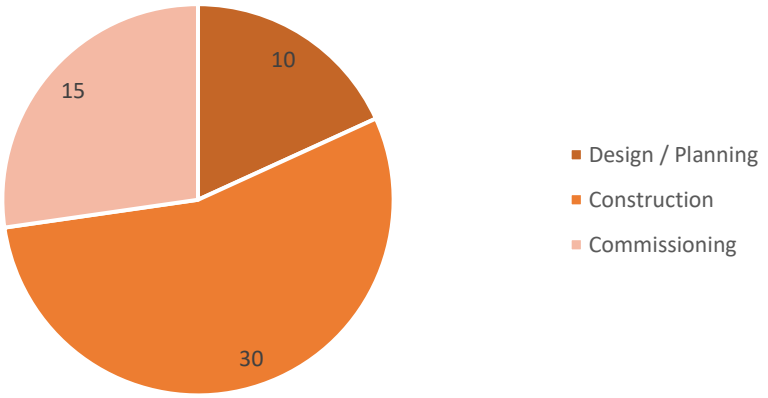

Figure 8: Section 1 Q5 - What phase of the project are/were you involved in? Select all that apply.

As shown in Figure 8, 55% respondents were involved in the construction phase of Data Centre projects, with 30 participants selecting this option. This indicates that most professionals contributing to the survey had direct, hands-on experience with the practical execution of projects.

These results suggest that the survey captured a wide range of perspectives from different stages of the project lifecycle, but with a strong emphasis on the construction stage. This is especially important because many of the challenges related to workforce planning and productivity become most evident during the construction phase, when labour demand is at its highest and coordination is most critical.

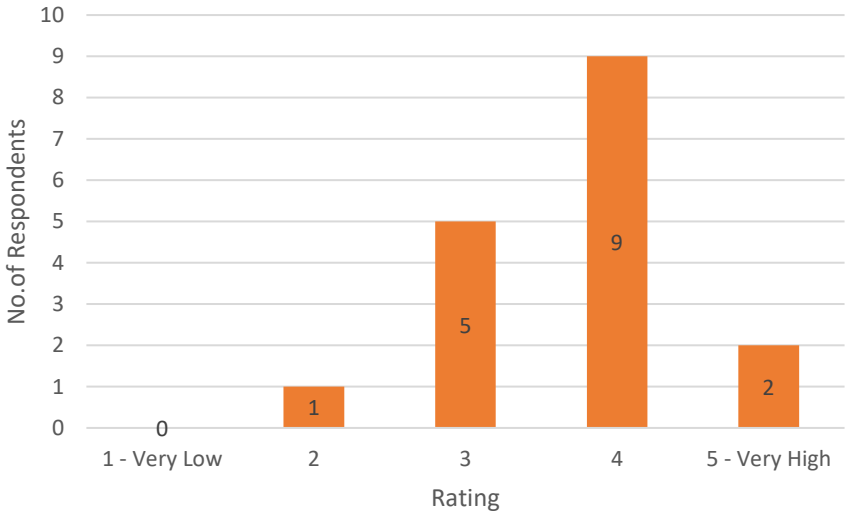

Figure 9: Section 1 Q6 - If you were on the Design / Planning stage, how would you rate your productivity during this stage of the project?

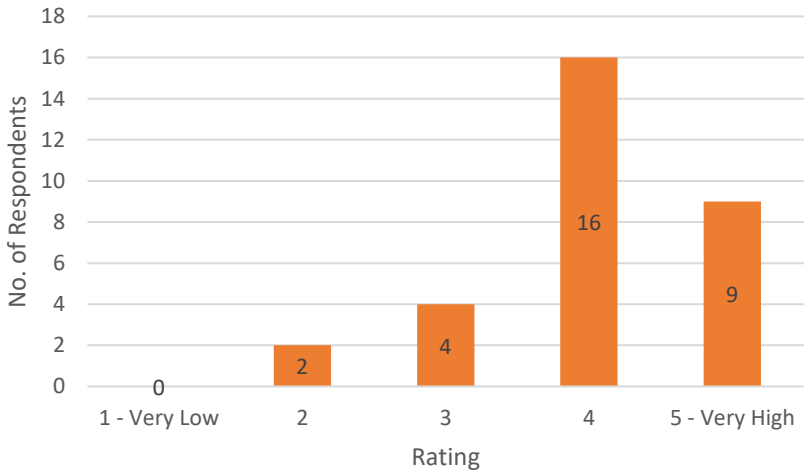

Figure 10: Section 1 Q7 - If you were on the Construction stage, how would you rate your productivity during this stage of the project?

Figure 10 shows that multiple individuals also said that there were idle labour and resources being used incorrectly throughout the construction phase. In some cases, teams who finished their work early had to wait for new tasks or approvals, which caused extra downtime and expenses. This problem was especially hard to deal with on big projects, as transport, accommodation, and site facilities added a lot to the total costs.

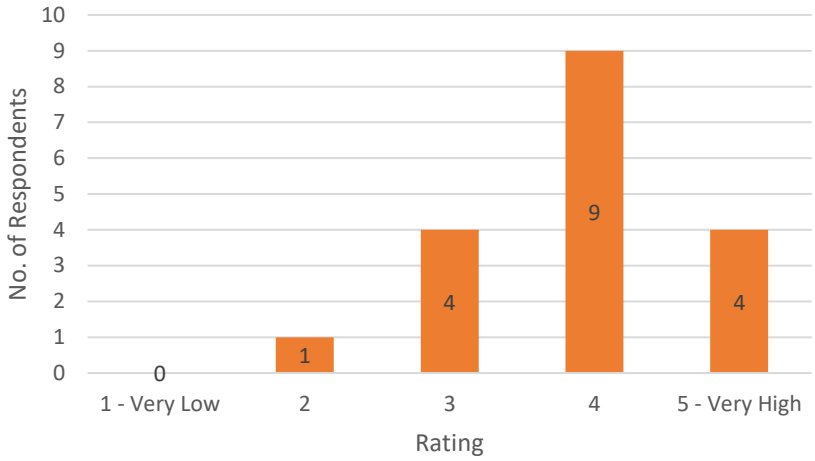

Figure 11: Section 1 Q8 - If you were on the Commissioning stage, how would you rate your productivity during this stage of the project?

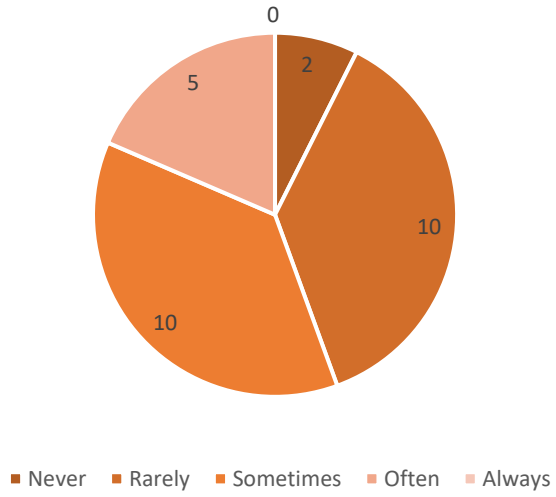

Figure 12: Section 3 Q26 - How often did you see your coworkers waiting for work or instructions?

Figure 12 shows that 74% of the participants reported that they infrequently or occasionally noticed employees awaiting instructions. A fewer proportion of respondents indicated that this was occurring frequently or briefly.

The results point out that delays caused by confusing assigned tasks or communication delays

persist as a significant issue on site. The amount of these events indicates that coordination and control may be poor, therefore weakening the project's overall productivity.

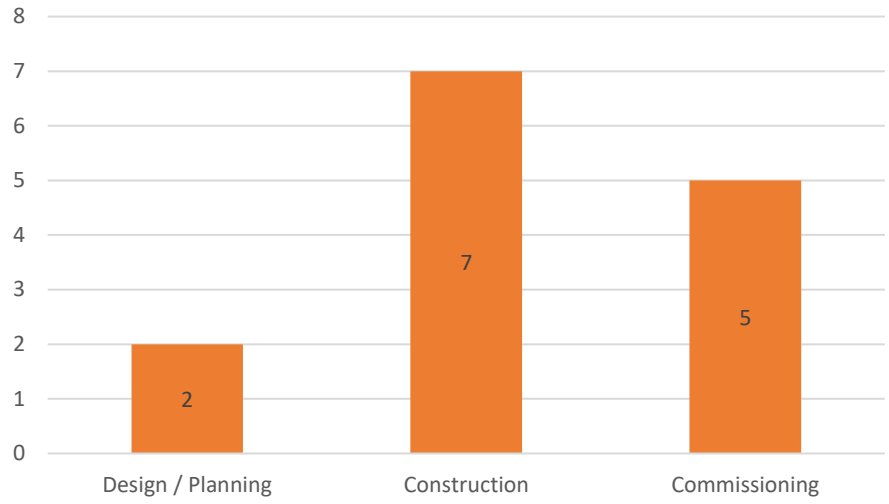

Figure 12: Section 3 Q27 - If you answered 'Often' or 'Always', during which phase(s) did this occur?

The survey results show that people have similar preferences to what they said in the interviews. Both interviewees noted that the transition from construction to commissioning is one of the most challenging stages of large projects. This phase of construction often involves managing changes to the schedule, the design, and the project workforce. This data shows that if there isn't careful planning and coordination between phases, production levels are likely to fall during these important parts of constructing a Data Centre.

4.2.5 Communication & Coordination

Survey participants said that communication and collaboration were among the most critical factors influencing workforce efficiency in Data Centre construction projects. Many respondents indicated that managers, contractors, and subcontractors sometimes failed to communicate effectively, resulting in confusion over timetables, responsibilities, and labour requirements. Therefore, projects had to hire unnecessary personnel, wasted time, or duplicate efforts due to delayed information dissemination.

Many participants said that important contractors and subcontractors need to be involved earlier.

Survey respondents believed that early involvement of all primary stakeholders would ensure alignment in design, planning, and implementation efforts.

Before construction starts, this method would also make it easier to find possible resource shortages or responsibilities that are the same.

Several professionals also emphasised the need for better visibility of project schedules and progress updates. They suggested that using shared digital platforms or collaborative planning tools could enhance transparency and help teams coordinate could reduce inefficiencies, minimise rework, and achieve smoother transitions between project phases.

In summary, the findings indicate that strong communication and early coordination are essential for avoiding extra labour costs and maintain high workforce productivity throughout Data Centre projects.

Table 1: Section 2 Q24 - How could communication between project managers and subcontractors be improved to avoid overstaffing?

At Contract evaluation, Project Managers should be consulted. Subcontractors are to advise/collaborate with the Project Manager if changes to their Resource profiles is needed
Visibility of the planned versus actual and adjustment needs to be communicated more frequently say on a weekly basis to better plan resources.
using planning tools and controlling the actual works on site and plan the workload
Better understanding of schedule and time impact to project progress caused by delays onsite with both vendor and trade partners
By planning for future risks and opportunities, they can estimate staffing needs more accurately.
Clear and concise construction requirements. Clear distinction between construction requirements and commissioning requirements.

Respondents gave a few useful tips for improving communication between project managers and subcontractors to avoid overstaffing, as shown in Table 1. A lot of people said that project managers need to be actively involved in contract evaluation to make sure that any changes to resource needs are communicated to subcontractors.

Using planning tools well and keeping a closer eye on what happens on site were two of the most important ways to manage workloads. Participants said that both vendors and trade partners would be better able to plan and adjust staffing levels, ideally on a weekly basis, if they had a better understanding of how schedule changes affect progress. This would help align workforce development with project needs.

4.2.6 Innovation

The survey results showed that a lot of people in Data Centre construction were interested in using new technologies and tools to make workforce planning better.

Many of individuals who took part in the surveys knew that technologies based on data could make better forecasts about staffing needs, find skill gaps, and help balance workloads at different stages of a project. These kinds of tools could also enable project teams try out different planning scenarios, see how changes to the timetable affect the project, and deal with unexpected workforce changes.

Respondents also said that new ideas in workforce planning would not only make staffing decisions more accurate, but they would also make them more open and accountable. Companies could improve coordination between departments and lower the risk of both overstaffing and understaffing by using measurable data instead of speculation.

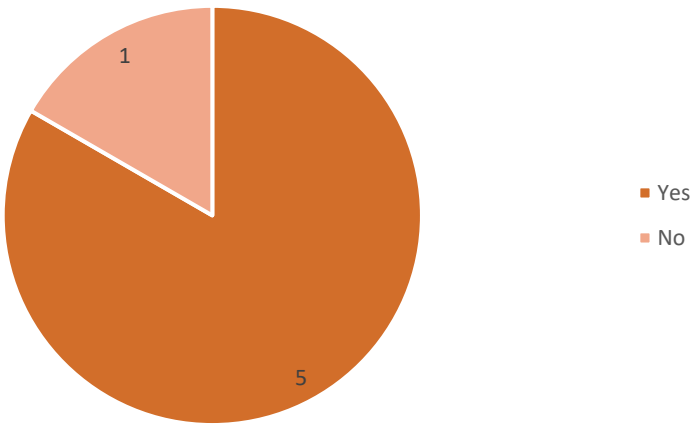

Figure 13: Section 2 Q23 - Would you or your colleagues (that are involved in workforce planning) be open to using new tools, such as the Headcount Model?

As shown in Figure 14, 83% respondents expressed openness to using artificial intelligence (AI) or a Headcount Model to support forecasting and decision-making processes. This shows a growing awareness among industry professionals that traditional, experience-based planning methods are no longer sufficient for managing the complex labour demands of large-scale projects.

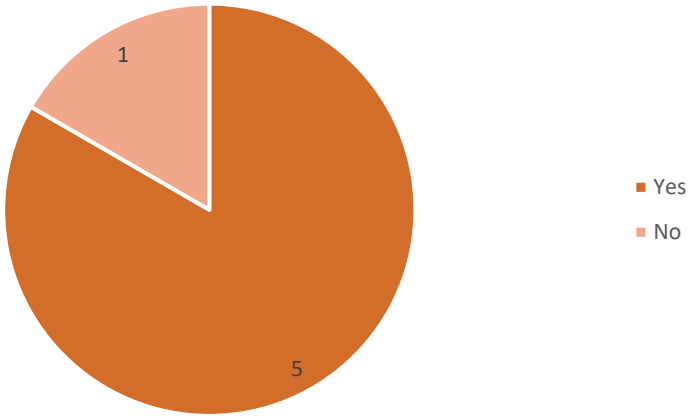

Figure 14: Section 2 Q25 - Would you support the use of AI in workforce planning?

Overall, the results suggest that there is a clear willingness within the industry to explore modern digital solutions such as AI assisted workforce planning and headcount modelling. This shows a support to make labour management more efficient and strategic in Data Centre construction sector, as shown in Figure 15. This openness reflects a growing recognition that traditional, experience-based methods are no longer sufficient for managing complex labour demands in large-scale projects.

4.2.7 Roles

The results of the survey showed that many professionals who worked in constructing Data Centres were interested in applying new tools and technology to improve workforce planning.
A lot of the people who took part knew that tools that use data could help them guess better about how many people they would need, uncover skill gaps, and make sure that all parts of a project had the right amount of work to do. These technologies could also help project teams perform different planning scenarios, assess how schedule changes impact progress, and respond more quickly to unexpected workforce challenges.

Participants who worked on the most recent Finnish data centre project were asked about the type of business they were employed in or had managed. The aim of this inquiry was to gain a deeper understanding of their work experience and the diverse perspectives they brought to the study.

The research included people from different roles and levels of the organization to make sure that the analysis showed how complicated and varied managing a workforce is on big construction projects. The variety of people who answered the survey also made it possible to make meaningful comparisons between how main contractors, subcontractors, and clients plan, coordinate, and communicate with their workers in Data Centre settings.

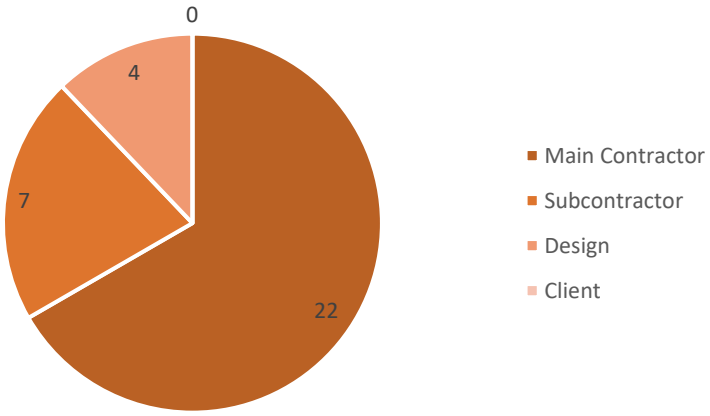

Figure 15: Section 1 Q2 - What type of organisation did/do you manage or work for on the most recent Finnish data centre project?

Figure 16 shows that 67% of the people who took part were from main contractor companies, while a smaller number were from subcontractor companies and client companies. This mix gave a well-rounded view of workforce planning and management practices from people who were involved in different levels of the project.

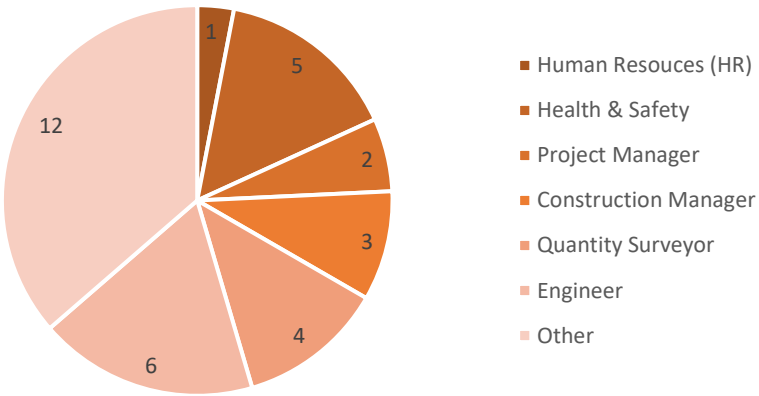

Figure 16: Section 1 Q3 - What was/is your role in the company?

Figure 17 above shows that the survey got responses from a wide range of professionals working in the Data Centre Construction field. The people who answered the survey had different jobs, such as project manager, engineer, quantity surveyor, health and safety officer, human resources officer, and procurement officer. This broad range of job functions provided us important information about how people in different fields see problem with workforce planning. For example, project managers and engineers often talked about problems with scheduling and productivity, while HR professionals talked about problems with hiring, matching skills, and making predictions.

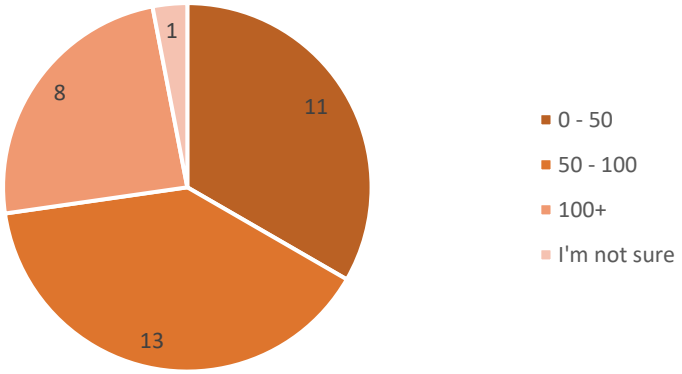

Figure 17: Section 1 Q4 - How much staff in your company, worked on the project?

The findings were more reliable because there were so many different roles and organisational backgrounds. This made sure that the results showed a wide and realistic picture of how people are currently managing their work in Data Centre Construction.

5 Discussion

This chapter looks at the main findings of the research in relation to what is already known about managing workers, productivity, and planning the workforce for Data Centre Construction projects. The goals are to explain the survey and interview data and show how workforce planning affects productivity and the success of the project. The discussion is based on four main ideas:

1) Problems with predicting and planning for the workforce
2) Causes of staffing issues
3) Communication and coordination
4) Openness to innovation

These topics address common problems with staffing for Data Centre construction projects, and they also show how could help planning, coordination, and new technology.

5.1 Workforce Planning and Forecasting Gaps

The study showed that planning for personnel on Data Centre projects regularly suffers from confusion and discrepancy. A lot of the people who took part said that their projects didn't have clear staffing plans and had to rely on their own experience. It tells us not a lot of people are using digital tools like Primavera (P6) for planning based on data yet.

Both the surveys and the interviews showed that they had the same problems: last-minute changes to project schedules, teams not talking to one other well, and not using properly forecasting tools. These issues regularly resulted in the organization having either an excess or a deficiency of staff at various times, adversely affecting production and increasing expenses. The interviews, especially with the people responsible for each of the commissioning phases, showed that making incorrect forecasts about the workforce caused problems later, such as delays and poor work quality.

The results show that even though more people are starting to understand how important structured workforce scheduling is, the Data Centre construction sector in Finland still isn't very good at using systematic, tool-assisted planning methods. To close this gap, project managers and subcontractors could use digital tools like a Headcount Model to make forecasts.

According to Vulpen (2024) points out that such schedule pressure often leads to quick fixes instead of smart workforce management.

5.2 Causes of Staffing Issues and Project Phase Patterns

People who answered said that the main reasons for staffing problems were bad planning, bad forecasting, and always having to meet tight deadlines. Several respondents noted that managers often had to hire more people than necessary because project deadlines were too tight. They were nervous of delays, so they didn't want to rely only on a carefully planned workforce strategy.

Another major challenge was the shortage of skilled workers, particularly for specialised roles. Staffing issues were evident during both the construction and commissioning phases. Many respondents observed periods of overstaffing, which led to overlapping tasks, wasted time, and higher costs for on-site facilities and accommodations. Conversely, understaffing happened when there were insufficient skilled workers or multiple tasks needed attention at the same time. These changes indicate that workforce planning does not always align perfectly with project schedules or risk management strategies.

The interviews also made it clear that making personnel decisions on unexpectedly could hurt the whole project. For instance, problems with quality control that came up during construction, such as not having enough staff or workers, often delayed the commissioning phase and changed the overall schedule. This shows how important it is to plan the workforce strategically so that the right skills are available when they are needed. One participant said, "We had enough people at one point, but not always the right people at the right time." This shows how important it is to match the right people with the right tasks at the right time for both short- and long-term project needs.

In general, staffing issues on construction sites happen for several reasons, such as tight deadlines, a lack of skilled workers, and quick decisions made by managers. To deal with these problems, project planning, workforce forecasting, and risk management need to be better integrated. This means that the right people with the right skills need to be there at the right time.

5.3 Communication and Coordination Challenges

One of the most important things that affected how well the people on the Data Centre construction projects did their jobs was how well they talked with each other. Several people who answered said that problems with communication between people working on the project usually caused delays, rework, and the wrong use of resources. They also said that contractors should be hired

earlier in the project so that there is enough time to plan and put everything together. People also thought it was important to make it easy for project managers, subcontractors, and suppliers to talk to each other so that there wouldn't be any confusion or roles which were too similar.

These findings align with Showry and Manasa (2014), who argue that leadership communication and cross-functional coordination are critical and cross-functional coordination are critical components of effective workforce management. When leaders are clear about what they want and tell departments to talk to each other, it's more likely that everyone will agree on goals, deadlines, and how to use resources. However, when communication breaks down, it can mean doing the same tasks again, having too many responsibilities and not knowing how to prioritise staffing. These kinds of problems not only slow down progress, but they can also make team members angry, which can hurt morale and engagement

To solve these problems, organizations should use more structured communication and coordination systems that promote openness and consistency during all stages of a project. Regular coordination meetings, a single reporting system, and common digital planning tools could all help people work together better and make sure that staffing needs are explained clearly.

Also, training for leaders and managers that focuses on intercultural communication, solving conflicts, and making decisions together would help project managers lead teams with people from different backgrounds. By improving collaboration tools and making sure that everyone knows what their responsibility is, companies can improve project performance, cut reduce waste, and make the Data Centre construction industry work better together.

5.4 Openness to Innovation

The interviews and survey both show that professionals in the Data Centre construction industry are open to adopting new approaches to workforce management. While many still rely on traditional, experience-based methods, there is a clear open to explore digital tools and innovative solutions that could improve staffing efficiency and enhance accuracy of forecasting.

Many survey respondents expressed interest in using models such as the Headcount Model or AI-based planning tools to support decision-making. This openness reflects an awareness that digital solutions can help optimise labour forecasts, manage resources more effectively, and reduce the risks during critical project phases.

Interviewees also noted that current planning methods often fall short because they lack sufficient time, fail to provide accurate predictions, and do not offer a comprehensive view of all relevant data. They suggested that analysing real-time project data, trends, and performance indicators could improve workforce planning and help anticipate future staffing needs.

However, the results also indicate that openness to new ideas does not automatically translate into practical implementation. Many organizations still lack the necessary digital tools, training, or managerial support to effectively integrate new technologies into existing planning processes. This shows that testing, using, and improving new planning tools is one extremely critical item that needs to be done during the construction time of a Data Centre.

To move forward, businesses could start with small test project. They could use workforce planning tools like Headcount Models or AI-assisted platforms. You could try out these tools in one phase of a project and then use them on more sites once they have been shown to work. Training recruiting managers and project planners will also help make sure that these technologies are used correctly and all the time.

In short, the research shows that the Data Centre building business is open to try new ways of managing its workers. Even while traditional methods are still the most common, many people agree that digital tools and planning based on data can greatly improve reliability, openness, and productivity. Promoting the gradual application of new digital technologies will help organisations go from responding to difficulties with their workers to planning better, which will lead to better project results and a greater competitive advantage in the Data Centre construction business.

5.5 Recommendations for workforce planning

The results of this study show that it is very helpful to group labour needs by stakeholder group and project phase. There are a lot of people who work together to build a Data Centre. These people include planners, main contractors, subcontractors, HR specialists, and commissioning teams. Each of these groups has different needs, wants, responsibilities, and levels of risk. You need to know how manage people if you want to be a good leader.

The research results clearly indicate that stakeholders experience different workforce challenges at different stages of the project lifecycle. During the construction phase, the main contractor and subcontractors typically require a large volume of labour with varied skill levels. Many of these roles can be filled relatively quickly and usually locally, and unskilled or semi-skilled labour is often

more accessible. Because of this, the risk associated with short team understaffing in construction may initially appear low.

However, the interview findings show that this assumption can be misleading. If the wrong people are selected during construction for example, workers with insufficient skills, falsified certifications, or poor-quality performance, the impacts are not limited to the construction stage. Poor workmanship creates defects and unresolved issues that push delays into the commissioning phase, where the situation becomes far more critical.

The commissioning phase requires highly specialised, technically competent professionals, and these skills are significantly harder to source at short notice. Any labour gaps during commissioning pose a much higher risk because commissioning activities must be completed within tight regulatory, technical, and client-driven deadlines.

Different stakeholders have different needs across these phases:

- Main Contractors require consistent visibility of staffing numbers, productivity, and schedule impacts and risks. They must balance cost control with ensuring teams are adequately allocated to meet deadlines.
- Subcontractors often face pressure to provide additional workers at short notice to complete project phases completion. Their ability to plan is limited when project schedules change unexpectedly.
- HR and planners need tools that help them make accurate predictions and tell them early on what skills they need, especially for commissioning roles that need to be filled well in advance. They also need to deal with the risks that come with the number of workers that the contractors give them.
- Commissioning Teams need a stable, high-performing workforce with verified technical competence. They depend heavily on the quality of construction output.

To avoid the risks that may result from poor planning of the above requires stronger cross-stakeholder communication, early engagement of contractors, structured planning sessions, and open reporting of workforce predictions.

5.6 Own Learning Reflection

In relation to the topic of this research, I gained a deeper understanding of the Data Centre Construction project lifecycle, and the critical role of workforce risk management plays to ensure successful project completion. I learned that even small staffing issues during the early phases can

lead to major delays and productivity challenges later in the project. The interviews were particularly valuable in demonstrating how leadership, communication, and HR planning shape project success. I have also developed a clearer appreciation for the importance of aligning the needs of different stakeholders and improving communication to avoid misunderstandings, especially in multicultural environments.

From a personal perspective this work has given me an insight to the importance and benefits of the implementation of thorough research methods. The learning process has shown me that the research I have applied here and the skills I have learned in this body of work are not just beneficial for my academic endeavours but are also beneficial in all areas of my working life. This was shown when carrying out the background research and from analysing the data (from both the interviews and survey) it was soon clear that themes highlighting issues and risks were very common and it was apparent that organisations appear to share the same issues relating to workforce planning. Without thorough research this commonality would be missed, and the opportunity to improve working methods and efficiencies would also be missed. Previously I would only analyse and consider variables and experiences within my own organisation and department, I now fully understand and appreciate the benefits of research and am confident of applying these skills in my future endeavours.

The thesis has used ChatGPT and Copilot AI applications for proofreading only, the results were only used for comparison to my own work. The analysis and interpretation of the data, and all final decisions regarding content were carried out independently by the author.

6 Conclusion

This study highlights that effective workforce planning in Data Centre construction requires a structured and adaptable approach that recognises varied needs of numerous stakeholders and disciplines. The results show that everyone who worked on the project, from the main contractor to the subcontractors and clients, has their own problems with managing their workforce needs. So, any suggested Headcount Model should be able to deal with these differences and meet the specific planning and operational needs of each field.

The research also shows that the risks and staffing needs are very different between the construction and commissioning phases. During construction, mistakes in estimating the number of workers needed or making bad predictions can lead to too many or too few workers, which can directly affect costs and productivity. In contrast, the commissioning phase needs a smaller team with very specific technical skills, which makes it harder to find qualified people and raises the risk of delays or failures in the project.

The interviews showed how these problems really affect people. Both professionals said that even when workers are very productive during construction, problems often come up later in the commissioning phase because of wrong headcounts and not enough planning earlier in the project. For example, the first person interviewed said that there were times when there were too many staff members because of schedule pressures and bad forecasting. They also said that there were times when there were too few staff members because there weren't enough skilled workers. The second interviewee said that, in general, the lack of qualified local workers and the need for different international teams to work together on big, complicated projects caused problems with communication, quality standards, and scheduling.

These accounts support the idea that any effective workforce planning approach, especially a Headcount Model must be able to handle the realities of large-scale, multicultural, and multi-phase projects. A single solution would not be sufficient. Alternately, the model should have so adaptable functions that allow for phase-specific adjustments, reflecting the unique staffing needs and considering the risks during a project’s construction and commissioning phases.

The main conclusion from the research is that s that the risks and skills needed for construction and commissioning are very different. During the commissioning phase there are usually more workers, they are less specialised, and they are more likely to have to deal with changes in the timetable of the project. The commissioning phase also needs a small, highly skilled staff that must be ready to go at the correct time. Poor headcount management during construction, including wrong forecasts or delays, can have a direct impact on when the project is ready to be

commissioned. If construction work falls behind schedule, commissioning workers may have to wait around on site, which wastes resources and slows down the process. So, people for commissioning must be planned and hired far in advance, but they must also be based on reliable data about the project's development.

The research additionally suggests that the availability of skills is an essential factor of workforce risk. It gets difficult to find qualified workers as the level of skill needed increased. Because lack of skilled workers makes the risks with cost, schedule, and quality even more. Both professionals who were interviewed said that when project demands were high, companies often had to onboard employees from other countries or use subcontractors. This made situation more complicated and made it more difficult to coordinate. So, a headcount model should not only keep track of how many people are on the job, but also their skill levels, risk levels, and methods of acquisition to make sure that the workforce is as dynamic as the project.

Interaction and collaboration are also key factor for how well employees does their job. Surveys and interviews discovered that between project managers, subcontractors, and trade partners communication lacked. This leads to a problems like confusion, overlapping roles, and delays, which did especially not result good within teams which had people from different cultures. Any workforce planning should have ways for clear communication, like visual dashboards or connections to project scheduling software, so that stakeholders can keep a track on staffing and make the necessary changes.

Many people who participated in the survey described that they were open to trying new aspects, and a lot of them were attracted towards digital forecasting tools like AI-assisted Headcount Models. This also shows that the construction industry is ready to adopt data-driven tools to go forward thinking workforce management, analyse future risks, make the best out of resources, and get the best project results.

In short, this study demonstrated that modern Data Centre construction needs a powerful and reliable Headcount Model. Such Model should include:

- Recognise the differing needs of various stakeholders and disciplines.
- Include functions to assess and manage risks specific to each project phase.
- Account for difference in skill set requirements and labour availability.
- Facilitate proactive coordination between construction and commissioning teams.
- Integrate communication and forecasting tools for real-time planning and adjustments.

By implementing these principles, organisations can improve workforce management practices, enhance productivity, and reduce the costly inefficiencies caused by poor headcount planning.

Ultimately, a well-designed Headcount Model would make Data centre construction projects run more promptly, improve forecasting ability and create a stronger workforce planning. It would be valuable both for planning tasks and managing their execution.

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Appendices

Appendix 1. Survey questions

Evaluating Overstaffing Challenges in Data Centre Construction: A Headcount Model Approach

This research is part of my final year thesis, studying a Masters degree in Business Administration and Human Resources, with a focus on understanding the challenges related to staffing issues within the Data Centre construction industry.

Your participation in this anonymous survey will provide valuable insights into the current state of Data Centre construction in Finland and help identify areas of improvement with staffing. Thank you for taking the time to participate in this important study.

Total Sections: 2/3
Estimated time completion: 8 - 10 minutes
Anonymous?: Yes

* Indicates required question

1. Have you worked on a data centre construction project within the last 5 years? *

Mark only one oval.

- ◯ Yes
- ◯ No

Skip to question 2

Introduction

2. What type of organisation did/do you manage or work for on the most recent Finnish data centre project? *

Mark only one oval.

- ◯ Main Contractor
- ◯ Subcontractor
- ◯ Design
- ◯ Client
- ◯ Other: _____

3. What was/is your role in the company? *

Mark only one oval.

- ◯ Human Resouces (HR)
- ◯ Scheduler
- ◯ Health & Safety
- ◯ Administration
- ◯ Project Manager
- ◯ Construction Manager
- ◯ Commercial Manager
- ◯ Quantity Surveyor
- ◯ Engineer
- ◯ Other: _____

4. How much staff in your company, worked on the project? *

Mark only one oval.

- ◯ 0 - 50
- ◯ 50 - 100
- ◯ 100+
- ◯ I'm not sure

5. What phase of the project are/were you involved in? Select all that apply. *

Check all that apply.

- ☐ Design / Planning
- ☐ Construction
- ☐ Commissioning

6. If you were on the Design / Planning stage, how would you rate your productivity during this stage of the project?

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very High

7. If you were on the Construction stage, how would you rate your productivity during this stage of the project?

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very High

8. If you were on the Commissioning stage, how would you rate your productivity during this stage of the project?

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very High

9. How would you rate the productivity of your colleagues? *

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very productive

10. Have you noticed an overstaffing issue within your company? *

Mark only one oval.

- ◯ Yes
- ◯ No

11. If you said 'No' to the previous question, was your company understaffed on the project?

Mark only one oval.

- ◯ Yes
- ◯ I noticed no issues

12. Were you involved in the planning of staff numbers for this project? *

Mark only one oval.

- ◯ Yes *Skip to question 13*
- ◯ No *Skip to question 26*

Construction Project Staffing

13. Did the project have a documented staffing plan before arriving to site? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I'm not sure

14. Did/does your company use any workforce planning tools to plan staffing numbers for a project? *

_____

15. Were there any labour laws, union regulations, government or industry incentives that affected workforce planning? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I'm not sure

16. Were staffing levels adjusted during the project? If yes, how frequently? *

Mark only one oval.

- ◯ Often
- ◯ Occasionally
- ◯ Rarely
- ◯ Never
- ◯ I'm not sure

17. If you answered 'Yes' to the last question, did overstaffing lead to increased costs in any of the following areas? Select all that apply.

Check all that apply.

- ☐ Accommodation
- ☐ Transport
- ☐ Site Facilities
- ☐ Supervision
- ☐ Safety Management
- ☐ I'm not sure

18. In your opinion, what are the primary drivers of staffing issues in data centre construction. Select all that apply. *

Check all that apply.

- ☐ Poor planning
- ☐ Inaccurate forecasting
- ☐ Pressure to meet deadlines
- ☐ Lack of skilled labour
- ☐ We didn't have staffing issues
- ☐ Other: _____

19. On the project within your company, did you notice duplicate roles? (E.g. two administrators doing overlapping tasks) *

Mark only one oval.

- ◯ Yes frequently
- ◯ Yes occasionally
- ◯ No

20. Within your company, did you notice colleagues complaining / reporting / leaving the project due to boredom / not enough workload? *

Mark only one oval.

- ◯ Yes frequently
- ◯ Yes occasionally
- ◯ No

21. What tools or methods would you recommend to better forecast staffing needs?

22. Have you heard of a Headcount Model used for workforce planning? *

Mark only one oval.

- Yes
- No

23. Would you or your colleagues (that are involved in workforce planning) be open to using new tools, such as the Headcount Model? *

Mark only one oval.

- Yes
- No

24. How could communication between project managers and subcontractors be improved to avoid overstaffing? *

25. Would you support the use of AI in workforce planning? *

Mark only one oval.

- Yes
- No

Construction Project Staffing

26. How often did you see your colleagues waiting around for instructions or work? *

Mark only one oval.

- Never
- Rarely
- Sometimes
- Often
- Always

27. If you answered 'Often' or 'Always', during which phase(s) did this occur?

Check all that apply.

- [ ] Design / Planning
- [ ] Construction
- [ ] Commissioning

28. Did you experience any downtime due to too many workers being present on-site? *

Mark only one oval.

- ◯ Always
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

29. On the project, did you notice duplicate roles? (E.g. two administrators doing overlapping tasks) *

Mark only one oval.

- ◯ Yes frequently
- ◯ Yes occasionally
- ◯ No

30. Did you notice your colleagues complaining / reporting / leaving the project due to boredom and not enough workload? *

Mark only one oval.

- ◯ Yes frequently
- ◯ Yes occasionally
- ◯ No

31. In your opinion, what are the primary drivers of staffing issues in data centre construction. Select all that apply. *

Check all that apply.

- [ ] Poor planning
- [ ] Inaccurate forecasting
- [ ] Pressure to meet deadlines
- [ ] Lack of skilled labour
- [ ] We didn't have staffing issues
- [ ] Other: _____