Master's Thesis

Toward an Inclusive Work Environment In the Construction Industry Using Digital Tools

MSc Construction Management and Engineering
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TUDelft

TOWARD AN INCLUSIVE WORK ENVIRONMENT IN THE CONSTRUCTION INDUSTRY USING DIGITAL TOOLS

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ABSTRACT

Women in construction are marginalised, and gendered work culture results in a higher turnover rate of early female professionals. On the other hand, after the COVID-19 pandemic, construction organisations have understood the need for digitisation to derive benefits from digital tools. Besides, it was presented that using digital devices may impact work & employment and employees' behaviour and organisational culture. In this context, the study aims to explore how the usage of digital tools at work influences the gendered work culture and how it can improve the early career experience of female employees in the construction sector.

This research employed two data collection methods: (1) a review of previous studies and (2) a series of semi-structured interviews. Reviewing previous studies aims to understand the trend and phenomena of the research topic to build a research framework. Career development challenges for female early career professionals: family-work balance; pay; stress; recruitment and selection; training; allocation of tasks and positions; work climate and condition; network; and career opportunity. Then, a series of semi-structured interviews were conducted.

This research suggests that using digital tools in communication results in misunderstanding, fewer opportunities for bonding and relationship building with colleagues and exclusion. Moreover, the usage of digital tools enables female employees to gain respect and be heard because the results of the digital tools support their opinion. Furthermore, the data-driven perspective promotes removing bias and subconscious bias in decision-making. On the other hand, hierarchy and pressure on budget and schedule hamper the implementation of digital tools at work practice. Besides, it was identified that these changes affect the experience of early female employees in the sector. The digital-related skillsets provided them with more job opportunities, breaking gender-stereotypical norms. A remote working environment enabled by digital communication made female employees balance work and life more manageable, and promotion decisions can be based on a data-driven perspective. Regretfully, digital communication disturbs the accommodation of new employees and socialising opportunities between colleagues.

It is recommended to facilitate training programmes for digital tools to improve and promote the benefits of using digital tools. In addition, more flexible network practices can also be provided to encourage socialisation, and fair and accurate data analysis programmes for promotion can be developed.

PREFACE

In 2020, when the entire world had stopped working because of the pandemic, I started this Master's programme at TU Delft. It was a major decision to move to the Netherlands. From the education during the Pandemic I could learn a lot of things: starting from theories and practical skills, as well as how to adopt and react to challenging situations. All the learned lessons are concentrated at this document. I could have never been able to complete without the support of many people around me. Firstly, I would like to thank my graduation committee: Dr. Paul Chan, Dr. JL (John) Heintz, and Dr.ir. Marian G.c. Bosch-Rekveldt for the guidance, providing the insight, and the support during the research process. With your guidance and support, I could complete and enjoy the process.

Conducting a graduation research process alone was certainly not easy, but I certainly learned priceless lessons. From this process, I learned how to believe in my self and work in order to achieve goals. Recruiting multiple interviewees without knowing much people in the Netherlands was very challenging, however from this experience, I learned how to approach people and build personal connection. Moreover, thanks to this opportunity, I could meet several people whom I never imagine to meet in my daily life: from people who just started their own career to people who have uncountable responsibility in a firm. Throughout the process, I met incredible people working in the sector, who were willing to help and provide guidance. To all of the research participants, I would like to express my gratitude to share your experience and dedicate your time to me. Furthermore, I would like to give special thanks to Jan Reinout Deketh for helping me recruiting interviewees and providing deep insight about the industry.

I also want to thank my friends who went through this challenging time together and supported each other. I would like to thank my family who provided infinite trust and support on me in the process. Lastly, to my husband Antony, I could not achieve this without your infinite support and unconditional love. The relationship with you is the most valuable thing I have.

To the readers, enjoy the result of my Master's programme, and I hope that I present the value of diversity and inclusion in organisations.

Emma-Jeongeun Lee
Delft, 2022

EXECUTIVE SUMMARY

Introduction

In the construction sector, female employees are marginalised, and the turnover rate of early professionals is very high, which deteriorates women's participation in the construction industry. Many scholars investigated the career challenges of female employees in the sector, finding that the trend does not improve.

On the other hand, it was presented that the construction sector is slow in adopting the digitisation trend at work. However, after the COVID-19 pandemic, the urgency of work digitisation has been stressed, and the decision-makers in construction organisations understand the need for digitisation to take advantage of digital tools. It was presented that using digital tools may impact employees' behaviour and organisational culture; therefore, it can eventually influence the decision of early career female professionals.

Study objective

In this context, the primary objective of the study is to explore how the usage of digital tools at work affect and be affected work culture and how this influence on one another have an impact on the work experience of female employees in their early career. For a more comprehensive investigation, a research question was set: *How are the usage of digital tools influencing and influenced by the gendered work culture in the construction industry, improving early career of female employees?*

Research method

The study employed a qualitative research method to collect data on personal experience, opinion, belief, attitude, and value, which can be obtained thoroughly from a quantitative research method. The study is divided into five research stages: (1) review of previous studies, (2) interviewee selection, (3) interview protocol development, (4) series of semi-structured interviews, and (5) result evaluation.

Research stage 1: a review of previous studies

In the first stage, a review of previous studies, the research aims to collect knowledge from empirical findings and understand the trend and phenomena related to the research topic. Two topics - work culture and digital tools - have been explored when reviewing existing studies. Here, the findings helped the researcher to understand : (1) the career challenges to female employees in the early career stage, (2) the impact of the usage of digital tools on work and employment, and (3) the key elements of the digital tools that have an impact on work culture in the industry. In this stage, ATLAS.ti was used to structure and visualise the findings.

Research stage 2: interviewee selection

The interviewee selection was crucial for the study as it determines the capability of the interviewees to provide relevant information; hence, the interview selection criteria were set: (1) early career professionals in the construction industry, (2) a member of a related topic activist group, and (3) professionals in an executive, managerial, or supervisory role in the construction industry.

Research stage 3: interview protocol development

Based on the findings from research stage 1, an interview protocol was developed for three groups of interviewees.

Research stage 4: series of semi-structured interview

Sixty-eight invitations were sent, and 16 interviews were conducted from September 2022 to November 2022. Furthermore, the study adopted a snowball method

to recruit interviewees. The interview lasted 45 to 65 minutes and was conducted both online and in person.

Research stage 5: Result evaluation

In this stage, the corresponding interviewee transcribed and reviewed the interviews. Then, the transcripts were put in the program ATLAS.ti, and thematic analysis was used.

Review of previous studies

1 Characteristic of work culture in the construction industry:

Empirical studies suggest the following career development challenges for female professionals in their early career: family-work balance; pay; stress; recruitment and selection; training; allocation of tasks and positions; work climate and condition; network; and career opportunity. Many female employees face challenges balancing family and work responsibilities, as the sector demand long-working hours and changing work location. Moreover, it was argued that the pay is not equivalent to labour and discriminated by gender. Furthermore, it was identified that there was unfair treatment for recruitment and selection, allocation of tasks and positions, career opportunities, and network practices based on gender stereotypical norms. Besides, work climate and conditions were not in favour of people who do not meet the stereotype and identity of the construction sector have been excluded.

2 Impact of digital tools on work and employment

Implementation of digital tools at work have an impact on working condition; tasks and occupation; and organisational structure and individuals' standards of behaviour. A digitised work environment enables remote working and changes the working condition. Moreover, the adoption of digital tools results in automated procedures and changes in work activities, which has an impact on the occupation. As the information and data are stored digitally, it allows easier and more transparent information sharing, irrespective of the hierarchy structure of the organisation. Besides, as digital communication allows quicker communication, it enables the individuals' ideological influence.

3 Impact of digital tools and work culture

As shown above, the *work condition*, which was one of the career challenges for female early career professions, is influenced by digital tools. Moreover, the new requirement of skills and knowledge for recruitment influences *recruitment and selection processes*, as well as *career opportunity*. Additionally, fair information sharing provides an *career development opportunity*. While online communication leads to a different style of *networking*, the ideological influence, which is enabled by online communication, can lead to change in *work culture and condition*.

Analysis and discussion

The study explored three themes from the interview: (1) the impact of work culture on digital tools, (2) the impact of digital tools on work culture, and (3) gendered experience.

1 Impact of digital tools on work culture

The implementation of digital tools influenced work conditions, tasks and occupation, and organisational structure and individuals' standards of behaviour.

Work condition change Online communication facilitated remote working, which results in miscommunication, less opportunity for bonding and relationship building with colleagues, and exclusion. Since people are not working in a shared space, employees cannot obtain information accidentally by overhearing others' conversation. Moreover, online meetings does not provide chance for informal conversation before or after meeting; hence, employees lose personal contact and relationship with colleagues. Furthermore, older generation or people who are unfamiliar with

digital tools are excluded when digital tools are mainly used in daily work practice. *Organisational structure change* When digital tools are used in communication, the digital-related skills of female employees encourage them to gain respect and be heard from existing employees when they are undermined.

Influence individuals' standards of behaviour Skill sets and knowledge of digital tools promote female employees to demonstrate their capability and expertise. Besides, the data-driven perspective disengage bias in decision-making, which leads to fairer decision.

2 Impact of work culture on digital tools
The use of digital tools at work is not encouraged by time and budget constraints. The strain slows the introduction of new tools into the organisation and burdens construction organisations with their implementation.

The industry's conservatism slows down the introduction of digital tools into daily work processes. Because the employees don't utilise digital tools frequently, they react reluctantly to them, which results in digital exclusion.

Physical structures are constructed in the construction sector. Employees prefer using old procedures over digital ones since they are less familiar with them. Additionally, due to dust and other dangerous components, building sites lack digital equipment.

Digital tool use is significantly impacted by hierarchy. hierarchy among project participants, within an organisation, and inside a team. The actors in the hierarchy are led to follow an actor at a higher position.

3 Gendered experience

First, *education-to-work transition* The participation in networking events provides female job seekers to demonstrate their expertise. Job searching platform also enable network building opportunity and present female applicants expertise. Moreover, organisations are reorganising the skill requirements for recruitment and selection. Therefore, the gender stereotypes becomes less relevant in the selection process.

Secondly, *Early career experience* the focus of training is to promote engagement of new employees in the new work environment. Online communication and remote working face challenges due to the drawback of online communication. On the contrary, the usage of digital tools promote data-driven perspective, which make early career professionals to be respected and heard.

Furthermore, looking at the *work practice*, digital competence allowed female employees to gain respect from colleagues and break the existing gender stereotypical norm toward women that female employees underperform. Besides, data support the women to provide their opinion, and data-based decisions draw the bias out. Additionally, remote working environment makes work-life balance more manageable.

Network practice are interrupted as mentioned above; however, it provides an opportunity to join despite personal circumstance. On the other hand, remote work disturbs employees' socialisation.

Lastly, *promotion* decision can be made more objectively when data is used to support the decision. As mentioned, the data do not allow subconscious bias to influence the decision. Besides. the digital competence allows female employees to prove their capability; therefore, more career opportunities are accessible.

Limitation and recommendation for the future research

Study limitation

1. The study employed online and in-person settings for interviews. It is unsure whether the interview method changes the interviewees' answers. It may have an impact on the motivation to share personal experiences.

2. The qualitative data was collected after the data collection framework had been developed based on empirical findings. However, the existing studies focus not on the Dutch construction sector nor on early-career female employees. Therefore, the interview may have asked questions that are not apparent and relevant to the experience in the Dutch construction sector. Similarly, the preset framework may have limited the range of answers.

3. The research participants were recruited using the snowball method, which results in data collection of people with similar interests, experiences, and opinions. Moreover, other diversity factors can also result in interviewees' different experiences.

4. The interview was conducted in English, which may lead to mistranslations of the experience and opinion.

Future research recommendation

1. To examine the validity of this research, bigger-scale research and quantitative data collection can be employed to explore more general trends and phenomena.

2. The scope for future research can be reduced and divided into several research topics, as the term digital tool and work experience are broad to explore.

3. Preliminary interviews can be added prior to conducting a series of interviews to apply and develop a data collection framework that is more appropriate in the Dutch construction field.

4. Future research can also focus on other diversity aspects because it all influences one's experience at work.

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INTRODUCTION

Many Architectural Engineering and Construction (AEC) graduates leave the sector or start working in different business sectors [Silbey, 2016]. Even though they start working, the turnover rate of young professionals within five years is relatively higher in the construction sector. For instance, only 24% of project managers in their early careers in the construction industry stated that they would stay in the industry for over five years [Borg and Scott-Young, 2021b].

Many organisations in various business sectors put much effort into building an inclusive work environment. Regardless of the endeavour, young professionals and graduates still struggle to find their positions in the workforce. Many young career women starting their careers in the construction industry express their frustration with the work culture and face difficulties in continuing their careers. Many female employees in their early career perceive the glass ceiling as an invisible organisational barrier [Fernando et al., 2014] that does not allow their career advancement and faces overt and covert discrimination. Moreover, they feel that the work is not acknowledged [Mrowczyk, 2020], and need to fight with lack of respect from counterparts [Dean, 2020].

Some studies looked into barriers to women's career development in the construction industry. Common identified obstacles were conflict between work and family duties [Hatipkarasulu and Roff, 2011; Rosa et al., 2017; Navarro-Astor et al., 2017], working conditions [Hickey and Cui, 2020], masculine organisational culture that accompanies sexist comments and harassment [Mooney, 2014; Perrenoud et al., 2020], and lack of respect and recognition [Hickey and Cui, 2020; Navarro-Astor et al., 2017; Dean, 2020; Mrowczyk, 2020].

On the other hand, the construction industry is changing with the implementation of digital tools to work. After the COVID-19 pandemic, the urgency of digital tools implementation has been stressed more than before [Hai et al., 2021]. Digitisation allows the construction industry to take advantage of it, such as internal organisational improvement and a provocative role in the globalised market [Slavinski and Todorović, 2019]. Using digital tools at work may influence employees' behaviour and organisational culture [Elliot, 2009; Isensee et al., 2020], and eventually, it may be able to attract more women graduates and retain female employees. Because the digital tools can cause restructure [Grover et al., 2022] in the organisation and enable the new employees' skills noticed [Jacobsson and Linderoth, 2021].

The study aims to focus on the issue of the higher turnover rate of younger female employees in the construction industry and investigate features of the industry that keeps younger women away from the sector. The study also explores the impact of digital tools on the working environment and how it affects the turnover rate of younger women employees in the construction firm.

1.1 RESEARCH CONTEXT

This section will present the research domain and the context of the research. Firstly, the research context will be presented in Section 1.1.1, and the following section will show the scope and research domain.

1.1.1 Context of the Research

All the business sectors have their image and distinctive work culture. The construction industry is known as the macho sector, which illustrates the industry as demanding and physical [Powell and Sang, 2013]. This harsh condition pushed women away from the industry [Choi et al., 2022], and the work culture has become more exclusive due to the demographic feature of the workforce [Maurer et al., 2021]. This exclusive work culture leads to challenges and bad experiences when young women enter the construction profession. Women in the construction industry claimed they had experienced unfair treatment even during the recruitment process [Hickey and Cui, 2020]. After the recruitment process, the situation does not get better when women finally enter the sector. Young female entrants are not welcomed, instead facing negative behaviour and attitude from the existing workforce, mostly male. Moreover, many women face pressure to work extra hard to exceed their counterparts to earn respect from the existing employees and the peer male employees [Whittock, 2010; Bagilhole et al., 2002]. As a result, many young female professionals in the construction industry are considering leaving the industry. This early resignation of women is related to the under-representation of females in the industry, which discourages young female employees from staying in the industry [Choi et al., 2022].

1.1.2 Research Domain and Scope

This research will focus on the influence of digital tools on work culture in the construction industry. The research domain and context are illustrated in Figure 1.1. The construction industry will be the main research domain. The influence of adopting digital tools in the industry on the work culture will be examined to prevent young women employees from leaving the business sector.

Figure 1.1: Research domain and context of the research

1.2 PROBLEM STATEMENT

In this context, the following problem statement has been formulated:
Many young women entrants to the construction industry leave or consider leaving the industry. Many previous studies presented negative experiences of young women in the construction field, such as lack of respect, sexism, aggressive reactions from counterparts, and overt and covert unfair treatment. This phenomenon can be connected to some features of the exclusive work culture of the industry. The construction industry is characterised by a masculine work environment, which is harsh, physical, and exclusive organisational

culture. It drives young women engineers to the corner and eventually leads them to leave the sector.

1.3 RESEARCH OBJECTIVE

This study aims to investigate how the usage of digital tools at work influences and get influenced by the gendered work culture. Furthermore, it examines how the impact of one on another can influence female employees in their early careers in the construction industry, which will eventually help to attract and retain more women employees in the sector.

1.4 RESEARCH IMPORTANCE

Recently, the construction industry in the Netherlands has suffered from a skill shortage. On top of the issue, it was found that many female employees do not stay long or do not enter the industry after relevant studies. The previous studies showed that the work culture and environment are partially to blame. The importance of integration and collaboration in the construction industry has been emphasised for many years. An inclusive work environment is a key to these features. However, regardless of these elements' value in the sector, the work culture has been preserved for many years.

The topic "women in construction" has been studied by many scholars; however, the focus of the studies was on women as one group. Early career women in the construction industry have not been explored and focused on. Moreover, most women in construction studies were conducted in Australia, the UK and the US; therefore, there are limited findings on the Dutch construction market.

Due to the digitisation trend in the industry, change in the business relations in the construction market is expected and eventually, change in tasks, working conditions, and many others related to work and employment. Therefore, the impact of the usage of digital tools on the retention of female employees needs to be studied in a new context: the construction industry's work culture and conditions in the digitised work environment.

1.5 RESEARCH QUESTIONS

A research question has been formulated, responding to the problem statement above:

How is the usage of digital tools influencing and influenced by the gendered work culture in the construction industry toward early career experiences of female employees?

The following sub-research questions are established to answer the research question more comprehensively.

- *Sub-Question 1: What are the elements of gendered work culture and digital tools that have an impact on early career experiences of female employees?*

- *Sub-Question 2 (a): How do the usage of digital tools influence the gendered work culture?*

- ***Sub-Question 2 (b)**: How do the gendered work culture influence the usage of digital tools?*

- ***Sub-Question 3**: How do these changes have an impact on the early career experience of female employees in the industry?*

Substantiation of the chosen research questions

The gendered work culture of the construction sector should be reviewed to solve the stated problem, focusing on the impact of the implementation of digital tools at work on work culture. The focus of the study mainly lies on the early career experience of female employees in the construction industry and the influence of digital tools on work culture:

1. Gendered work culture of the construction industry that specifically challenges female employees should be investigated. In addition, the usage of digital tools need to be examined whether it has an impact on the early career experience of female employees, exploring how it changes the nature of workforce and the work experience (SQ1). This develops and set a theoretical scheme to understand the context of the research from theories and it become a backdrop for the subsequent research stages.
2. As in the former sub-research question identified that gendered work culture influences early career female professions, it is required to explore the impact of usage of digital tools on gendered work culture (SQ2 (a)) in practice. Moreover, due to the inter-influential relationship of the two elements (the usage of digital tools and gendered work culture), the impact of gendered work culture on the usage of digital tools also require attention (SQ2 (b)).
3. How these influences (SQ2 (a) and (b)) can affect the early career experience of female employees is studied (SQ3).

1.6   DOCUMENT OUTLINE

Firstly, the research framework was presented in this chapter (Chapter 1, showing the context of the study and the problem that the study wants to focus on. Research questions for the study are also introduced in this Chapter. Second, the methodology of this study will be discussed in Chapter 2. It will address the overall methodology and research stages. Chapter 3 will present findings of previous studies to explore the issues in depth. In this Chapter, sub-research question 1 will be answered, presenting the findings from theory. In the next Chapter, Chapter 4 will present the interview set-up, and the interview result will be shown in Chapter 5, presenting analysis. Then, Chapter 6 will address the discussion in three themes: (1) impact of the usage of digital tools on gendered work culture, (2) impact of gendered work culture on the usage of digital tools, and (3) impact of usage of digital tools on early career experiences of female employees in construction. Here, the empirical findings of first two themes will supplement the answers to SQ1 from the previous chapter. The third theme will answer SQ3. It will also address study's limitations and based on the limitation, future research suggestion will be presented. The conclusion will be followed in Chapter 7, presenting the answers to the research questions and discuss the implications of the research findings. Lastly, Chapter 8 will provide a personal reflection on the research process.

The overview of the document can be found in Figure 1.2. It illustrates where each sub-research question will be answered in the research and the document.

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Research framework

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Research method

Research process

Review of previous studies

Interview protocol development

Series of interviews

Data analysis

CHAPTER III:
Review of previous studies

Concept 1: **Work culture** in the construction industry

Concept 2: **Digital tools** and its influence on work and employment

Work culture and digital tools

SQ1

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Discussion

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Theme 1
Impact of the usage of digital tools on gendered work culture

SQ2(a)

Theme 2
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Figure 1.2: Outline of the document

2 | METHODOLOGY

This chapter presents the method used for the data collection and analysis to answer the research questions (were presented in Chapter 1.1). Therefore, this chapter will first present the research strategy in section 2.1, introducing the research process and applied research method. Then 2.2 will discuss the research method in more detail, based on the research stages that are explained in the earlier section.

2.1 RESEARCH METHOD

The study used a qualitative research method due to the focus of the special issue [Powell and Sang, 2013]. More specifically, the study used a literature review and semi-structured interviews to collect data. This study uses a series of interviews as a data collection tool among many qualitative research methods. It is a helpful research approach to obtain data on participants' experiences, opinions, beliefs [Ryan et al., 2009], attitudes, and values [Barriball and While, 1994], regarding a particular study question or topic of interest. Additionally, the interviews allow researchers to investigate the respondents' concerns and experiences through interactive discussions [Höglund and Larsson, 2019]. It also allows the researcher to examine the validity of the interviewees' answers by non-verbal language [Barriball and While, 1994].

2.2 RESEARCH STAGES

This section discusses the research process in depth. A more detailed research method will be explained based on the research stages. The process of the research is shown in Figure 2.1. In Part One literature review was conducted, and Part Two continues to collect data from a series of interviews.

The research is divided into five research stages. Stage 1 aims to collect knowledge from empirical findings and literature, where the first sub-research question is answered. Based on the findings from the first stage, the interview protocol will be formulated for the next research stages.

In Part Two, a series of interviews are conducted to determine the influence of digital tools on the construction industry work culture and whether it can improve younger women employees' early career experience in the sector. In stage 2, lists of potential interviewees are made and selected from the list. Finally, the interview protocol is developed in the third research stage.

2.2.1 Stage 1: Review of previous studies

This stage reviews previous literature to understand the problem (see Section 1.2), which needs further attention, and identifies a theoretical gap [Skulmoski et al., 2007], from which Research Questions are formulated to settle the identified prob-

PART I	PART II			
Stage 1 Literature Review	**Stage 2** Interviewees Selection	**Stage 3** Interview Protocol Development	**Stage 4** Series of Interviews	**Stage 5** Result Evaluation

Figure 2.1: Research process

lem.

Review of the previous study on the work culture of the construction industry

To answer sub-question 1, common features of the construction industry were reviewed. Firstly, articles were searched by keywords. The used keywords for searching can be found in the table 2.1. After searching, nine relevant articles remained to be analysed. The publication years of the article were considered to take into consideration of the phenomenon and trend change over the years. The publication year of the article varies from 2001 to 2022. These articles were analysed using the ATLAS.ti program helps to understand unstructured and qualitative data by structuring and visualising complex elements [Friese, 2022]. The articles were added to the system, and open coding - an inductive analysis - was used for the analysis: firstly, the most frequently appearing words on *word cloud* (see Figure A.1) were noted after understanding the context of the vocabulary, then the words were clustered and categorised to several codes. Finally, the codes were separated and assigned to corresponding categories. The categories were set to help understand the experience of early career women in the industry in order of career experience. This process can be seen in Table A.1.

Table 2.1: Keywords that were used for searching the review of previous studies

Topic	Keywords
The work culture of the construction industry	Construction industry work culture, Work climate of the construction industry/sector, women in construction, female employees in the construction industry, career barrier for women AND construction, work environment construction, work culture construction, organisation culture construction, gender equality construction, diversity construction, construction inclusive work culture, women turnover construction, retention women construction
Digital tools development & implementation and its influence on work culture	Digitisation AND construction, construction AND digital change, digital tools and work environment, digitisation employment in construction, digitisation/digital tools AND work culture, digitisation AND attitude/norm/culture, digital tools AND work environment, digitisation AND task/occupation change

Review of previous study on digital tools and organisational culture

To answer the sub-research questions 2 and 3, the impact of digital tools on work and employment was reviewed. Firstly, the consequence of the usage of digital tools was identified. During this process, the same method was used for answering the first sub-question. Next, the most recurrent impact of digital tools on employment
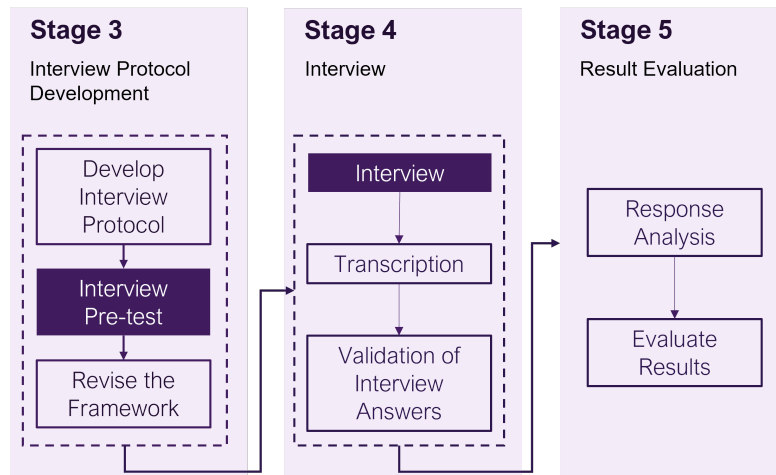
Figure 2.2: Data Collection and Analysis Process of Delphi Method

was identified and clustered. It can be seen in Figure A.3. This helps to answer the second sub-research question. Then to answer sub-research question 3, these elements were reviewed and associated with the codes identified in Table A.1. This can be seen in Figure A.4.

2.2.2 Stage 2: Interviewees Selection

In any research, selecting a data source is a critical stage [Blaikie and Priest, 2019]. The interviewees for this study are responsible for providing sufficient and diverse perspectives.

The interviewees should be able to provide their early career experience and opinion on the impact of digital tools on the construction firms' work culture based on their work experience and expertise. Nevertheless, the collected information can be biased depending on the diversity of participants. In order to collect unprejudiced answers, interviewee selection criteria are developed for this research stage. Research participants must meet one of the following selection criteria:

- Early career professionals in the construction industry [1] or recent graduates of higher education in design, engineering, management;

- A member of a related topic activist group;

- Professionals in executive, managerial, or supervisory roles in the construction industry;

With early career professionals, the interview aims to understand their career experiences in the industry. Moreover, it will examine how digitisation is involved in the experiences and its impact on the industry's culture and work practices. In comparison, the interview with employees in senior positions will explore work (organisational) culture and work practices, as well as the engagement of digital tools in these aspects and analyse how this affects the career decision of younger employees. Lastly, the activist members are invited to the interview, as they are universally aware of the situation.

In addition to the participant's ability to provide the information, their commitment is crucial. Therefore, in addition to the selection criteria, their interests and

---

1 There is not a clear definition of what is an early career professional, but this research describes a group of employees that show potential in successive professional careers and future leader [Kulkarni et al., 2018], and those who have work experience under ten years.

commitment to the research process should also be inspected Hasson et al. [2000]. The number of participants was limited to under 20, as exceeding 20 usually results in unwieldiness [Sekayi and Kennedy, 2017]. Akins et al. [2005] stated that well defined small group of interviewees shows the most valid argument. Therefore, this study limited the number of interviewees to 12 to 20.

Once the potential interviewees are selected, the potential participants will be invited with informed consent (attached in Appendix B.1). Informed consent is developed based on the data management plan for the research (see Appendix B.2).

This study adopted a snowball method to recruit the interviewees. At the end of the interview, the interviewees were asked whether they could introduce an interviewee who meets the interviewee criteria for this topic.
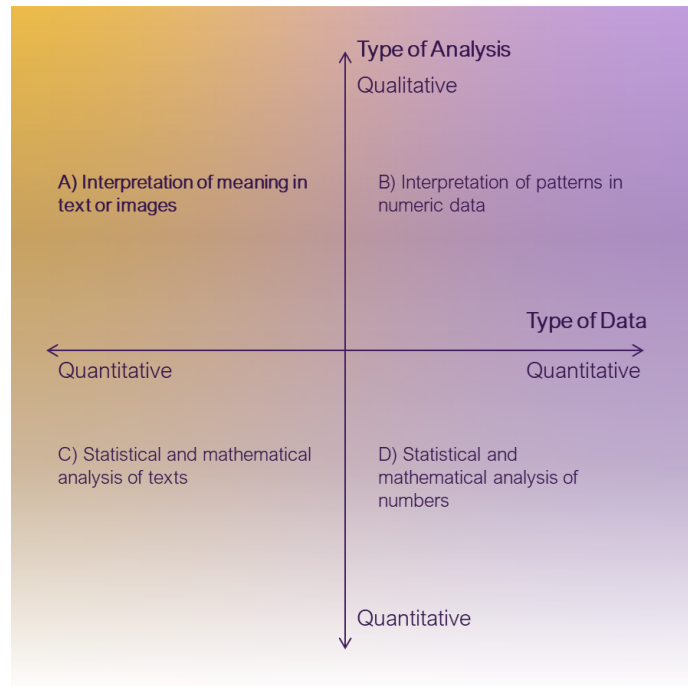
Figure 2.3: Qualitative and quantitative data analysis based on [Guest et al., 2014]

2.2.3 Stage 3&4: Semi–structured Interview

In this study, the interview aimed to explore and understand the work experience of interviewees. Due to the broad scope of the topic, the interviews were semi-structured to collect consistent data. After the selection of the interviewees, semi-structured interviews are carried out. The overall process is described in Figure 2.2.

In the third research stage, an interview protocol was developed, and it was pre-tested, which was advised by Hasson et al. [2000], by three research supervisors before conducting the interviews with the experts to ensure the questions contained appropriate structure and language. It also allows the researcher to confirm that the desired data can be collected from the interview [Reynolds and Diamantopoulos, 1998]. The interview protocol can be seen in Appendix C. This protocol has been developed respecting and following TU Delft Research Data Framework Policy, and ethics approval was acquired by Human Research Ethics Committee ethics coordinator (ID: 2492).

Three versions of the interview protocol have been developed to make good use of the interviewees' time. The overall structure (7 parts) of the protocol remains the same for each protocol. However, minor adjustments were made to the questions depending on the positions and roles of the interviewees. Therefore, the duration of each part will differ.

The interview enables research participants to be open and ensures flexibility in the research process [Flick, 2009]. Moreover, due to the focus of the research - human value and culture - the research requires an interpretative approach, as numerous aspects of moral principle, culture, and relationship cannot be thoroughly evaluated by the quantitative research approach because it generalises the findings [Cypress, 2015].

2.2.4 Stage 5: Response Analysis

This research collects qualitative data and uses qualitative analysis. Figure 2.3 shows the distinction between qualitative and quantitative data analysis. The top left part of the figure is the data analysis method for this study. To analyse the collected qualitative data, thematic analysis is used. The thematic analysis allows the researcher to identify patterns and focus on the interpretation of the theme; therefore, the analysis demands more engagement and elucidation of the researcher [Guest et al., 2014].

The analysis starts with transcribing the collected data and interview recordings in this study. This process allows the researcher to be familiarised with the data set and explore patterns from the data. As the interviews were conducted semi-structured, the interviewees discussed consistent topics. From the transcript, patterns will be observed, and these patterns were coded in ATLAS.ti programme. This process enables the researcher to systematically discover and monitor themes from the pattern. It also allows the development of the outline of the observation visually. When the transcription coding is completed, quotations corresponding to each code are shown together; then, the researcher can review the codes and eliminate what is irrelevant. The themes were created into categories and organised codes in the next step. Figure 2.4 shows the overall process of the analysis. When the last step is finalised, the observation and interpretation of the researcher are documented. This can be found in Chapter 5.

Step 1 Transcription	Step 2 Create & apply codes	Step 3 Collate codes	Step 4 Create theme	Step 5 Evaluation and revise
Transcription of the audio data will allow familiarise with the data and actively pay attention to patterns.	From the previous step, observed patterns will be codes to be applied. However, in this research the codes that were created by the review of previous study will be used.	All the quotations that are related with the codes will be shown together in this step and it will provide the researcher to review whether the extracts are associated with the codes and support.	The codes will be categorised into themes.	

Figure 2.4: Thematic analysis process, based on Delve [2022]

3 | REVIEW OF PREVIOUS STUDIES

This chapter will present findings of previous studies regarding experience of younger female professions in the construction industry and examine whether digital tools can influence the work and organisational culture in the construction industry. Firstly, in Section 3.1 will show higher turnover rate between women employees in their early career in construction and identify the factors that influence this decision on leaving or staying in the sector. Then the next section, Section 3.2, will present the organisational factors of these career challenges, focusing on the work culture and environment of the construction industry. Moreover, it will show how the factors are interconnected and influencing each other. Later, the last Section (Section 3.3) will address the impact of digital tools on organisational culture and the trend of digitisation of the construction industry.

3.1 HIGHER TURN OVER BETWEEN YOUNG FEMALE PRO-FESSIONALS IN THE CONSTRUCTION INDUSTRY

The construction industry is recently facing a significant labour shortage [European Construction Sector Observatory (ECSO), 2021], one of the reasons for which can be a high turnover rate. The construction sector in the Netherlands showed a significant increase in total turnover in 2018, showing a 23.4% increase compared to the rate in 2010 [European Construction Sector Observatory (ECSO), 2021]. In this section, the focus will be the higher turnover trend among young female construction professionals and it will present their early career experience in construction.

Science, Technology, Engineering and Mathematics (STEM) education institutes accomplished the attraction of more female students [Maurer et al., 2021]. Gale [1994] stated that a more significant number of female graduates in construction or related topics does not result in more female employees in the male-dominated industry and preventing them from leaving the industry. After 25 years of Gale's study, the trend has not been improved much [Zhang et al., 2021]. For instance, the study of Dainty et al. [2006] showed few women graduates of construction-related subjects joined professions the British and Australian construction [Dainty et al., 2006]. 15% of female students account for a cohort of related engineering degree, while only 8% are female managers or professionals in the UK. 10 years later in the US, according to Silbey [2016], around 40% of women awarded a degree in construction or related do not enter or leave the profession.

Even though they enter the industry, many young professionals do not stay long in the industry. Recent studies have identified an increasing trend of higher turnover rate or their intentions among young women construction professionals in construction-project-based organisations [Deloitte, 2018, as cited in Borg and Scott-Young [2021a]. Early career women in the industry encounter multiple challenges to enter and stay in the construction industry [Perrenoud et al., 2020; Silbey, 2016; Oo et al., 2020].Early career women are being forced out of the industry [Choi et al., 2022] by the work culture [Hickey and Cui, 2020] and the negative experience in the industry. Early career experience is critical because it significantly impacts their

future professional decision, as well as leaving the industry [Zhang et al., 2021].

In addition, despite women's attainment of professions, women engineers remain seriously underrepresented in the construction industry both numerically and hierarchically [Zhang et al., 2021], facing barriers to career advancement [Dainty et al., 2006; Bagilhole et al., 2002; Navarro-Astor et al., 2017]. This issue is shown in numerical values. According to Maurer et al. [2021], in the construction execution phase, women account for only 8% of the total employees. Meanwhile, women could not be promoted to managerial positions due to the company policies [Dainty et al., 2000, 2006; Perrenoud et al., 2020]. This glass ceiling is seen as 'an invisible organisational barrier' that prevents growth within the organisation [Fernando et al., 2014].

Over the years, many empirical studies have explored the topic of women in construction and why they leave the industry. Table 3.1 shows women's career challenges in construction identified in the previous studies. The barriers can be broadly divided into two categories: (1) personal and (2) organisational factors. Personal factors include family-work balance, pay and stress. In contrast, organisational factors include recruitment and selection, training, allocation of tasks and positions, work climate, gender stereotype, networks, working conditions, and career opportunities. Figure 3.1 shows how these factors are separated into two groups.
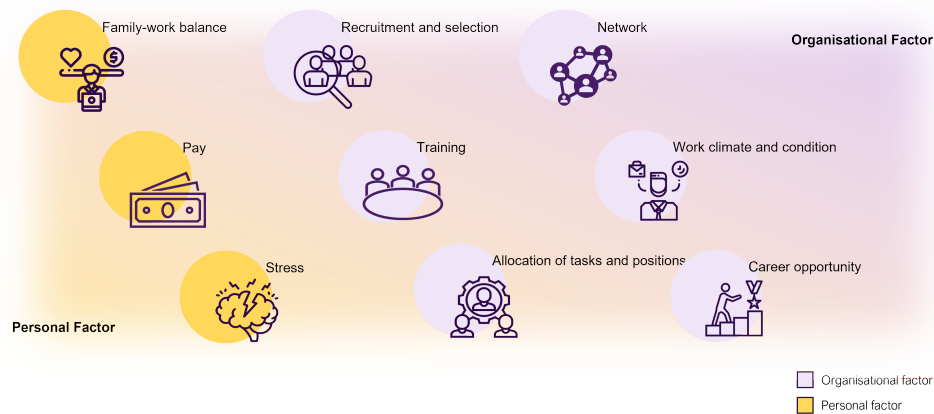
Figure 3.1: Career challenges

3.1.1 Personal factors

Family-work balance

Many women have left or are considering leaving the industry after facing a conflict between their professional and personal roles. The most fundamental career challenge for women in construction is to find a balance between professional and personal ambitions [Hatipkarasulu and Roff, 2011; Rosa et al., 2017]. Many women professionals adopt the "either/or" approach when it comes to work and family decisions, choosing between career advancement and fulfilling family duty [Dainty et al., 2006]. It is connected to the construction industry's working conditions, which require long working hours and shifting work location [Dainty et al., 2006; Worrall et al., 2010]. Not only while pursuing their career, but women are also under pressure when they enter the industry. Peer pressure and their family, career advisors and teacher's attitudes toward the sector often act as a deterrent [Fielden et al., 2001], as the industry is generally far from providing part-time schedules, daycare programmes or career break [Naoum et al., 2020]. Dainty et al. [2000] stated that

Table 3.1: Women's career advancement barriers, identified from previous studies

Career challenges	Sources
Family-work balance	Dainty et al. [2000]; Worrall et al. [2010]; Rosa et al. [2017]; Perrenoud et al. [2020]; Naoum et al. [2020]; Maurer et al. [2021]
Pay	Navarro-Astor et al. [2017]; Perrenoud et al. [2020]
Stress	Dainty et al. [2000]; Navarro-Astor et al. [2017]; Rosa et al. [2017]; Naoum et al. [2020]; Maurer et al. [2021]
Recruitment and selection	Rosa et al. [2017]; Naoum et al. [2020]; Maurer et al. [2021]
Training	Worrall et al. [2010]; Perrenoud et al. [2020]
Allocation of tasks and position	Worrall et al. [2010]; Navarro-Astor et al. [2017]; Rosa et al. [2017]; Perrenoud et al. [2020]
Work culture and condition	Dainty et al. [2000]; Worrall et al. [2010]; Navarro-Astor et al. [2017]; Rosa et al. [2017]; Naoum et al. [2020]; Maurer et al. [2021]
Network	Dainty et al. [2000]; Worrall et al. [2010]; Navarro-Astor et al. [2017]; Rosa et al. [2017]; Maurer et al. [2021]
Career opportunity	Dainty et al. [2000]; Worrall et al. [2010]; Navarro-Astor et al. [2017]; Rosa et al. [2017]; Perrenoud et al. [2020]; Naoum et al. [2020]

in the UK, more than half of construction male workers had partners who did not work and took care of their family issues. Many companies are aware of these concerns of women employees and carry out work-life balance policies, but it is remained to be a challenge for many female employees in construction [Oyewobi et al., 2019].

Pay

Some studies identified pay as a career advancement barrier. It was stated that some companies in the industry do not offer staff members fair pay, pensions, and/or additional benefits [Fielden et al., 2001]. In addition, there is pay discrimination - women get paid less for equivalent labour than male employees [Navarro-Astor et al., 2017], and it is widespread and well known by the professionals in the industry [Fielden et al., 2001].

Stress

Stress is another personal factor that leads women to leave the industry. Many women expressed the challenges against stress. Some women stated that the stress comes from balancing work and family balance [Naoum et al., 2020], while some in supervisory roles expressed that in addition to stress caused by job nature, women come under considerable pressure to keep up with male colleagues due to limited career development opportunities [Rosa et al., 2017; Maurer et al., 2021].

3.2 WORK CULTURE AND ENVIRONMENT OF THE CONSTRUCTION INDUSTRY

The previous section introduced introduced career challenges for women employees in construction and it could be broadly divided into two groups: (1) personal

factors and (2) organisational factors. This section will zoom into the organisational factors. The former was discussed in the last section and this section will focus on the organisational factors. Before discussing the organisational factors in Section 3.2.2, the work environment and work culture will be presented in Section 3.2.1, as it shows interconnection between other factors.

3.2.1 Work culture and environment of the construction industry: behaviour, attitude, and perception

Macho organisational culture and work environment characterise the construction industry. Gale [1994] presents the culture of the construction industry. According to the author, construction activities motivate "the construction culture" passively and(/or) actively. These activities involve information exchange and management style that involves time, cost, and quality parameters, and these do not deal with gender but ignore gender relationships. As a result, gender-blind organisational cultures are prevalent in public and private construction sectors. Moreover, working condition in construction is known as harsh and demanding. Employees are required to meet the condition of longer working hours and nomadic nature of workplace [Dainty et al., 2000; Navarro-Astor et al., 2017; Naoum et al., 2020]. The challenging work environment discourages employees from pursuing their careers in the construction field [Zhang et al., 2021]. It makes the industry seen as a harsh and physical industry [Powell and Sang, 2013; Mooney, 2014] and results in numerically male-dominated work environment, defining masculine identity [Ness, 2011] (see Figure 3.2).
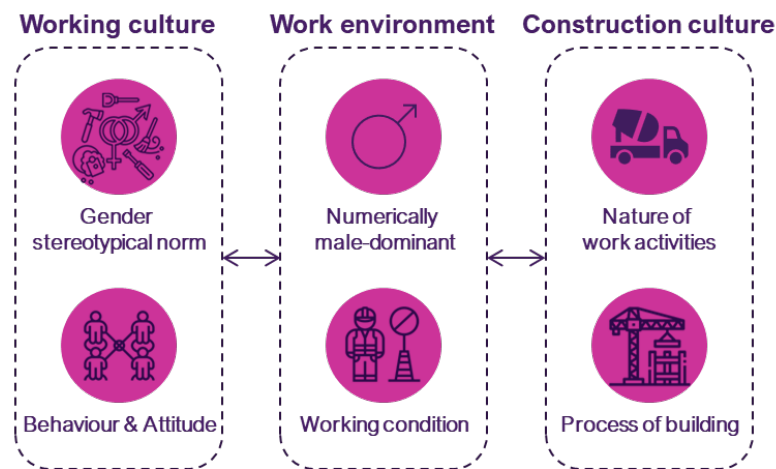
Figure 3.2: Work culture and environment of the industry: how it is formulated and preserved

This identity has been preserved by applying gender stereotypical norms, and aggressive and hostile reaction when women enter the industry. Stereotypical norms are often used to preserve the power imbalance between dominants and the marginalised [Whittock, 2010]. For instance, when female employees enter the male domain, men tend to react aggressively and be hostile with a negative attitude [Ness, 2011; Powell and Sang, 2013], saying they (women) do not fit in the physical and demanding sector. For example, existing male employees often perceive female entrants to the industry as intruders and show an aggressive reaction, such as sexual harassment and inappropriate jokes [Bagilhole et al., 2002; Ness, 2011]. Especially for women in the building site, it is threatening and hostile [Dainty et al., 2000]. From this, those who do not fit the image and stereotypes of the sector have

been excluded [Perrenoud et al., 2020]. As a result, the primarily masculine work climate has been preserved by portraying female engineers as exceptional or extraordinary for working in construction, resulting in sexual harassment becoming a common characteristic of the construction site [Wright, 2013].

Women in this sector have been facing challenges related to this issue, including being assigned to uncomplicated projects, isolated from supportive networks, and unfair treatment even during recruiting processes [Silbey, 2016; Bagilhole et al., 2002; Perrenoud et al., 2020]. The study of Dainty et al. [2006] distributed a questionnaire to members of Australian National association of Women in Construction, and the result showed that a more significant proportion of female employees (46.7% of agreement) answered that they had been treated differently based on ethnicity, sex, and age. Moreover, Mooney [2014]; Hickey and Cui [2020]; Perrenoud et al. [2020]; Hoff [2021] showed that the female employees who left or seriously considering leaving the sector answered that it is due to "harassment and lack of respect". For example, women have not been recognised doing the same work as men without jeopardising masculinity notions associated with building activities [Wright, 2013]. What is worse is that this became a common feature of the industry [Wright, 2013]. This denying reaction toward women employees is not only from the counterparts but also from the industry itself. The construction sector is hesitant to agree with the capability of women and accept them as a potential skill pool [Gann and Senker, 1998; Zhang et al., 2021].

According to the study of Sang [2007], many younger construction professionals, or who appear younger, faced a "negative attitude" from the construction site workforce [Powell and Sang, 2013]. For example, young female trainees were often shown to experience dangerous and sexist pranks from male employees [Whittock, 2010].Wright [2013] also mentioned that the form of gender interaction, which is characterised in the construction industry, is not accepted in other business industries.

Moreover, many women expressed that they were unheard of or not getting the same weight as other male employees [Dean, 2020; Mooney, 2014]. Especially on the construction site, women must integrate into the male-dominated industry [Wright, 2013; Gale, 1994] to be accepted and respected. This creates a conflict between their female identity and male norms in the industry [Gale, 1994]. When women appear less female, they have higher respect from the group [Mrowczyk, 2020; Wright, 2013]. Often women employees fight over ostracism, are perceived as weaker and having fewer skills from the on-site workforce and experience exclusion when they are in management roles [Mrowczyk, 2020]. An interview with the women CEO of a construction company that was conducted by Connley [2019] showed that women struggle to deal with skilled male labour who are "uncomfortable with female employees in a management role with their authority and sense of knowledge", even challenging their technical knowledge.

This reluctant behaviour of the industry and existing male employees put pressure on women to outperform to gain respect. Interviewees of Whittock [2010]'s study, who are early career women in the construction firm, expressed her pressure of getting everything right, stating that 'she could not afford to make mistakes, as women employees are more visible - due to less number of the female employees - when she started to work in the construction firm. A comparable answer was received from the study of Bagilhole et al. [2002]: the interviewee worked extra hard when she joined the construction-related profession to be recognised that they complete the tasks as other male employees do.

Powell and Sang [2013] and Hickey and Cui [2020] argued that the existing work culture has a negative influence on women's recruitment and retention. Similarly, it was presented that the prevailing work culture and environment of the industry result eventually in limiting the potential talent, skills, and expertise pool [Powell and Sang, 2013; Hickey and Cui, 2020]. Besides, this harsh condition and the organisational culture keep women away from the construction sector, resulting in the under-representation of women in the field [Maurer et al., 2021]. Furthermore, due to the preservation of the predominant work culture, it does not change work environment and ideologies of people in the industry, which influence behaviour and attitude.

Therefore, It is worth understanding early professional experience as a woman, as it is crucial for the future career decision [Zhang et al., 2021]. Furthermore, to attract and retain younger women engineers and managers in the construction field, it is crucial to listen to and understand their career experience [Bagilhole et al., 2002]. Likewise, Dainty et al. [2000] stated that the lived experience should be the base of the initiatives and efforts to raise female participation in the construction industry.

On the contrary, in the last decades, many women's career in the construction industry is focused on the US or the UK industry [Rosa et al., 2017], which results in the lack of up-to-date understanding of the Dutch construction industry. Moreover, many studies have been critical in understanding the experiences of professional women in construction, but less attention has been placed on the specific demographic group of early career professional women in the construction industry [Zhang et al., 2021]. Therefore, more comprehensive understanding of younger female employees experiences in the construction sector is required to attract and retain more women employees in the near future. Change in the work environment and organisational work culture may lead the construction sector to encourage more women to enter and stay in the industry [Karakhan et al., 2021].

3.2.2 Organisational Factors

The last section showed how work culture is formulated and kept over years in the industry. This section focuses on the organisational factors and review how it is connected and influenced by work culture. Figure A.2 shows the network diagram of these 9 career challenge factors, illustrating how they are interconnected.

Recruitment and selection

Recruitment and selection processes in the industry are relatively informal, which does not align with procedures adopted by human resource professionals [Navarro-Astor et al., 2017]. In this process, a network is often used for gaining employment. Often applicants with existing contacts with the companies they apply to are favoured [Dainty et al., 2006], whereas women have less chance in these networks as the networks are principally male-dominated [Navarro-Astor et al., 2017]. Moreover, during the hiring process, women candidates are questioned and examined with the underlying unconscious bias and gender stereotypes [Rosa et al., 2017; Hickey and Cui, 2020].

Training

Female employees career challenges do not stop after entering the industry, but it continues with training. A wide range of training programmes are emphasised as they encourage and facilitate entry, retention and career development of women in

construction [Worrall et al., 2010], as it allows the development of practical skills and recognises their potential capability [Fielden et al., 2001].

Allocation of tasks and positions

The assignment of tasks, projects, and jobs tend to favour men in the construction industry, which results in 'occupational segregation' [Navarro-Astor et al., 2017]. According to the author, women are assigned administrative jobs, while most men have technical positions. Even though women are allocated to technical positions, they may be given to smaller or less profitable projects [Perrenoud et al., 2020], performing repetitive minor tasks [Rosa et al., 2017] because their skills and knowledge are not recognised [Navarro-Astor et al., 2017] and their (actual or perceived) physical capability is undermined [Hatipkarasulu and Roff, 2011].

Work climate

Work climate is can be seen as construction employees' attitudes, behaviours and perceptions [Worrall et al., 2010]. This includes sexist attitudes and practices not only become a career development barriers [Fielden et al., 2001; Maurer et al., 2021], but also hinder female students from choosing construction as a future career [Naoum et al., 2020]. Gender stereotypes is a part of the organisations' climate. It refers to a broad assumption or preconception regarding the qualities or characteristics that men and women should or should not have, or about the roles that men and women should or should not play [United Nations Human Rights, 2014].

Network

Networking practices in the construction industry is male-centered. There are two principal reasons behind this demographic feature of networking practices. First, considering that the industry's structure is male-dominated numerically, the network normally consists of men [Navarro-Astor et al., 2017]. Secondly, the networking events revolve around male-friendly activities, sporting events involving alcohol, for example [Rosa et al., 2017], or some informal networking activities that take place outside of work, when female employees are more likely to be occupied [Navarro-Astor et al., 2017]. Formal and informal network at work influences career success and development [Dainty et al., 2000]. It allows resource and knowledge exchange and provides an opportunity for one's capability and work to be recognised [Navarro-Astor et al., 2017; Maurer et al., 2021]. Besides, all of these affect career advancement [Dainty et al., 2000; Fielden et al., 2001; Maurer et al., 2021]. A study of Rosa et al. [2017] showed that women in their early career in construction were not invited to (in)formal networking activities. Worrall et al. [2010] showed this "isolationism" among new entrants to the industry, and most women suffer from loneliness and lack of companionship [Dainty et al., 2006].

Working condition

The industry's working condition derives from 'masculine model that are designed by men for men' [Navarro-Astor et al., 2017]. This job principle and expectation involves long working hours and mobility of workplace [Dainty et al., 2000; Navarro-Astor et al., 2017; Naoum et al., 2020].

Career opportunities

After being hired, women face another challenge: a lack of career development opportunities. Many women employees face a glass ceiling [Worrall et al., 2010; Navarro-Astor et al., 2017; Naoum et al., 2020], where they can not acquire a higher level position and not progress in their career development. In a study of Perera et al. [2020], career opportunities were identified as the second most inspiring factor

in retention. Unfortunately, many female employees' skills and competencies are undervalued and unrecognised [Fielden et al., 2001; Worrall et al., 2010; Rosa et al., 2017], leading to less provision of career opportunities.

These organisational factors can be ordered, as illustrated in Figure 3.3. This categories are created to understand these topics in an order of different stages of career level.

1	Education-to-work Transition	Recruitment & Selection
2	Early career experience	Training Work culture and condition
3	Work practices	Allocation of tasks & position Work culture
4	Networking	Networking
5	Promotion	Career opportunities Training Allocation of positions & tasks

Figure 3.3: Career challenges - organisational factor

3.2.3 Inclusive work environment

Previous section showed that the construction industry is characterised with the exclusive work culture and environment. Despite efforts for a more inclusive work environment in the construction sector [Menches and Abraham, 2007], regretfully, the progress toward inclusion has been gradual in the engineering and construction industry [Maurer et al., 2021]. This section will present the definition of inclusion and review how it can be achieved.

Brewer (1991) explains inclusion based on balancing two counterbalancing needs, which are similarity & validation and uniqueness & individualisation [Shore et al., 2011]. Throughout the process of balancing these two needs, people find a sense of belonging [Shore et al., 2011]. The sense of belonging is associated with acceptance and inclusion. Adopting Brewer's theory, Shore et al. [2011] defined inclusion as a perception of a member of a group feeling and experiencing the treatment that meets their needs for belongingness and uniqueness in the group. The authors developed a framework of inclusion based on belongingness and uniqueness. According to the framework, inclusion occurs when a group puts a high value on uniqueness, and individual group members feel belongingness highly [Shore et al., 2011; Mor Barak, 2017; Alexandra et al., 2021]. In other words, in an inclusive environment, individuals felt accepted to the group where they belong, regardless of their uniqueness of each and encouraged to retain pursuing their distinctive features. Likewise, Yu and Shen [2013] added a concept of different voices with diverse perspective approaches being respected and heard in an inclusive work environment. As a result, everyone's opinions are valued, and people are stimulated to contribute to the organisation.

The definition of inclusive differs depending on the scholars (see Table 3.2); however, common themes are apparent. Inclusion allows diverse individuals [Miller,

Table 3.2: Definition of inclusion

Author	Definition
Miller [1998]	Inclusive environment promotes diverse individuals to participate and allowed to play a part in the group
Pelled et al. [2002]	The degree of employees' feeling of acceptance to the group and treated fairly by other employees in the organisation
Lirio et al. [2008]	Inclusiveness prevails when employees in the professional organisation perceive that they belong to the organisation
McKay et al. [2009]	The work climate is inclusive and pro-diversity, when diverse individuals are promoted to participate and have an equal opportunities in their career.

1998; McKay et al., 2009] to participate and contribute [Lirio et al., 2008; McKay et al., 2009; Roberson, 2006; Miller, 1998], feeling sense of belonging and acceptance in the group [Lirio et al., 2008; McKay et al., 2009; Pelled et al., 2002].

There are three dimensions of inclusion: (1) participating in the decision-making process; (2) having access to applicable information; and (3) opportunity to be a participant in various activities [Mor Barak, 2017]. Pless and Maak [2004] suggested that the following should be accompanied throughout emotional realisation to build an inclusive work environment: (1) mutual comprehension to each other; (2) diversity of viewpoints; (3) trust; and (4) integration. When these are ensured in the work environment, a pro-diversity perspective is eventually formulated for the inclusive environment. In addition, it is achieved when people have influence in the decision-making process [Mor Barak, 2017], expressing opinions, feeling accepted and fitting in the group [Downey et al., 2015]. Pless and Maak [2004] added that redefinition and rearrangement of leadership, decision-making and teamwork are required to promote employee integration. However, initiatives for diversity often encounter application difficulties. Sometimes it may be the result of the insufficient fund, conflicting priorities, and lack of prospect pool (Bond, 2007; Marquis et al., 2008, as cited in Solebello et al. [2016]). Construction of an inclusive work environment is not easy, as it requires long-term and sincere commitment and will to change from all of the team members [Pless and Maak, 2004; Downey et al., 2015; Lirio et al., 2008]. Negative attitude toward changes and hostile perception toward a diverse group also influence the outcome [Thomas and Mengel, 2008].

Impacts of inclusion in a team environment have been studied by many scholars. An inclusive group provides more opportunities for better group performance [Wolfgruber et al., 2021]. For instance, it stimulates inter-collaboration between groups and encourages the improvement of personal skills [Shore et al., 2011]. This climate for diversity that provides a relaxed and positive viewpoint to difference inspire and stimulate employees to make a constructive contribution to their organisation.

Here, there is a need to distinguish between practised inclusion and perceived inclusion. Practised inclusion refers to initiatives and practices that are applied to create a climate of diversity. On the contrary, perceived inclusion can be seen as an individual's perception of the degree of belongings and being valued for being unique in a group [Alexandra et al., 2021; Shore et al., 2011]. The gap between practised inclusion and perceived inclusion may result in organisations not seeing the expected outcome of inclusive initiatives. To bridge that gap, it is advised that subjectivity should be exposed rather than aiming for more objectivity so that policies and practices can be subjected to critical scrutiny and improvement [Steinmeier, 2020]. Another issue of the gap comes from a lopsided focus on inclusion practices.

Often these initiatives are introduced to counteract problems that minorities mainly face, such as discrimination and marginalisation. Jansen et al. [2015] suggested that when majority members understand that they are actually in part of organisational diversity, their understanding of diversity and inclusion are enhanced, eventually increasing their support toward corporate inclusion practices.

3.2.4   Integration between project participants in Construction

Integration between employees were stressed to achieve inclusive work environment in earlier section. Integration is an important factor in construction. Integration between project participants is crucial for construction projects. The construction industry is characterised by fragmentation [Yu et al., 2010; Cao et al., 2018; Che Ibrahim et al., 2015], as the construction projects involve a process of building or assembling infrastructure, combining many disciplines, plans, elements, etc. Therefore, a construction project commonly includes many actors from different departments, such as project architect, construction engineer, construction manager, project manager, and skilled labours [Wu et al., 2019]. These cooperation occurs both within a single organisation and inter-organisations [Shirazi et al., 1996]. Even in a single organisation, due to the organisational structure of the industry - involving site-based and office-based jobs [Lingard and Francis, 2004] - the collaboration between site-based tasks and office-related jobs is required [Zhang et al., 2021]. Moreover, as mentioned above, the aggressive response from male employees to women entrants results in the segregation between young female newcomers and their counterparts.

In the architectural engineering and construction (AEC) industry, the collaboration and integration between participants play a vital role [Phelps and Reddy, 2009]. As mentioned earlier, construction projects bring multiple teams together to cooperate and deliver complex projects for months to several years. Organisations and individuals in the construction industry use the term integration to describe the implementation of working practices, methods, and attitudes that promote a culture of effective and accurate collaboration [Baiden et al., 2006]. Besides, in a construction project, many organisations and stakeholders need to be coordinated, as various expertise and competence required for a complex and unique project are rarely found in a single organisation [Larsson and Larsson, 2020]. This project-oriented relationship between participants requires engagement and alignment [Cao et al., 2018; Oraee et al., 2017], and it is necessary for the realisation of construction projects [Bygballe et al., 2016], but many scholars recognise that the integration of such cross-functional communities is not easy [Bechky, 2003].

Team integration has a considerable influence on construction projects. Firstly, team performance and project performance are highly related to the team integration [Oraee et al., 2017; Baiden et al., 2006; Deep et al., 2020; Che Ibrahim et al., 2015]. In the study of Franz et al. [2017] showed that when the team increases, project schedule delay was reduced and project intensity was reduced as a consequence. Moreover, Baiden et al. [2006] pointed out that time and cost overruns are partially led by the inability of project teams effective collaborate. Another impact of integration between project participants is that it enables the project manager to identify and react to risks and uncertainties in the project, as it reduces project ambiguity [Oraee et al., 2017; Deep et al., 2020]. Team integration has a positive influence on collaborative culture and promotes equitable relationships, enhancing project performance [Khairil Izam Che Ibrahim et al., 2013].

3.3 DIGITAL TOOLS AND ORGANISATIONAL CULTURE

This section will discuss the relationship between digital tools and organisational culture. Firstly, the concept of organisational culture will be reviewed then impact of digital tools in organisational culture will be presented. Afterwards, discussion of the digital tools and its trend in the construction industry. The benefits and drawbacks of the implementation of these tools will be presented.

3.3.1 Organisational Culture

Work environment and culture refer to characteristics of a group of individuals (employees) in a firm. Work environment and its characteristics can be understood as synonymous to organisational culture [Isensee et al., 2020]. In this study, work culture can be seen as an organisational (a construction firm's) culture.

Organisational culture was firstly recognised with objective features of an organisation, such as size, structure, policies [Boeyens [1985], as cited in Sempane et al. [2022]. On the other hand, Schein [1984] defined organisational culture as a fundamental presumption that a group has created, learned, or evolved in order to learn to deal with its issues with integration internally and external adaptation. Whereas, nowadays it is distinguished as 'a set of expected behaviour patterns that are expressed by individuals in the organisation and it greatly influence on behaviour on employees [Sempane et al., 2022]. Moreover, some demographic features of individuals in the organisation - age, sex, educational background, etc. - shape the organisational culture and value [Wallace et al., 1999].

Schein [1984] provides an important concept of dividing organisational culture into several levels. The author divides the organisational culture into three levels, as shown in the Figure 3.4. The visible artifacts that are the lowest level of the organisational culture. The example of the artifacts can be office layout, visible or audible behaviour, and public document, such as charters, employees orientation materials. This is easy to obtain, but it is difficult to interpret and understand the reason of the behaviours of the individuals in the group. Then, the value - the second level of the organisational culture - comes important to understand the reason of certain behaviours, because it controls the behaviours. Then this value comes from the basic underlying assumptions of the group that are taken for granted. These basic assumptions of organisations arise from organisation's history, individuals' and/or groups' experiences [Korte and Chermack, 2007].

On the basis of the findings of previous studies, organisational culture of construction firms are divided into three level, as shown in Table 3.3.

3.3.2 Impact of digitisation on work & employment

Three domains of the impact of digitisation on work & employment can be identified: (1) tasks and occupation, (2) condition of work [Fernández-Macías, 2018], and (3) organisational structure and individuals' standard of behaviour [Grover et al., 2022]. The network of these three dimensions and the impact of digital tools in work and employment can be seen in Figure A.3. Moreover, the overview of the impact of digital tools on work and employment can be seen in Table 3.4

Working condition

The digitisation disconnects physical work location and work activities [Fernández-Macías, 2018]. The author showed some examples of the change in working conditions. Digital technologies enable algorithms to control labour processes and allow
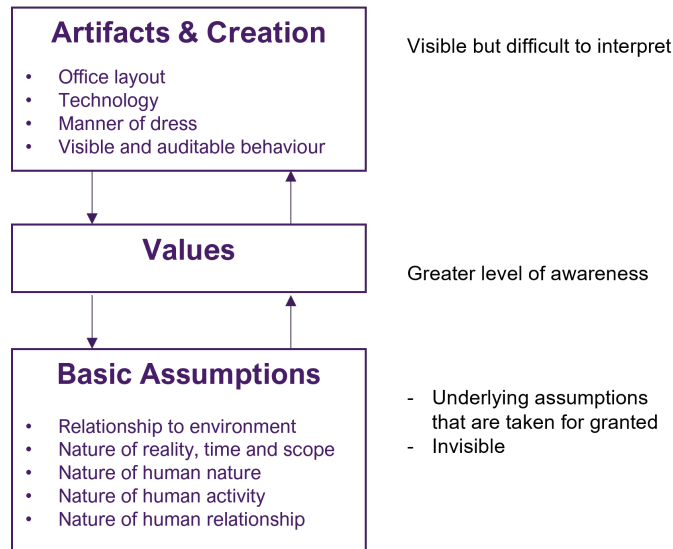
Figure 3.4: Levels of organisational culture adopted from Schein [1984]

automation. These digitised processes make human labour redundant and unnecessary. Moreover, digital communication platforms facilitate face-to-face communication services from any distance [Kudyba et al., 2020]. BIM, for example, functions as a communication tool between construction sites, fabrication sites, and design offices [Sebastian, 2011].

Tasks and occupation

As shown above, digitisation at work impacts the work environment and nature of work activities. These changes are also involved with changes in tasks and occupation [Fernández-Macías, 2018]. For example, BIM is on the rise with its potential for change in work activities and environment for cooperation [Sebastian, 2011]. Companies nowadays are rebuilding skills requirements for recruitment to involve more digitally capable workers [Kudyba et al., 2020].

Digital tools enable the development of cooperative work environment [Grover et al., 2022]. For instance, BIM functions as shared knowledge and it enables communication and coordination between the construction site, factories - for prefabrication and assembly, the design office, and engineering firm [Sebastian, 2011], providing the capability of real-time intercommunication both in text and visually, regardless of geographically varied location and diverse background [Kudyba et al., 2020].

Moreover, according to the study of Jacobsson and Linderoth [2021], the digital competence of new employees allow them to take specific responsibilities that is related to the digital tools. These small digitally related tasks allow them to feel the sense of "handling tasks and growing".

Organisational structure and relationship

Jacobsson and Linderoth [2021] showed three dimensions of digital transformation: implementation of digital tools, organisational adaption, and change of employees' mental models. At the organisational adaption level, it was emphasised that organisational strategies, routines, and processes align with the new digital technologies [Arvidsson et al., 2014]. Furthermore, the change in individuals' mental modes is

Table 3.3: The presentation of construction firms' organisational culture, based on the narrations in the previous studies

Level of organisational culture
Artifacts & Creation
Often use gender-blind parameters, such as time, cost, quality
Slow introduction of digitisation, however recently the industry is putting effort in how to make use of benefits of the digital tools
Longer working hours and mobility of the work place
Collaboration between off-site (office) and building site
Demographically more men employees compared to female
Physically demanding activities
Aggressive and reluctant behaviour toward new entrants, accompanied by lack of recognition and respect
Values
Differs from companies to companies, but common value of the industry is a building culture, in which assembling components and combining many order, plans, and elements. In these activities collaboration and integration are emphasised as a common value in the industry
Basic assumption
Gender stereotypical norm - women do not have essential technical skills in construction field and cannot perform like other male colleagues
Many female employees would leave the organisations to fulfil family duties

part of a change in the organisational culture.

Digital tools promote integration between employees by facilitating communication and fair information sharing. Firstly, the development of digital communication tools enhances ideological influence. It supports free expression between diverse members and encourages inclusion within the organisation [Grover et al., 2022], as it allows quicker and easier discussion between employees [Cijan et al., 2019]. Therefore, diverse values can be shared, and it contributes to influencing organisations' ideologies. Consequently, it may be able to change people's value and behaviour [Grover et al., 2022; Jacobsson and Linderoth, 2021]. Besides, this can help individuals to understand each other and provide diverse perspective, which are necessary to build an inclusive environment.

Moreover, the implementation of digital tools enhances fair information sharing. Information has become easier to access and transparent to all employees, including people at a lower level of the structure [Cijan et al., 2019], without distortion or censoring [Sherna, 2003, as cited in Hilbert [2011] - emphasised as one of dimensions of inclusion. Besides, the digital preservation of information allows the protection of digital objects for a longer-term period [Steinmeier, 2020].

In addition to the aforementioned impacts, digital tools bridge the knowledge-experience gap. Taking the study of Jacobsson and Linderoth [2021] as an example, even though the new employees' skills are unnoticed and neglected, digital competence enables recent graduate students to bridge the gap in knowledge-experience [Borg and Scott-Young, 2021a] and enter the organisation more quickly. Furthermore, when inexperienced new employees and experienced employees are paired

Table 3.4: Overview of the usage of digital tools' impacts on work and employment

Domain	Impact
1 Working condition	
	Automation Digital technology development allows automation which makes human labour redundant [Fernández-Macías, 2018]
	Separation between physical work location and tasks Digital communication disconnect physical work location and work activities [Fernández-Macías, 2018; Kudyba et al., 2020]
2 Tasks and occupation	
	Tasks Companies are now paying attention to rebuilding skills requirements - digitally related - for the recruitment [Kudyba et al., 2020]
	Collaboration and communication Digitally enabled communication allows collaboration and communication from distance [Grover et al., 2022]
	Digital competence - opportunity Digital competence provides more career opportunities for freshly graduated students [Jacobsson and Linderoth, 2021]
3 Organisational structure and relationship	
	Fair information sharing Easier and transparent access to information regardless of level in hierarchy [Cijan et al., 2019]
	Communication: ideological influence Diverse perspective can be shared more easily and effectively [Cijan et al., 2019], which allows change in people's value and behaviour [Grover et al., 2022]
	Digital competence The digital related skills enable new employees' knowledge and their skills to be noticed and help to be part of the organisation more easily
	Relationship From mutual learning process between new employees and experienced employees provide opportunity to learn from each other and build relationship [Jacobsson and Linderoth, 2021]

as a mentor-mentee team, there is a mutual learning process between two employees.

Change in working condition, tasks, and occupation can have an impact on artifacts and creation level of the construction firms' organisational culture, as it changes some aspects of the construction industry's nature. While change in organisational structure and culture can have an impact on basic assumption level because it can change people's belief and presumption. Thus, new digital technology and its usage could change individuals' behaviour and eventually influences organisational culture [Elliot, 2009; Melville and Ross, 2010; Isensee et al., 2020]. These impacts of digital tools on work and employment are associated with the career challenges that were found in Section 3.2.2. The interconnection between the impacts and barriers can be found in Figure A.4 Appendix A.

3.3.3 Digital tools in the construction industry

Introducing new technology has resulted in a digital transformation of businesses across all industries. The constantly evolving digital transformation of business operations is bringing complexities [Kudyba et al., 2020].

The dynamic characteristic of the industry and slow-moving change in the core construction knowledge have resulted in the industry falling behind in introducing digital tools to their business [Turk, 2021]. Meanwhile, during COVID-19 pandemic,

the urgency of digital tools' implementation and adoption have been stressed, pressuring the industry and organisations to facilitate the digital tools [Hai et al., 2021]. The construction firms today are no longer asking whether they should implement new technologies, but *how* to make use of benefits of the technologies [Jacobsson and Linderoth, 2021].

Digitisation in the construction industry brings excellent opportunities and challenges around its adoption of the digital tools and techniques [European Construction Sector Observatory, 2019]. It provides wealthy options to the firms which want to take advantage of it [White, 2012], as it allows the firm to play an proactive role in global market [Slavinski and Todorović, 2019]. The digital technologies provides opportunities for internal organisational improvement [Slavinski and Todorović, 2019]. Digital tools provide a new form of interaction and information sharing platform, resulting in the collaborative value creation [Bock, 2015]. For instance, visualisation and simulation, one of the main features of digital tools, such as Building Information System (BIM), are supported by data-driven perspectives [Lavikka et al., 2018]. BIM has become an essential tool for the information exchange and management in AEC industry, allowing information exchange between all the stakeholders throughout the life cycle of a building infrastructure [Hossain and Nadeem, 2019] and providing a communication platform between users [Slavinski and Todorović, 2019; Negroponte, 1995].

Yet, some decision-makers from organisations do not understand how to deal with the digital transformation [Lavikka et al., 2018], regardless of the benefits of implementing digital technologies. Digital inequality is another drawback the decision-makers should pay attention to. According to Durand et al. [2021], many personal and positional features, such as age, income and level of education, gender, lead to digital exclusion. For example, Carlo and Bonifacio [2020] suggested that accommodation of more digital tools at work, such as Information and Communication Tools (ICT), results in the digital generation gap between younger and older generations. The digital generation gap brings challenges to leaders of organisations [Hai et al., 2021], as Digital integration is a crucial issue in digital transformation. On the other hand, digital tools also lead to excluding people with different educational backgrounds [Besné et al., 2021]. Digital skill shortage is another challenge. In the Netherlands, there is an increasing risk of existing employees due to outdated professional skills in the industry, leading to the growing demand for high-skilled and medium-skilled workers [European Construction Sector Observatory (ECSO), 2021]. Moreover, the digital transformation made remote working more accessible, resulting in polarised opinions. Some people express their frustration that remote work results in feelings of disconnection and isolation, whereas others argue that the digital platform provides opportunities to connect people from different locations [Richards et al., 2022]. Besides, in the process of digital transformation process, leaders of organisations need to protect human ethical code, developing inclusive approach for digital transformation [Hai et al., 2021].

3.4 CONCLUSION

Figure 3.5 illustrates the overview of this chapter.

This chapter identified career challenges of women employees in the construction industry: family-work balance, pay, stress, recruitment and selection, training, allocation of tasks and positions, work climate, network, working condition, and career opportunities. All of these factors are interconnected and influenced by two factors - work climate and condition; therefore, the chapter laid emphasis on work
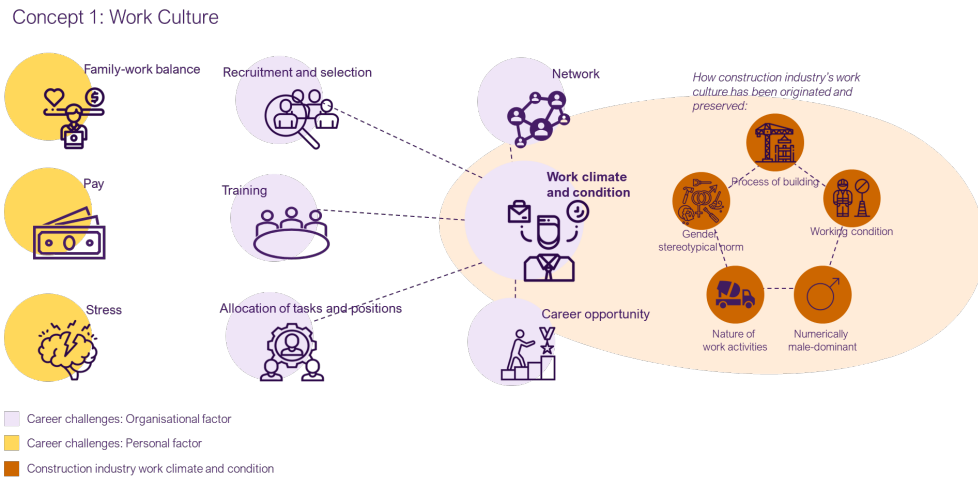
(a) Concept 1 - work culture of the construction industry: identification of career challenges for women employees in the sector
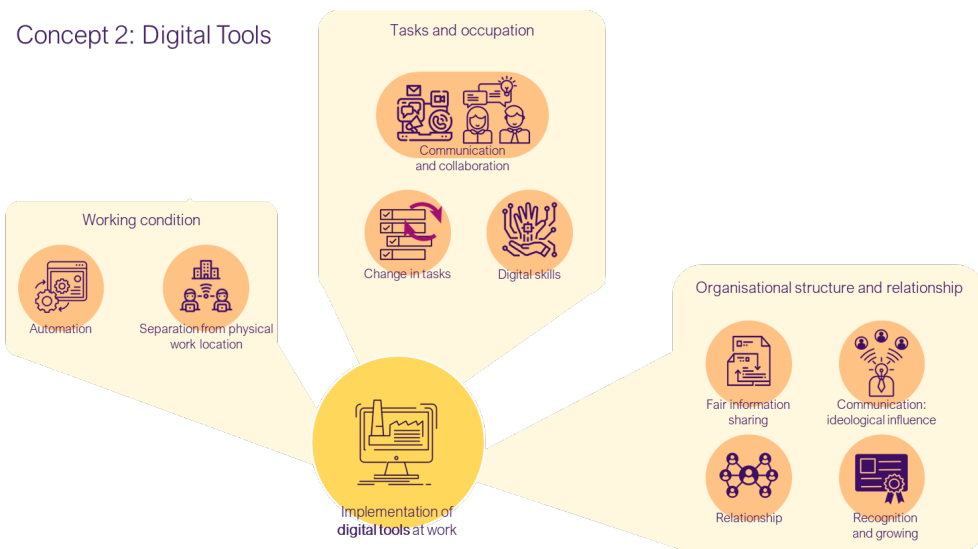
(b) Concept 2 - Digital tools and its impact on work and employment (influences on three dimensions - working condition; tasks and occupation; organisational culture and relationship

Figure 3.5: Review of previous study overview

culture and environment of the industry - behaviour, attitude and perception. It was shown that younger women designers, engineers, and managers faced negative attitude/behaviour and unfair treatment led by gender stereotypes.

To improve this situation, (1) definition of inclusive organisation and (2) how it can be achieved, were reviewed. Inclusive work environment refers to an environment where diverse individuals participate and contribute, while feeling the sense of belongings and acceptance in the group. There are three dimensions of inclusion: (1) participation in decision making, (2) free access to applicable information, and (3) opportunity to participating many activities. Throughout the inclusion process, understanding and trusting the diverse individuals and integration should be accompanied.

Afterwards, it was shown that the development of digital tools and its usage at work may have an influence on work culture and environment. The use of digital tools at work can promote changes in a several level of construction firms' organisational culture. First, change in working condition, tasks, and occupation can in-

fluence in artifacts and creation level of organisational culture. On the other hand, the change in organisational structure and climate can affect on basic assumption of people; therefore, change in individuals' value.

Based on the identified career challenges, the focus of the next research step is on understanding early career experiences around the identified career challenges, and examine whether the digital tools can have an impact on these aspects.

3.5 RESEARCH CONCEPTUAL FRAMEWORK

Work culture of the construction industry and the implementation of digital tools influence each other and interconnected. The impact of digital tools on work culture influences the gendered experience of employees in their early career in the construction industry and eventually this steers the decision of female early career employees to stay or leave the industry. This conceptual framework is illustrated in Figure 3.6.
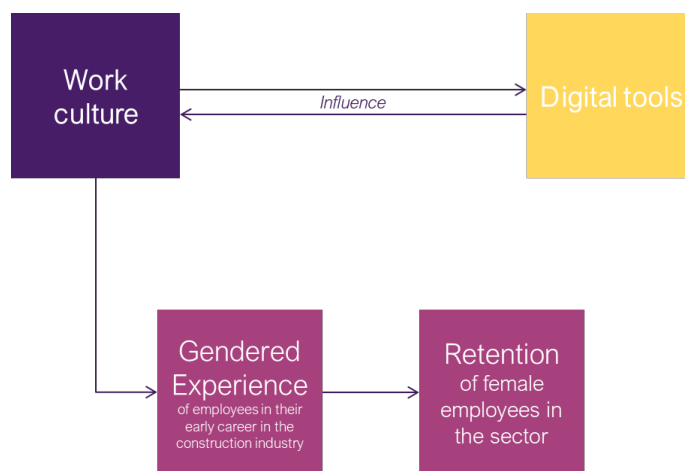
Figure 3.6: Research conceptual framework

4 | SEMI–STRUCTURED INTERVIEW SETUP

In this Chapter, Section 4.1 will present the interviewee group, and Section 4.2 will show the overall structure of the interview protocol. This interview protocol was created, respecting and following TU Delft Research Data Framework Policy. Figure 4.1 shows the process of the second research stage.

(a) Research process, where second research part includes series of interviews
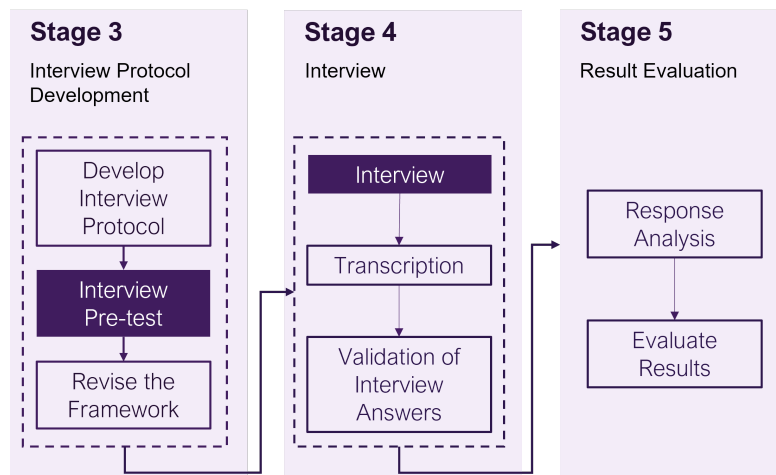
(b) Interview process

Figure 4.1: Organisational culture measurement tools

4.1 SELECTION OF INTERVIEWEES

The semi-structured interview approach is adopted for the qualitative data collection stage. The process of the interviewee selection is shown in Figure 4.2. For this research, 69 potential interviewees were invited to the interview session. The potential participants received an invitation mail through the LinkedIn network or their professional email account. Among 69 people who were invited for the interview, total of 10 people accepted the invitation. When the respondents agreed to participate in the interviews informed consent form was sent (it can be found in Appendix B.1). Furthermore, the research used a snowball approach to recruit more participants. At the end of the interview, the interviewees were asked to extend their colleagues who fit the criteria. From this, 6 additional interviewees were recruited; therefore, 17 interviews were carried out for the research.
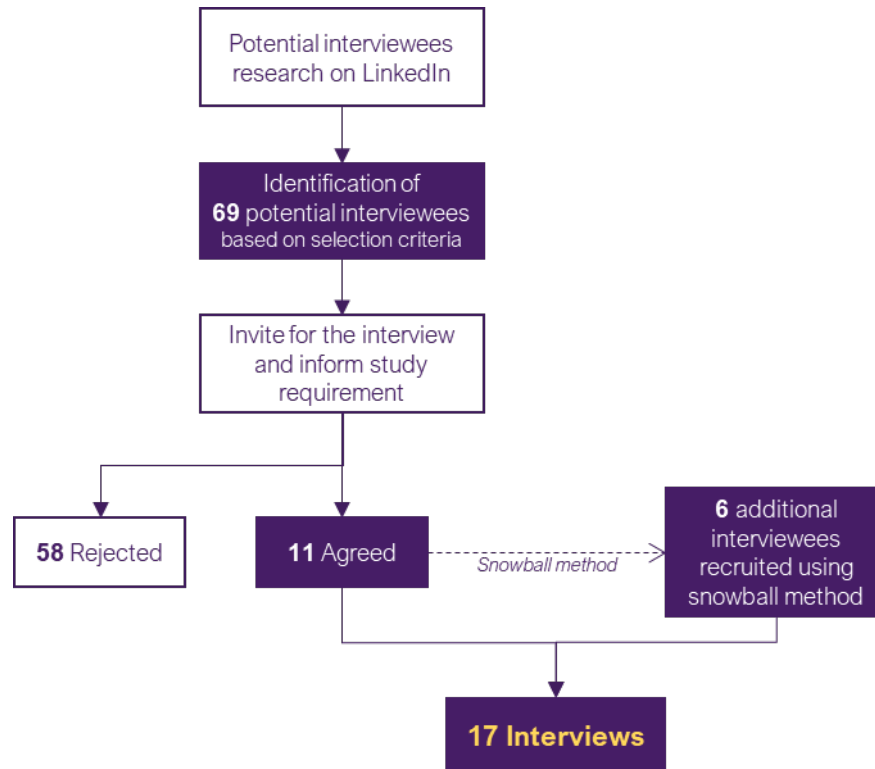
Figure 4.2: Interviewee selection process

The interviews are conducted with the following:

- Early career professionals in the Dutch construction industry;

- Professionals in executive, managerial, or supervisory roles in the Dutch construction industry who have more than ten years of working experience in the industry; and

- Members of a related topic activist group.

With early career professionals, the interview aims to understand their career experiences in the industry. Moreover, it will examine how digitisation is involved in the experiences and its impact on the industry's culture and work practices. At the same time, the interview with employees in senior positions will explore work (organisational) culture and established work practices, as well as the engagement of digital tools in these aspects, and analyse how this affects the career decision of younger employees. Lastly, the activist members are invited to the interview, as they are universally aware of the situation.

Interviewees who express their interest in participating in the research are sent a research participant consent form (see Appendix B.1 prior to the interview, and it describes the aim and topic of the interview, summary of the data management plan regarding identifiable personal information and publication of the thesis. Additionally, written consent is obtained from all the interviewees.

4.2 INTERVIEW PROTOCOL STRUCTURE

Topics to be discussed in the interview were identified from the review of previous studies in Section 3.1. These factors are established as career advancement barriers

and challenges for women in construction, eventually leading them to leave the industry. The barriers are: (1) the process of recruitment and selection process, (2) training, (3) work (organisational) culture and work environment, (4) unfair allocation of operational roles, (5) networking, and (6) career development opportunities. These factors are arranged in an order of work experience, from job searching experience to promotion experience. The elements are placed in different parts of the interview protocol.

The overall structure of the interview (see Figure 4.3 will be described in the following sections. In this section, the structure of the protocol will be presented. Interview protocols for each group can be found in Appendix C.2,C.3 and C.4.)

Introduction

| 1 | **Education-to-work transition** | Recruitment & Selection |

| 2 | **Early career experience** | Training
Work culture and condition |

| 3 | **Work practices** | Allocation of tasks & position
Work culture |

| 4 | **Networking** | Communication
Networking |

| 5 | **Promotion** | Career opportunities
Training
Allocation of tasks & position |

Closing
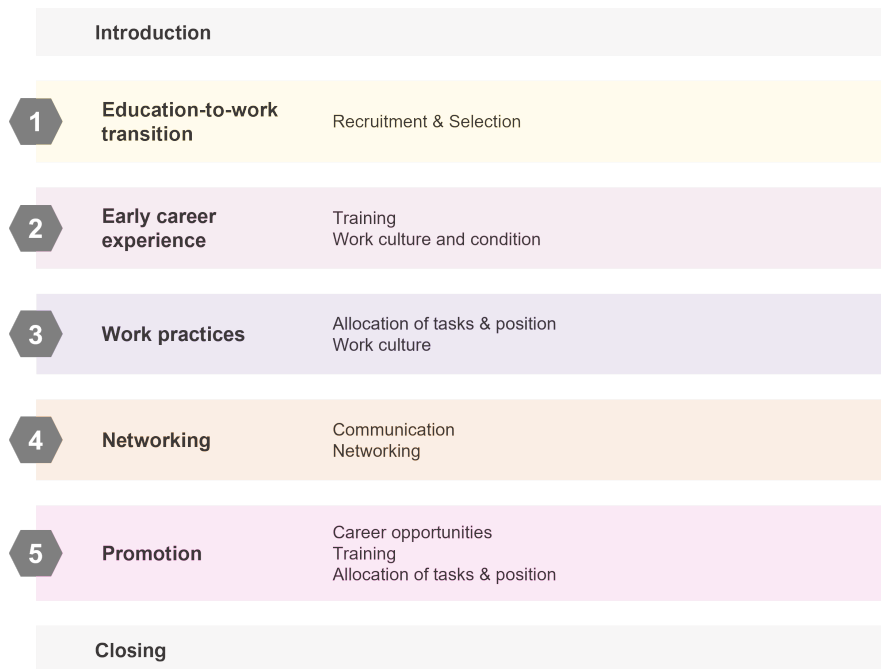
Figure 4.3: Overall structure of the interview protocol

4.2.1 Part 1: Introduction

In this part, the interviewer will share brief information about the study. In addition, the interviewer will share the aim and the importance of the interview and remind the interviewee about recording the interview session. Before the interview, the interviewees were already acknowledged with the data management plan and agreed to the informed consent of the interview.

4.2.2 Part 2: Education–to–work transition period

This part will address the interviewees' experiences and challenges during the education-to-work transition period. This part will focus on interviewees' job searching processes in the industry and the engagement of digital tools, and their influence on the experience will be examined. As this part aims to understand the experience during the education-to-work transition period and its impact on younger female employees' decision and intention to leave the industry, the interviewees in their early career stages will spend more time discussing their experience in this part (compared to other interviewees group).

4.2.3   Part3: Early career experience

In this part, the interviewees will be asked to discuss their early career experiences in construction firms. This part will start with the question about their early career challenges. Afterwards, the interview will focus on the interviewees' experience in (1) traineeship and onboarding processes and (2) their perceptions of the firms' work culture and environment. Moreover, how digital tools influence these processes will be questioned. Similar to part 2, the purpose of this part is to understand the experience of the early professionals; therefore, the early professionals will spend more time in this part of the interview.

4.2.4   Part 4: Work practices

This part aims to get more information about work-related experiences in the construction industry. In this part, interviewees will be asked about three concepts: (1) allocation of positions and activities and (2) usage of digital tools at work, and (3) organisational culture and working conditions. Interviewees with more work experience in the construction sector, such as employees with supervisory and senior positions, will spend more time discussing this topic.

4.2.5   Part 5: Networking practices

This part aims to understand communication and networking practices at work and their impact on the interviewees' work experience. The interviewees will be asked to present how communication and networking occur at work. In addition, whether digital tools are engaged in these practices and their role will be explored. Due to the difference in work experiences, the questions will be slightly different depending on the position of the interviewees.

4.2.6   Part 6: Promotion practices

This part will discuss the interviewees' experience regarding promotion practices. With early career professionals, this part aims to understand their career development opportunities. At the same time, consideration factors for the promotion of their team members will be asked of the managers, supervisors, and executives.

4.2.7   Part 7: Closing

The last part will present a summary of the interview session and remind them of the transcription of the interview. Finally, the interview transcript will be sent to the interviewees, and the interviewee can answer within one week if there is a doubt or something to add. Moreover, before closure, the interviewer will ask about the availability of other possible interviewees for the snowball method of interviewee recruitment.

4.3   INTERVIEW ANALYSIS METHOD

This research collects qualitative data and uses qualitative analysis. To analyse the collected qualitative data, thematic analysis is used. The thematic analysis allows the researcher to identify patterns and focus on the interpretation of the theme; therefore, the analysis demands more engagement and elucidation of the researcher [Guest et al., 2014]. It starts from the transcription of the collected data set - interview, in this study - then, the patterns from the text will be identified, and these patterns will be coded using ATLAS.ti programme. In this research, the codes cre-

ated in Chapter 3 were used. However, apart from the identified codes, new codes were added if patterns in the interview transcripts were observed. This progress enables the researcher to observe the theme systematically and develop an outline of the observation's account. Figure 4.4 shows the overall process of the analysis. When the last step is finalised, the observation and interpretation of the researcher are documented.

Step 1 Transcription		Step 2 Create & apply codes		Step 3 Collate codes		Step 4 Create theme		Step 5 Evaluation and revise
Transcription of the audio data will allow familiarise with the data and actively pay attention to patterns.		From the previous step, observed patterns will be codes to be applied. However, in this research the codes that were created by the review of previous study will be used.		All the quotations that are related with the codes will be shown together in this step and it will provide the researcher to review whether the extracts are associated with the codes and support.		The codes will be categorised into themes.		

Figure 4.4: Thematic analysis process, based on Delve [2022]

5 | RESULT AND ANALYSIS

This Chapter will present the result of the interviews and analysis. Section 5.1 will show the result of the interview series, presenting the interviewees' relevant information for understanding the research result. The following sections will focus on presenting the findings from the interviews, as shown in Figure 5.1. The findings will be presented under the interviewee categories. Under each category, three themes (see Figure 5.2) will be presented. The three analysis themes are (1) the impact of the usage of digital tools on gendered work culture, (2) the impact of the gendered work culture on the usage of digital tools, and (3) the gendered experience of the inter-influence of work culture and digital tools.
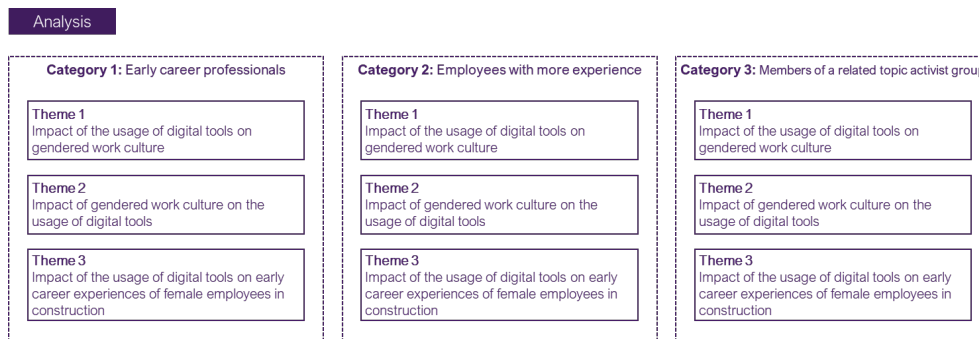
Figure 5.1: Analysis chapter overview

5.1 RESULT

For this research, 68 potential interviewees were invited to the interview session, and a series of interviews were carried out with 16 people actively working in the construction industry. Interviews were carried out between September 2022 and November 2022. Five interviews were conducted face-to-face, and the rest were conducted through online meetings using Microsoft Teams. The schedule and interview method (face-to-face or online meeting) were set by the preference of the interviewees. The interview lasted 45 minutes to 65 minutes. The interview was
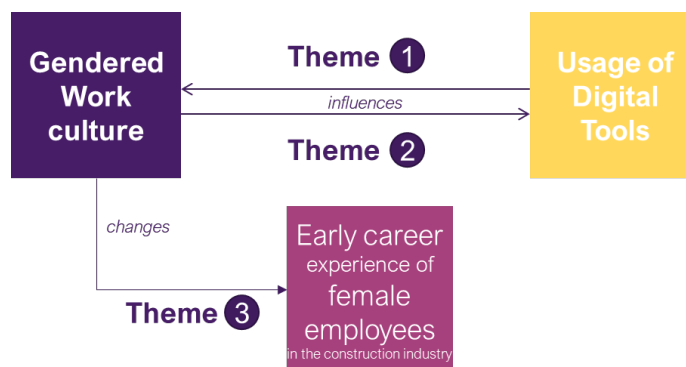
Figure 5.2: Analysis theme, based on the research framework.

recorded after asking for the interviewees' consent again after the interview started, and the recordings were transcribed. The transcriptions of the interviews were distributed to the corresponding interviewee and approved.

Table 5.1 shows the interview result. The numbers in the first column stand for the codes to refer to each interviewee in this document. Interviewees work in 14 companies with different work experience years and positions. Moreover, the interviewees' companies vary in construction engineering, construction execution, construction consultancy, and architectural studio.

Table 5.1: Interviewee information, where the column stands for the codes to refer to each interviewee in this document. For instance, [1] refers to interviewee one under category 1.

	Position at work	Work experience years*	Date of interview
Category 1: Early career professionals in the construction sector			
1	Junior bid manager	4 years	27/09/2022
2	Project manager for sites	4 years	30/09/2022
3	BIM engineer	3 years	30/09/2022
4	Project Manager (infrastructure freelancer)	6 years	05/10/2022
5	BIM coordinator	9 years	17/10/2022
6	Project manager	6 years	24/10/2022
7	Geo-technical engineer	7 years	28/10/2022
Category 2: Employees in the construction sector with more experience			
8	Leading professional on project and contract	25 years	11/10/2022
9	Risk manager	16 years	20/10/2022
10	BIM director	11 years	24/10/2022
11	Corporate risk department director	16 years	28/10/2022
12	Housing advisor	26 years	28/10/2022
13	Strategic tendering director	28 years	02/11/2022
Category 3: Members of a related topic activist group			
14	Senior advisor	33 years	21/10/2022
15	Project director	17 years	17/10/2022
16	Architect	6 years	27/10/2022
17	Business Lead	19 years	15/11/2022

Work experience years refers to the working experience years in the construction industry.

5.2 CATEGORY 1: EARLY CAREER PROFESSIONALS

5.2.1 Impact of the usage of digital tools on gendered work culture

Usage of digital tools

Interviewees, who are in their early career stage, recognised digital tools under the following three categories:

- Digital communication tools,

- Task-related digitised programmes, and

- Digital documenting programmes.

Digital communication tools refer to programmes that allow people to communicate in a digitised environment. Many interviewees in their early careers presented

their experience with digitised communication tools, such as Microsoft Teams. Many interviewees identified digital tools as communication tools. It was distinguished that the digital communication experiences are mainly during and after the COVID-19 pandemic, as shown below:

> "Digital tools in communication are more and more common now, and of course, with COVID-19, there was a lot of change in recent three years. Especially Microsoft Teams, it provides possibilities for work from home." [1]

Other interviewees [2], [6] agreed with the importance of digital tools in communication and emphasised the need to balance virtual and in-person communication.

Other digital tools used by early career professionals were task-related digitised programmes, such as Building Information Modelling (BIM) and python. Task-related digitised tools vary depending on the specialisation of the respondents; BIM was the most familiar instrument among respondents [2], [3], [4], [5].

Lastly, many interviewees stated that digital tools involved in their daily work activities are digital documenting programmes - Microsoft Office to document and communicate tools to inform others in a report form.

Impact on gendered work culture

Many interviewees shared their experiences with digital communication. Female interviewees identified that digital communication promoted attitude change to digital communication and more people started to realise the change after going through the COVID-19 pandemic. An interviewee recalled the experience of working from home during the pandemic period.

> "[...] the COVID time showed that remote working also works. Now I feel that it is balanced – some days going to the office and some days a week working from home, so they are both needed. [...] I feel like people are more available because you can ask on Microsoft Teams if they are available, and people can respond immediately with the answer or tell you about their availability." [anonymised[1]]

Similarly, another participant indicated an attitude change to using digital tools after the pandemic. According to the interviewee, the attitude of individuals to using digital tools in communication. It was stated that people are more willing to discuss and meet online. On the other hand, she posed a problem of exclusion of employees who work on-site that is led by digital communication:

> "Attitude of people has changed a lot after we started to work from home. The gap, the physical gap has been literally bigger between the on-site working people and office people. All the employees working at the office were sent home and did not come to the construction site as often as before. Only people who were needed at the location could come to the location, [...] the physical gap becomes bigger, but then these people working on site are more willing to meet and discuss problems in online meeting environments. We did not end up getting a communication gap because now people are more willing to use digital tools for communication, which was not the case before." [anonymised]

On the contrary, male respondents expressed concern about losing personal contact. It was stated that digital communication hampers building a good relationship between colleagues, as online meetings do not allow informal conversation before or after meetings.

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1 When it is identified that there is a chance of re-identification of research participants, the data is documented after anonymised.

"I think it's especially for meetings; you make much more impact when meeting everybody in real life. Sometimes you just need to catch up when you are at meetings, but people just press the 'leave' button after a meeting. They just disappear. You lose the connection when you are online. So that's the difference." [anonymised]

Moreover, a male participant stated that a remote working environment blurs the boundary between work and life, and he does not enjoy it: "I don't want to bring my work home and continue. I want to separate work and life." In comparison, female respondents showed the opposite reaction to remote working. They presented that the online working environment helps them balance work and life better and more efficiently.

On the other hand, using task-related digital tools helped the interviewees support their opinions and gain respect from colleagues. For instance, one female respondent shared her experience at the construction site.

"I was working at the construction sites. I realised that the industry is a man's world, and most of the time, men don't take women very seriously, especially when you're just graduated. [...] but checking their work and giving advice about the 3D modelling, my skills (digital-related skill-sets) helped me to gain some respect when I need to talk to people on-site." [anonymised]

Then the interviewee added that their digital skills and knowledge allow her to prove her capability, which helps support her opinion and help her to be heard.

"[...] you know what you're doing, and you know you're good at your job. They're men, they can be scary sometimes, and they have years of experience. I also have a lot of experience in the digital side, which they don't. So that's where you can gain respect, and they will hear what you say." [anonymised]

Likewise, another female professional shared her experience that digital tools help her to demonstrate her ability.

"As a woman in the industry, it constantly felt like I have to prove; why am I here? And they'll also question you why I am here and why they need me. But technology then helps me to prove if I actually can implement it. Because it's not enough to just have the information and develop a strategy. You have to implement the strategy. You have to make sure that the strategy works. Then you have to be able to not only demonstrate the benefits, but they have to feel the impact of that." [anonymised]

Similarly, the digital tools provide results based on data, and the result from the digital tools helped an interviewee support her opinion.

"[...] This is what technology is saying. This is what the data is saying; this is my analysis. This is what we need to do. Then they (people who were not listening to the interviewee's opinion) agree on it." [anonymised]

A male respondent shared a similar experience of using task-related digital tools. The interviewee identified that using digital tools helps better communication as digital tools provide visualisation in the conversation. Therefore it is easier to understand the issue better. The interviewee expressed fear of losing his job.

"You set what you want to look at and the criteria for success or failure. The python generates the top view, showing your problematic area, and

you can choose the problematic area to look into details and these things. That really helps a lot. At the same time, sometimes I felt that maybe in five or ten years I'm losing my job because everything can be digitised." [anonymised]

Another impact of using digital tools is that it removes bias when making decisions. An interview presented that the decision is made based on a data-driven perspective and does not allow it to be unfair.

"Technology helps me remove the prejudice from conversations. But we have to be very careful, so as a person who is operating it (digital tools), I cannot have any bias. I think that my diversity, skill set and of my experience help me stay neutral on a project. So, I do not favour, for example, the design team over the execution team. I do not favour cost managers over all of these teams. I think one of the biggest giveaways and one of the biggest compliments I get from my work is that I am not biased." [4]

5.2.2 Impact of gendered work culture on the usage of digital tools

Gendered work culture

Interviewees in their early careers identified the gendered work culture. The distinctive features of the gendered work culture were: conservative, aggressive and harsh, and hierarchy. All interviewees in their early careers agreed that construction sites could be quite aggressive and hostile. According to interviewees, "the work culture in the construction industry is very hard; it is not for everyone" [1], while another interviewee described the industry as an "aggressive work environment, not aggressive people" [2]. According to a respondent, the aggressive work environment results from "pressure in schedule and budget on-site" [7]. Besides, an interviewee added that the industry is "man's world and conservative" [6]. Whilst a research participant added that the industry has a "hierarchy (top-to-bottom culture) in work culture, focusing on practicality" [3].

Impact on the usage of digital tools

The conservative work culture did not help in adopting new digital tools to their work routines. A female interviewee who works with digital tools more often than her other colleagues mentioned:

"Where I work now, we have a couple of women, but I'm the only one working as an engineer. The rests are an assistant in the HR team or others. I'm the only female team member, and the rests of the project team are men in their 50s or 60s. [...] When I suggest implementing new tools, the reaction from people is: 'Yeah, but we've always worked without digital tools; why should we now suddenly change the way of working?'. They are very sceptical. Then I say, 'That's the future. Just listen to me and do it.' But they don't, so it takes months to realise or see the benefits of the new way of working. [...] Maybe they don't like to be told what to do. They have many years of experience and know what they are talking about."

Another showed the impact of hierarchical culture on the usage of digital tools. The interviewee showed that due to the focus on practicality if digital tools significantly impact problem-solving, people are open to accepting learning new tools and implementing them in their daily routines. Similarly, hierarchy within a project team affects accepting new tools in a project environment.

"It depends on the team size and who it is from the team. It doesn't influence the team that much if it's just one person and not one of the

leaders. But if the project manager doesn't want to use it, it has quite a big influence because they're setting the frame, how you work online, and then the others go around. So we have to give good examples even if you don't want to use the tool, but if you have to, then you just do it."

The hierarchy between project participating organisations also impacts the usage of digital tools. When a client requires a specific tool to be used in projects [6], the project needs to follow the digitisation trend under a hierarchical culture between project parties." it is different from when a team member does not wish to use one tool" [6].

As mentioned above, construction projects are under high budget and schedule pressure, and it hampers the adoption of digital tools at work. Accordingly, an interviewee suggested that the resistance in the company toward digitisation is due to cost and time [7]. People have many deadlines, so they do not have much time to learn and practice new tools [5]. An interviewee showed an excellent example of the matter:

" The companies need to agree that they may check on the tools in the first two weeks before they start working with them. It is very risky because it is not always guaranteed that for the first two weeks, the digital tools work perfectly for the project. Maybe after two weeks, you realise that it does not work, and then they are already missing two weeks of work. There is resistance about it." [7]

When the interviewees answered the questions, they chose words of obligation, such as "need to, have to, required", whereas male interviewees' answers used more optional words. For instance:

"Everybody's happy with what we are. Everyone's happy with Excel. [...] Not everyone wants to step out of their comfort zone all the time. Some people with a few years of experience already have different excel for different things, and it's much easier for them to go to the excel they're familiar with rather than learn new software. I also, I am quite lazy in learning these things. There quite a few chances I could have learned some programs, but in the end, I did not." [anonymised]

5.2.3 Gendered work experience of early career professionals in the construction sector

Interviewees shared their early career work experience in the construction industry. This section will present [2] the findings from the interviews, based on the career challenges for female employees that were found in Chapter 3.

EDUCATION-TO-WORK TRANSITION PERIOD

All interviewees in their early careers joined professions through networking and informal recruitment. This network has taken place through:

- participating in a company held events,

- school project collaboration with companies,

- personal contact, and

- online job searching platform.

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2 This section will not identify interviewee code, as the findings present the gendered experience and it may result in an opportunity for re-identification of interviewees.

Some interviewees got into contact with professionals in the sector by participating in events that companies held. After the event, they kept in contact and had informal interviews. An interviewee stated:

> "Ah, that (getting a job) was very easy. (laugh) I met some people at an in-house day, and then I kept in contact. with one of the people I met at the in-house day event. [...] I had a small (internal) interview (with the company), and they said, 'Okay, it's fine. Just give me a call when you are back (from the trip).' so I did, and I had a job (laugh), so it was very easy."

Another participant answered that the interviewee participated in a school project that collaborated with companies. The company supervisor was content with the project result; from there, the interviewee could continue working in the company part-time. The interviewee started to work at the same company after finishing their education.

Meanwhile, some interviewees got into the industry by using personal contact. One of the interviewees got help from an associate professor from one's graduation committees, who wrote a recommendation email for the interviewee. In comparison, another participant stated that a friend working at a construction engineering company informed them about a new project and introduced the interviewee to the project's team leader. In the meeting with the project team leader, the interviewee mentioned that their experience with digital tools and skills helped the interviewee to get the job.

Another respondent got into a job interview through an online professional networking platform. The interviewee got an interview opportunity with a company that the interviewee applied for by using the traditional method (applying for a vacancy posted online). The interview stated:

> " My first job opportunity was thanks to my sister. Even though two months before that, they (the company) rejected me through the traditional way. One of her networks, who was a recruiter at a construction company, saw her tagging me (on a LinkedIn post) and went on my profile. The recruiter saw my profile and hired me because the company was looking for interns."

Some of the female interviewees shared the challenges that were faced during the job search period. One stated:

> "One called me back, but even then, they told me that I had an interesting profile, but they did not have vacancies, saying that they just wanted to meet me and talk to me. It was ridiculous. I was so desperate for work. Sometimes, I would apply for jobs I was overqualified for just to get that interview and then sit in front of the right people."

On the other hand, another shared job-searching experience while she was pregnant. The interviewee shared that she was terrified to go to the job interview, being pregnant.

> "I was a couple of months pregnant and was very scared to go to the job interview. I was wondering if I should tell them or not. But then I did tell them, and I said, 'I'm pregnant, and I will work six months, and then I will have four or five months off because of the baby.' They told me that they knew and that it was not an issue. They said, 'We invited you because of your background, and that's your private life, and we accept it. Once you have a baby, you come back to us. No worries, we're not going to kick you out.' But that's always an issue in general. I know

one of my good friends who was hiding it for a long time (she was pregnant). Finally, they found out and the boss kicked her out, saying we don't have money and the time to waste in people who go five, six months away and then you come back."

A female research participant said she does not want to think about the ()direct influence of gender on the hiring process.

"For me, I refuse the idea of thinking whether it is difficult or easier because I am a woman; probably it is. There are some facts and statistics, but if you think about it, it is not the good vibes to look for a job. I did not think I was a woman or a mana man while looking for a job. While looking for a job, I thought if I had the potential and skills required for the job, I would get it, and that is how I got the job because of my potential and my characteristics."

Whereas male interviewees did not mention any challenges in the education-to-work transition period.

EARLY CAREER EXPERIENCE

Interviewees shared their early career experience, as well as training practices. From the respondents' answers, it was found that the interviewees had contrasting early career experiences. The training provision depended on the company which the interviewees worked for. Some answered the companies did not provide training, but the interviewee was introduced to a manager and colleagues on the first week of working. Then, the (s)he was in a meeting with managers, where the interviewee could learn about the work culture and practices.

Furthermore, many interviewees, who were not provided training, agreed that there is a culture of *'do it by yourself'* in construction, where "people need to find out what would be useful and organise it all by yourself." Therefore, the interviewees arranged site visits for themselves, took the initiative, were proactive in asking questions, and provided their opinions. An interviewee stated that it was challenging.

"To be honest, I had no training (when I entered the company). Instead, what I did was just go to people and ask. I did not expect people to take my hand and bring me to a training room with many lectures and presentations. Training by talking to people is the best way: training on the job and just going to the people. You learn the most practical skills and gain knowledge from talking to people who have already worked there for many years. Take the initiative and ask questions. That was challenging, so I had to change: become brave and bold."

While others answered that they were provided with a wide range of training programmes to help them to adapt to the new work environment, the training was "not just about your role and responsibility, but also other topics that you may find interesting" [3]. Moreover, some companies provide mentoring and buddy programmes for new employees. The mentoring programme focuses on knowledge-driven content, whereas the buddy program focuses on personal or cultural subjects, such as challenges and issues you face [6]. Furthermore, one interviewee shared an experience during an onboarding programme. In addition, the respondents mentioned that from the training, they felt a sense of belonging and understood the organisation better. According to the respondent, some training courses were provided in the online environment, which allowed the new employees to participate in the classes at their pace, whilst the offline programs provided networking opportunities [3].

A male interviewee stated that in his early career period, the interviewee was assigned to a mentor whose work experience in the field is over 20 years, and the interviewee and mentor exchanged knowledge. As a result, he acquired practical knowledge and felt the energy/love of the mentor for the company, which encouraged him to stay in the construction sector.

> "I was paired with old colleagues (for mentoring) who have worked 20, 30 years in the company. They have a lot of love for the company, which also brings you a lot of energy that you are dedicated to working here for another 40 years. I felt a passion for the company, which takes a lot of energy to build. I felt that the good culture of the company keeps people staying here and working for longer."

On the contrary, many female interviewees shared their challenging early career experiences. One interviewee recalled when she entered the company, where she was not feeling welcomed:

> "The first job where I actually left, [...] When I walked in, their reaction was: this is a Dutch company; what is she doing here? I felt that it was extremely rude. I am actually from a small village up north (in the Netherlands), and at this point, they did not know me and hadn't spoken to me. [...] So that sets the tone already: I do not feel welcomed in this space."

In addition, another expressed challenge in her early career, in the construction site, existing male employees "do not take women very seriously, especially when they are just graduated."

WORK PRACTICE

In daily work practice, it was found that female employees' challenges do not stop. Many research participants shared their gendered work experience. Both male and female interviewees agreed that the work culture in construction could be aggressive and hostile; however, the reaction to the work culture and the experience was polarised. The male interviewee presented his experience at the construction site:

> "There are times that people can shout at each other. But still the next day we'll go to the meeting together. We're trying to figure out to make it work. Even though some people openly express themselves and really don't like each other, you still try to work together and do a successful project. It is quite impressive that it has to come from your heart that you love this business, you just love what you do, and you can ignore all these challenges and disagreements with some colleagues, and you carry on with your job."

Here, the interviewee focused on the commitment and passion of the employees rather than the work culture and described it as inspiring.

On the contrary, when female interviewees share their experience with an aggressive work environment, they identify how they overcome or deal with such situations. For instance, one looked for her motivation and passion for the construction site: "I always convinced myself that I want to work in the construction site, I want to make things, and I want to be there when things are made". Similarly, another interviewee stated, "you have passion and encouragement in construction work". At the same time, two other interviewees stated that they changed to be brave and bold to adapt to the culture.

> "For me, before, I was a different kind of person. When I started working, I used to say yes to everything. Because all these big guys surround

you and, with so much knowledge, you're a little woman sitting in the middle of them. I used to just say, 'Okay. Whatever, I will do it.' My friend at work talked to me a couple of times after the meetings and told me that I needed to change and that I couldn't say yes to everything, otherwise, they would eat me up. It was also like a wake-up call: I needed to change, speak, and be louder. Not in a bad way, just say your opinion, and because you know what you're doing, you know you're good at your job."

Another interviewee showed a different way of handling the situation:

"Sometimes I hear comments, 'You are still a woman. You do not know.' Sometimes they assume I am a secretary because I am a woman. Especially in the beginning, it was more conservative. You got used to that. [...] I just make a laugh out of it. I think it's about how you accept and think about it."

An interviewee identified the lack of diversity in the organisation as challenging, stressing that the issue is not only about gender, but other diversity elements also influence their experience at work - how they are treated differently.

"The irony is that it was only happening to women of colour. [...] undermining them in front of clients. Making fun of them in front of clients, thinking that they do not understand or based on religion, mocking them. They would say, 'this is just my opinion.' Nobody cares about your opinion at work, so it is pretty bad. [...] What made me angry was that they would send me off for training whenever an incident happened. I did not understand why I am getting some kind of weird training about how to deal with stress. People who are doing it (causing the problem), nothing was happening to them."

Furthermore, one male interviewee stated that maternal leave is respected:

"You are respected for your maternal leave. People understand at a certain stage, [...] you get married, you have children, and you want a complete change of your work, taking some time off, et cetera. Maybe afterwards, You want to return to the office or work three or four days a week. That is also respected. That for that, I think it's quite nice."

Above is an opposing statement compared to an interviewee who went to the job interview being pregnant (mentioned in the Education-to-work transition period). Moreover, the interviewee another interviewee mentioned that more female employees are allowed to join the sector after remote work became more accepted:

"Generally, nowadays we see more female colleagues in the construction industry, and digital working enables more females to join. On-site, sometimes there is also resistance, and it is easier to handle a bunch of guys rather than you have one or two girls in the group. If you have to arrange the hotel, it is more difficult. On-site is not safe for some female colleagues. These days you can do a lot online and then participate in the project, but without being constantly onsite somewhere, for example, Africa; I think that also helps enable more female colleagues to join them in the industry."

NETWORKING PRACTICE

The research participants agreed on the importance of the networking practice, which allows employees to exchange knowledge [1], [3] and share career opportunities [3], [6].

Respondents with considerable digital skills and knowledge identified that they could build a network from their work and performance in previous projects [4]. For instance, the interviewee said:" I used to be very outspoken, and that used to be something that people would pay attention to. From that, I build my network." [4].

As many employees were sent home to work remotely during the pandemic, the boundary of using digital tools in communication has become lower. Therefore, after experience working remotely for a few years, many interviewees discussed the impact of online communication and remote working on building a relationship with colleagues - networking. Many stressed the importance of non-verbal communication and informal conversation. Online meetings do not provide time for informal communication before or after the meeting. After the meeting, "people just press *'leave'* button" [6], and it resulted in a very weak bond with colleagues [5], compared to the Pre-covid period.

Moreover, an interviewee determined that online networking practices do not allow the flexibility provided in offline networking practices, such as being late, walking around and talking to random people. On the contrary, some demonstrated a positive impact of these online networking events. For example, when events are held online, people who did not participate in offline settings participate in the events and feel more secure being engaged.

> "I am a board member of the younger employees' community in my company, which helps you to build a network with young people in the company. [...] When we hosted online networking activities due to Corona (COVID-19), different people who participated in offline events came to the online events. They would go to our online activities and said they feel far more secure or welcome in an online activity than offline." [anonymised]

PROMOTION PRACTICE

According to the respondents, it was shown that promotion decisions are made subjective. Usually, the promotion is carried out after a discussion with managers, and the decision is made based on the manager's opinion about the individual's performance. A participant stated:

> "The performance management system is very basic. We have a yearly report meeting, where we ask colleagues for feedback, and my manager will also receive this feedback, which we discuss with the manager. It is not linked to skills or knowledge. I think they (the organisation) should improve on that because then you can measure the individuals' performances." [1]

An interviewee showed a challenging experience related to the promotion. A team manager made the promotion decision, and the discussion did not go well. Moreover, the interviewee stressed the importance of networking in a career opportunity.

> "[...] I do not know whether I was bringing it too soft, but I told my manager multiple times about my ambition and goal to develop, and nothing happened. Ultimately, I saw a vacancy for a position I wanted to apply for, and I even changed a company within the same group. I spoke to another manager about the vacancy and got the job."

While a few female interviewees presented a similar opinion on career development opportunities. The interviewees believed that "being a woman makes you do

more than men to prove yourself. It is worldwide. To show your skills and knowledge, you need to work harder and more than your male colleagues. It is a battle to compete to get your position and win the opportunity." Likewise, another interviewee added that the interviewee always had to "demonstrate her capabilities" and bring her competitive advantages in career opportunities.

Table 5.2: Overview of interview analysis: Category 1

Theme	Expression from the interviewees in Category 1
Theme 1: Impact of the usage of digital tools on gendered work culture	
Attitude change	People changed their attitude toward online communication and remote working - some people are more willing to discuss online after experiencing online communication and remote working during the pandemic. *Male interviewee* expressed negative opinion on remote working. The boundary between work and life is blurred and he does not enjoy it. The interviewee wants clear separation of work and life. *Female interviewee* stated that remote working environment encourages easier balance between work and life.
Exclusion	Digital communication may lead to exclude site workers. On site, employees are required to stay on site to build physical building, while office employees were sent home during the pandemic.
Relationship change	A problem of Exclusion of certain position was posed. The site workers were not sent home during the pandemic, which result in putting some people at health risk. Losing personal contact. Digital communication does not allow informal conversation before or after meeting, which is crucial for building relationship.
Demonstrate individuals' capability	*Female interviewees* stated that the usage of digital tools helped them to gain respect from people on site. The interviewees stated that as women in the industry, they need to prove their capability.
Improve communication	Both *male and female interviewees* agreed that usage of digital tools improve communication. First, a *female respondent* presented that the data-driven perspective and result from the digital tools help them to support their opinion. Second, *a male interviewee* stated visualisation of the digital tools is involved in conversation, the issue is understood more easily, as the graphic shows problematic area and focus on one aspect. He also expressed fear in losing job in the next few years.
Remove bias	Data-driven approach removes bias in decision-making and work practice.

Theme	Expression from the interviewees in Category 1

Theme 2: Impact of gendered work culture on the usage of digital tools

Conservative mindset	The industry is characterised by conservatism, which do not help people to implement new tools in their work practice. People show skeptical reaction to the new tools and takes time to adopt the digitised tools until they see the benefits.
Hierarchy	Hierarchy within an organisation and inter-organisations influence the reaction to the new digital tools. Because of hierarchy in a project team, an employee in higher position's preference have an impact on adopting the tools to a project, on the other hand, clients' demands make a project to use the tools in the project.
Pressure on budget & schedule	Because of tight deadline and budget, employees are resistant to learn and practice new tools. Difference in choice of words were shown: *Male* interviewees use optional words, whereas *female* interviewees used vocabulary that imply obligatory, such as need to, have to, and required.

Theme	Expression from the interviewees in Category 1
Theme 3: Gendered work experience	
Education-to-work transition	All interviewees obtained professions through networks. The network is built from a school project, company events, personal contact, and job searching platform.
	Female interviewee experienced challenges while she was searching for a job, being pregnant, because of her acquaintance being fired due to the pregnancy. Another *female* interviewee stated that she does not want to think about gender because she wants to focus on her characteristics. On the contrary, *male interviewee* did not mention
Early career experience	Depending on the company, there was difference in provision of the training. It was agreed that the training allows new employees to feel sense of belonging to the group. When the training was not provided, respondents organised their own training and learning opportunity.
	Male interviewee shared that in his early career period, from the employees who worked with many years of experience inspired the interviewee to stay longer in the sector. While some *female employees* in the sector shared challenging early career experience: feeling not welcomed and not taken seriously.
Work practice	Aggressive and hostile work culture was identified, however, the reaction to this work culture was contrasting. *Female* employees found motivation and passion or became bold for staying in the sector and cope with the challenges, while *male employee* stated that the culture and passion of the employees are inspiring.
	Gender is not the only issue at work, but other diversity elements needs more attention.
Network practice	Digital skills and their performance in the project enabled network opportunity.
	Online communication hampers relationship building for newly hired employees.
Promotion practice	Promotion decision is made in subjective manner, based on manager's opinion on individuals' performance and ambition.
	Female employees in the sector continuously are pressured to prove their capability.

5.3 CATEGORY 2: EMPLOYEES IN THE CONSTRUCTION SECTOR WITH MORE EXPERIENCES

This section will present the result of the interview with construction sector employees with more experience, such as professionals in a managerial, supervisory, directory, and executive roles.

5.3.1 Impact of the usage of digital tools on gendered work culture

Usage of digital tools

When the interviewees were questioned about the involvement of digital tools in their work practice, it was identified that more experienced employees recognised task-related-digitised programmes. Moreover, they also distinguished the change and trend of digitisation at work practices, while early professionals mainly shared their experience with remote working and digital communication tools. Interviewees in category 2 mentioned all of the digital tools that were identified in Section 5.2: digital communication tools, task-related digitised programmes, and digital documenting programmes; however, one more tool was mentioned - document/file sharing tools.

Identified digital tools:

- Digital communication tools,

- Task-related digitised programmes,

- Digital documenting programmes, and

- **Document/file sharing tools**

Although they identified the digitisation trend around them, the use of digital tools in their daily work routine was limited. Most of them stated, "I notice younger people around me use the digital tools at work, and it is very different from when I started to work." Another respondent added that hardly any digital tools are used at work. The interviewee showed why (s)he does not use digital tools in their daily work routines.

> "My surrounding did change, but I didn't really change my way of work-
> ing. Of course, there are extra tools and a lot of change. But in my case,
> I know how to deal with it (the digital tools), and I know how it works.
> But for me, it doesn't improve the quality of my work."

Impact on gendered work culture

More experienced interviewees pointed out the effectiveness of digital tools. For instance, some work activities can be very repetitive, which can be automated by digitisation [8], [10], which saves time. It was suggested that this saved time could be used to construct a better work environment.

> "We see that we have much repetitive work: doing the same calculations
> repeatedly; of course, you can do that by hand, but if you can automate
> repetitive tasks, it saves time. This time can be used for more important
> things: focusing more on intelligent, creative and social activities, such
> as events for building inclusive work environment." [8]

Meanwhile, a respondent was sceptical about the impact of digital tools on gendered work culture, stating:

> "I am unsure if I see that (change in work culture). Of course, it changes
> our way of working, but that is similar to the world around us. Some-
> times it (a digital tool) brings the people in the office closer to the people
> outside because you need to share a little bit more information and ex-
> plain how things work. But I do not think the tools changed our culture."

Then the interviewee continued that remote working and digital communication may result in exclusion compared to traditional work. People "used to meet and sit together to discuss, but now there are much more online activities, and work is done separately from each other". Moreover, a similar opinion was expressed that digital innovation may lead to the exclusion of the older generation, which is

not used to the digital trend. The interviewee stressed that "not everybody has the same pace and ability to deal with all digital innovations."

The digital tools and knowledge helped more experienced employees to understand individuals' capabilities. The interviewee believed that the sector does not check the competence of employees; however, the digital-related skills show their capability.

Lastly, a research participant expressed the importance of information/file sharing. The digital tools allow all the employees to be on the same page by sharing the same file version. Therefore, confusion can be prevented. For the accuracy and effectiveness of the information sharing, an interviewee emphasised "the quality of data' and employees' effort.

5.3.2 Impact of gendered work culture on the usage of digital tools

Gendered work culture
Many interviewees defined gendered work culture with a similar pattern: conservative culture. Regardless of the interviewees' gender, they identified the construction industry has a conservative culture, which is (1) not innovative. (2) not risk-taking, and (3) male-dominated. There was a tendency in the answers. After presenting the work culture in the industry, they pointed out that "it is not as bad as it used to be (when they started to work)". A female interviewee presented how she perceives the work culture:

> "(the culture is) Really nice. I'm one of the few female workers in the area. There are some female colleagues in the design field and some in contract management, strategy and business development. Mainly outside - an execution and a work preparation, it's all male. There are no females, but it doesn't bother me. Not at all. I like the culture of a building company because it's straightforward. It's all on setting goals, achieving goals, working hard, and there's hardly any politics, so for me, it's great."

A participant [8] established that the industry is fragmented, where many parties collaborate. Furthermore, another [10] added that there is pressure on cost due to bad margins and stated that this pressure creates a more aggressive and harsh environment. Besides, low margin does not allow innovation due to high failure costs and risks [13].

On the other hand, a respondent illustrated the work culture quite distinctively. The interviewee described that authenticity and loyalty are found in construction work culture. It was stated that the personnel in the sector work hard to realise large projects, making them feasible altogether.

> "People around here, they are quite authentic. They just try very hard. [...] In the end, we always have to build the same stuff outside, and it is always a heavy job, and you always need people who can perform outside. That is a big part of our culture. Also, there is loyalty in the company, which I also have because we do everything together, such as large projects, and we make that happen together. A very high level of loyalty in the company makes you deal with a lot of noise. [...] and I think that comes from a physical part of the job outside." [13]

A respondent showed a very contrasting view to others. The interviewee recognised an open-minded culture, where organisations seek problems and want to solve problems. The interviewee described as follows:

"The culture, I have to say they are quite open-minded on a normal day. There are a lot of people who want to solve problems. That is a good part of the organisation. If you want to solve problems, you are always looking for problems, of course. Everybody enjoys that you solve problems. What is happening is that if you look at the organisation, we are more reactive than proactive, so that should change a little bit." [11]

Impact on the usage of digital tools

Interviewees showed some resistance to adopting the new digital tools at work. According to the interviewee, people resist the change if it interferes with their daily work routines, whereas people accept the change if it brings immediate benefits to their work. The reaction to the change also depends on the ease of use:

"Last year, at the company, we invited a specialist in change management: how you can change people's behaviours. People don't want changes. That's a fact because they like their routines and question why they should change if I've been doing this for years the same way it works. I know my way, and I'm comfortable with this. So, it only works when people immediately see the effects. If you have a digital innovation and a tool which works that is not hampering or doesn't need a lot of explanation to implement, which should be easy to use and user-friendly, which you can implement step by step, making small steps at the time and you see the effects immediately. Then things work, and people will accept it. They'll be open for also next steps."

In a similar experience, an interviewee shared that "the digital tools make many things (floor plan, pictures, etc.) together and it provides "extra insight, which is an improvement brought by BIM and 3D", and people gain advantages. Then, the respondent added that digital programmes need to give advantages to work practices:

"[...] all those improvements in BIM and 3D, they're really helpful. People start getting used to it and working with it. They also see the advantages. I think that's the main thing. If it helps you, then it's okay. If it only takes extra time or you only do it for management reports, and it doesn't help you in your daily work, then it's more difficult. It needs to be worthwhile for your work, and you need to see the added value for your work. Otherwise, it only takes time."

Some other responses show that older generations are more resistant to new tools. For example, an interviewee shared his(/her) experience in implementing a new digital tool in a project. However, it was shown that as the younger generation is more "familiar" with digitisation, it is easy for them to use and learn new tools.

"For younger people, it's easier (to get used to new tools). They're more familiar with all the new systems and working with computers. They easily adapt to all the new systems and changes, and for them, it's really easy to start working with them. The elderly have more difficulties and don't always know how to use things. But then again, younger people will help or do it for them."

Whereas another interviewee emphasised the impact of the nature of the work activities on the usage of digital tools.

"We would rather do things live. The whole construction world is about doing things live, so that is what I encountered during my work here, and it's always been this way. [...] Here, mostly the guys love to be faced to face with each other. I do not know what it is, but it is in their nature. The guys here grew up outside at the projects working outside live. As working, they developed to a management position and went to the office, so their whole background is on-site and offline."

5.3.3 Gendered work experience

During the interviews With the interviewees in category 2, the education-to-work transition period and early career experience were not dealt with, as their job-searching experience may not be relevant to the scope.

WORK PRACTICE

Here, very contrasting gendered work experiences were identified. Many female interviewees shared their gendered experiences. For example, an interviewee stated that she observed the male-dominated work culture from the number of female colleagues in a management position compared to male colleagues. Moreover, she shared that the site can be a male-centred work environment, where only one toilet for both genders, where female employees might feel uncomfortable or not considered much.

> "In my first jobs, I did not feel the difference; when I came to that management level, that was the moment I thought, now I realised there is a difference in how they look at you. Around me, there are many male colleagues and very few female colleagues in management positions. [...] The cultures? It's a man's world because when you are on a construction site, and the working people are all in these units where they work, there's only one toilet. It is not always that comfortable to go to all the toilets where everyone goes. That's when you realise it's not facilitated for women at these sites."

Then another interviewee pointed out that her colleagues in senior management there are fewer female coworkers, and she decided to accept and get used to it and try to take small steps at a time.

> "Sometimes it is tough because I am one of the few women in senior management around here. I might have a sort of a different style and a different way of approaching, and my colleagues sometimes find it difficult. I had to get used to it to let that go. [...] there is a culture (acknowledging) that is not always in line with what I would like it to be. That is the way it is. [...] Sometimes, I just get completely fed up with all the typical old-fashioned male stuff, and I want to go to work elsewhere. [...] You must be patient to change things, which takes time. Patience is perhaps the biggest challenge I had around here - to be patient and not to be disappointed when things don't work out. To see the small steps and to be happy with them, that is what it is all about."

On the other hand, another female respondent shared their experience with inappropriate jokes:

> "I never experience people acting strange, but they respect you for what you are, and it doesn't matter if you're male or female. So, for me, it's great. Never had any problems, only some jokes, but I could also laugh about them,"

Male respondents' experience was quite contrasting to the experiences mentioned above. For example, one shared that he did not have many challenges in his career.

> "(pause). I did not encounter that many challenges. If you consider challenges as obstacles, I did not encounter that many obstacles. Maybe because I am a man, it could be, and I'm Dutch, so I speak the language. I am highly educated, so I have a lot of things that work with me that support my performance in this field. I didn't experience that many obstacles in my way. "

Furthermore, the male interviewees did not mention anything related to gendered work experiences.

NETWORKING PRACTICE

The interviewees presented some experience in online networking practices. Online networking events were held mainly during the pandemic period. The research participants have pretty conflicting opinions and experiences. Some interviewees noticed that newly joined employees during the pandemic had difficulty networking with other coworkers in an online networking and remote working environment [11]. From some responses, it was identified that online networking events do not promote flexibility to walk around and meet new people; instead, they are assigned to a breakout room in an online meeting [9], [13]. The networking opportunity is essential for newcomers, according to an interviewee.

> "If you just started your new job or started from scratch, you must learn a lot. You want to learn how the organisation works and organisational culture, of course, but also, you can learn directly through digital tools, but talking in person and working with each other is more efficient. Working with each other and meeting points with officers is important. Not to work, but to learn." [11]

Then the interviewee added that more experienced people did not mind working from home during the pandemic, as they are already aware of how things are done in the organisation.

While an interviewee pointed out that the digital tools used in communication enable fir-for-purpose information sharing. An example of the fit-for-purpose is shown:

> " The information should be shared (communicated) fit-for-purpose. In my company, we have a system that ensures that all people are aware of important issues, but people who do not wish to have redundant information are not informed with details and are not bothered. This process of fit-for-purpose communication can be developed and helped by using digital tools." [8]

A female interviewee pointed out that digital communication can bring an undesirable impact, and she shared when she received an inappropriate message from a male colleague. Then she said, "I don't know how to interpret the message, and this should not have happened if it was not digital. Because when it was not digital, you had to meet (in person), and there were always several people in the surroundings so that nothing could happen".

PROMOTION PRACTICE

For the promotion practices, similar to the early career professionals' answers, it was identified that promotion decision and the performance management system is primarily based on subjective decision and opinion on individuals' performance, capability, and ambition. It was found that allocating tasks and positions is carried out broadly in two levels. First, at a company level, there are departments in the organisation, and each department has directors, who make annual plans with their subordinates and their employees, and this level mainly focuses on personal development [8]. In contrast, the project level focuses on content [9], specifically knowledge-based performance [11].

A respondent expressed regret that some characteristics of construction projects - low margin and high risk [10] - do not allow the provision of career development opportunities, stating:

> " [...] again, it is under time pressure, so we only want the project's most experienced and talented people. What you do then is that you exclude

> people who are still in training or have the potential to become an expert. But they still need some years of experience. They never get there if you do not give them the opportunity." [8]

In addition, the interviewee added that frustration with the slow career development leads to staff turnover in construction organisations.

Besides, a female employee shared her experience in the promotion. The interviewee stated that after certain years in the construction sector, she faced a glass ceiling: "some men do not always accept a woman in a higher position beside them or above them." Moreover, another presented her experience with affirmative action from the organisation:

> "I think when I was selected for the *representative role*[3], I think I had the benefits of positive discrimination. Because I am a woman, they did not say that because they cannot do that, of course, [...] but it was mentioned that they want more diversity in the *representative role.* [...] a new directing managing director called me, and he said, we want some women in our team, so I called you. That's when I said thank you for calling me, but I want to be selected because of my qualifications."

Table 5.3: Overview of interview analysis: Category 2

Theme	Expression from the interviewees in Category 2
Theme 1: Impact of the usage of digital tools on gendered work culture	
Spare time	Some tasks and repetitive, which can be automated, then much time will be saved and this time can be spent for building more inclusive work environment.
Exclusion	The impact of the usage of digital tools on work culture was not clear as it may result in exclusion. Digital communication result in distance between people. Besides, it may lead to exclusion of older generation.
Demonstrate capability	Digital tools establish individuals' capability, and it helps senior employees to understand personal proficiency and performance.
Unified working style	When information and document are shared online, employees are on the same page and work with a unified information.
Theme 2: Impact of gendered work culture on the usage of digital tools	
Conservative mindset and practicality	People show resistance to the digital tools because it interfere their work routines. Once it is bringing immediate benefits and easy to use, people would show different reaction to it.
Age	Older generation tend to have reluctant behaviour to the usage of new tools, as they are not as familiar as younger generation is.
Work activities	The nature of the construction work activities is do build physical product outside, therefore people prefer to talk physically.

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3 The title of the position is not shared to avoid re-identification of the interviewees. The interviewee used to be in the representative position; however, currently, the interviewee is not in that position.

Theme	Expression from the interviewees in Category 2
Theme 3: Gendered work experience	
Work practice	Many *female interviewees* stated that there are more male employees at work around them and on-site is especially facilitated mainly for men. Inappropriate jokes were mentioned a few times. While, male interviewees did not express difficulties related to gender.
Network practice	More experienced employees expressed concern about the digital work environment bothers on-boarding process of the new comers. Moreover, it was stated that senior employees were not bothered by the remote work environment. Digital tools enable fit-for-purpose information sharing. *Female interviewee* shared experience with inappropriate message receiving.
Promotion practice	An objective standard and career profile are used for promotion, however, it was demonstrated that senior employees assign tasks and make the promotion decision, based on their opinion on the individuals' performance. Due to the pressure of time, career development opportunities are not much provided. A female interviewee shared her experience with positive discrimination in promotion decision, as the company wanted to assign a female employee in a representative role.

5.4 CATEGORY 3: MEMBER OF AN ACTIVIST GROUP OF A RELATED TOPIC

5.4.1 Impact of the usage of digital tools on gendered work culture

Usage of digital tools

The interview identified people who use similar digital tools at work. The recognised digital tools that are used in daily work tasks are:

- Digital communication tools,

- Task-related digitised programmes, and

- Digital documenting programmes.

One interviewee stated that some specialised digital tools are used daily, while another stated, "not much of digital tools are used in his(/her) position. The interviewee demonstrated that "sometimes designs are made algorithms and scripts to generate the shapes."

Impact on gendered work culture

Many interviewees discussed the impact of digital communication on the gendered work culture. According to the responses, digital communication results in misunderstanding. It was demonstrated that as people are not physically in an office, people do not have a chance to obtain knowledge unconsciously by overhearing other people's conversations without realising it [15].

Besides, it was shown that online communication and personal circumstances are more understood [15], [16], [17], which results in a larger number of people working remotely. Both female and male interviewees showed positive reactions to remote

working as it allows them to manage their personal time better. Furthermore, the interviewees agreed that informal conversations for team building and bonding opportunities are missed as team members are not working in a common room.

According to an interviewee, digital tools help the convincing old-schooled people. The interviewee shared an example:

> "the most effective way of convincing old-schooled people is by showing them an actual 3D model. Sometimes old-schooled people are very focused on just seeing it on paper and seeing one section of the project, for example, the one master section where they're supposed to solve everything. You show them the actual 3D, and the section is solved, but then you cut through another way of the project, and there's another problem there. Everybody in the project can see from the 3D that there are all problems."

Additionally, another female respondent shared a similar experience. The interviewee shared an experience meeting with more than ten male colleagues and was the only woman in the meeting as a technical leader.

> "There were ten men, and then I was the one who was the technical lead. The others were representatives of different companies, so they were all male. It is just that the atmosphere overall is you feel that you are a minority there, but it's not a hostile environment by any means. [...] It's just a small sample of what it is in the industry. I do feel that I was listened to and heard about my opinion. I think the communication is very respectful. I do not feel disrespected in any way. It can be because of my position and results from the digital tools I present in the meeting."

In the earlier section, an interviewee mentioned that the file/document sharing system allows fair information sharing; however, the opposite opinion was expressed. As digital tools and data storage enable everyone to access the data and information, in the management department, there is an ongoing discussion about the sensitivity of the information:

> "company sensitivity is an issue: figuring out who finds what, who talks to whom when the information should be shared with everyone, when not to share something."

5.4.2 Impact of the gendered work culture on the usage of digital tools

Gendered work culture
Interviewees in category 3 defined *work culture* as similar to other interviewee groups; however, people emphasise the work environment that lacks diverse actors. An interviewee stated:

> "(the culture is) Still not as good as I would expect. So, the number of women is still quite low. Management, now, perhaps where I work, you have almost all Dutch white people, to be honest. [...] even in the previous company where I worked, it has more international groups of people, so there was a bit more diversity than (where I work) now. But, in both companies, in a more senior position, there is certainly no diversity."

Other features that are already mentioned earlier were also mentioned: male-centred, lower EQ, not innovative (conservative).

Impact on the usage of digital tools
Two interviewees presented that age or familiarity with digital tools, in general, impacts the usage of digital tools at work.

"I'm still involved with the diverse activities of my company, and with a colleague, I interviewed 16 seniors within the company, 50 plus. [...] I see that some of them embrace digitisation, and others do have problems with it. They are afraid they can't keep up with the speed of change. They are afraid of ending up as a useless person within the company, [...] I think the population in your company will influence the acceptance of digital transformations."

Then the other interviewee added that many younger generations are already familiar with working with computers, therefore it is easier for them to get trained in new tools. Working for long years in the sector can result in resistance to change and digital innovation:

"I have seen many less open-minded people who have difficulty adapting. This is because they do it the same way for 20, 30 years, and they know best they think and are not so open for it (change)."

Besides, another stated that the site environment is sometimes more challenging to use a digital system due to dust and lack of infrastructure than an office work environment. In comparison, some conservative people resist using digital tools, complaining that they lose the sense of touch and drawing on paper. Finally, the respondent said they run workshops to make people more involved in the digitisation trend. Because clients also demand digitisation in the project, organisations "must follow the market rhythm."

Table 5.4: Overview of interview analysis: Category 3

Theme	Expression from the interviewees in Category 3
Theme 1: Impact of the usage of digital tools on gendered work culture	
Misunderstanding	Digital communication results in miscommunication, as people do not have chance to obtain knowledge unconsciously, which occurs when people are in a shared space.
Work-life balance	The online communication promotes easier personal-time management, as it makes personal circumstances more understood.
Power of persuasion	Digital tools, which specifically presents 3D model, provide a view from a different standpoint, and it makes easier to convince the old-schooled.
Exclusion	People who are not familiar with using digital tools may be excluded by the usage of digital tools.
Theme 2: Impact of gendered work culture on the usage of digital tools	
Familiarity	Familiarity with digitisation have an impact on the reaction to the usage of digital tools. Some older people are afraid of not able to catch up.
On-site environment	At the construction site, the environment is more challenging to use digital tools due to dust and lack of infrastructure.
Conservatism	The sense of touching paper is missing, so some people are opposed to the digitisation.

5.4.3 Gendered work experience of early career professionals in the construction sector

EDUCATION-TO-WORK TRANSITION PERIOD

A woman respondent shared her job-searching experience, showing that she had very sexist and racist interviews.

> "I still remember very sexist interviews that I was thinking, 'Oh man, no. I don't wanna work with these people.', and somewhere even a little bit racist – it wasn't clear to me because also I look very ambiguous, so people sometimes don't know how to treat me. So I got some weird interviews, and, in the end, I was already giving up on it and saying, No, I'm just gonna fly back to my country because I'm tired of this."

It was shown that challenges exist even during the hiring process, even before entering the industry and company.

EARLY CAREER EXPERIENCE

Three interviewees stated that new employees had challenging early career experiences due to remote working and online communication. A participant emphasised the importance of physical contact when grasping a culture of an organisation:

> " If you just started your new job, you must learn a lot. Of course, you want to learn how the organisation works and its organisational culture. [...] A funny example: we had external advisors, who took a picture of our culture, and they found out that, especially a few new colleagues hired in the past three years (during the pandemic), the socialisation of those new people is disturbed. We usually value those physical encounters and use those physical encounters to teach people what our culture is. But we could not do that during the Covid period. We did not have any other way to teach the culture through the screen. [...] When we all came back to the office, the new colleagues did not know whether they could wear shorts or where to put cups after meetings. It is small things, but it is part of the organisation's culture." [14]

Moreover, it is more difficult to feel that" you belong to a company" when you start to work in a new environment without personal contact with other colleagues [15]. Additionally, according to another respondent, new employees, who joined the office during the pandemic, showed different reactions to the existing employees. The newcomers encountered challenges in their early careers to adapt to the new environment and learn cultures because there was "not much interaction with all the staff" [16].

WORK PRACTICE

Some interviewees addressed female employees have difficulty managing work and personal life balance.

> "I have seen many women leave the work fields after having children. Because it was more difficult to combine the project work for construction company projects, but sometimes some people disappeared with less clear reasons."

On the other hand, for female employees who are staying in the sector, a participant stated, "when I see my female colleagues or seniors, they fall into two categories. Either leave the sector early after starting their career or outperform and stay in the industry for many years and in a very high position." While it was shown that the issue of balancing professional- and personal life emerged even in male colleagues.

"Though, it also happens with men who have a wife who also works. I also know that some men are not making their career as much as they would like because they also take responsibility for the family and household. A few women (in the senior position) usually have a husband with a full-time jobs, so it's almost always an issue for them. While there are also quite a lot of men for who isn't issue because there also still quite a lot of men having a wife at home who is doing only part-time."

An issue of discrimination through ambiguity was raised. As more attention is given to diversity & inclusion, and discrimination at work, some people encounter unfair treatment that is hard to pinpoint.

"I feel that sometimes you could get intimidated by that atmosphere. But it is just making jokes, making everybody laugh, and then everybody forgets that because the atmosphere was awkward at the beginning. I think that helps; using a little humour and just making people feel comfortable is fine. [...] I try not to give it too much thought. I just go in and do my job and try not to. I maybe reflect upon it later, but I don't let it get in the way of doing my job."

An interviewee expressed that it is very tricky to address the grey area of unfairness in the workplace.

"For example, we often discuss where you draw the line within the company. When someone is, for example, very harsh to a female person that works within the site team, it is clear cut. Everyone knows this is not done. But let us say, for example, four people are in a meeting room when I sketch this hypothetical situation. There is one woman, and she leaves early, and three men stay behind. One of the three says something like, " Oh, we had a very nice meeting here, and how do you judge that situation? When I am at that table, I say, I ask this the guy who would say that. I would ask him, what do you mean? What is the importance of this comment? [...] We need to address the grey area to be noticed and changed. Someone could feel not safe or not inclusive."

NETWORKING PRACTICE

Interviewees shared their experiences with digital communication and network practices. Since remote working is more facilitated after the pandemic, the interviewees shared positive and negative impacts. It was shown that in the remote working environment, people "understand personal circumstances better". However, many respondents expressed that building a team or network is disturbed, as the interaction is different. Furthermore, online communication is prone to a misunderstanding between coworkers.

"[...] more misunderstanding because it's not that you're in the same room checking with another colleague and someone overhears and says, "Oh, are you talking about this?"; "I didn't mean that." So, I also see it as the disadvantages."

PROMOTION PRACTICE

During the interviews, one of the participants shared an experience related to promotion and incentives:

"A few years ago, when I was still on the board of directors, I found something strange from a list of people who earn the incentives for the year, and I thought, 'there is something wrong with this list, but I do not know what. So, I reread it and then saw that there were only, I think,

three or four women in a list of hundred people. [...] Since then, we also performed data analysis on this rating and salary increases and bonuses to find out if unconscious bias is playing a role there."

Then, the interviewee added that the bias is not only regarding gender but the nationality, background, age, and other diverse elements, and shared the result of the subconscious bias test:

"I remember doing unconscious bias tests provided by Harvard. They're done by hundreds, thousands of people, and I was on a board of directors then, and I did an unconscious bias test on whether I relate male or female more to family and career. My result of this test was that I related males way more with careers than females and females way more with family. That was quite a surprise because I was a career woman, so it was so surprising. I was quite shocked. I also find out I have unconscious biases on age and people's weight."

In addition, the interviewee stressed the importance of decision-making based on a data-driven perspective.

"Since then, we also performed data analysis on this rating A to E, but also in salary increases and bonuses, just to find out if there's any unconscious bias playing a role there. [...] Then we do the data analysis and check whether there arere any biases in it."

Table 5.5: Overview of interview analysis: Category 3 - continued

Theme	Expression from the interviewees in Category 3
Theme 3: Gendered work experience	
Education-to-work transition	An interviewee shared experience with a sexist interview experience, which demonstrates existence of the gendered experience in the hiring process.
Early career experience	New comers face difficulty in adopting to new work environment with the remote working environment.
Work practice	Some *female employees* are encounter challenges in managing work and personal life, which *male employees* also face. While, it was argued that there are less male employees who does not have the same issue as much as female employees. There is an issue of discrimination through ambiguity, which is difficult or unclear to pinpoint.
Network practice	Personal circumstances are more understood, while the digital conversation disturb interaction between colleagues.
Promotion	An issue of unconscious bias was proposed in promotion decision.

5.5 COMPARISON

In the earlier sections, result of each categories were compared. This section will present how the answers and the experiences were different on the basis of the interviewee criteria and gender.

5.5.1 Impact of the usage of digital tools on gendered work culture

The impact of the usage of digital tools on garnered work culture is provided in Figure 5.3, based on the interview criteria.

	Category 1	Category 2	Category 3
Demostrate capability	■	■	
Exclusion	■	■	
Improve communication	■		■
Remove bias	■		
Spare time to build inclusive work culture		■	

Figure 5.3: Comparison of interview results (impact on the gendered work culture)

Both early career professionals and more experienced employees identified that digital tools help to demonstrate capability. For female employees, there is pressure to establish their competence and prove their capability. Digital tools here allow early-career women to demonstrate their skills and expertise. Furthermore, the capability helps newly graduated employees gain respect from existing employees who do not have digital skills and expertise. While senior employees agreed that it is easier for them to understand individuals' performance and competence.

It was presented that the usage of digital tools facilitates communication. First, the result from the digital tools supports early career professionals' opinions. The digital tools use data to generate a result, and this data-driven perspective and result help young employees' opinions to be heard. Moreover, visualisation facilitates more effective communication. In comparison, a male employee expressed job insecurity, as digital tools substitute their tasks and labour. Moreover, a member of an activist group also agreed on the impact of digital tools on communication, emphasising that visualisation helps to convince old-schooled people. Some employees maintain working with paper. However, digital tools present a different points of view and perspectives in 3D models.

Besides, a female early career employee demonstrated that digital tools remove bias in decision-making, as the decision is based on a data-driven perspective; therefore, it does not allow favour of a certain group.

Both younger and senior employees agreed that using digital tools results in exclusion. The pandemic lowered the barrier to entry of online communication, as the pandemic period forced people to use digital tools for communication. Early career professionals expressed concern about the issue of the exclusion of on-site employees. For instance, the gap between on-site employees working closely related to the on-site work environment and office-located employees has become bigger. A more experienced workforce posed an issue of the exclusion of the older generation, who are unfamiliar with the digital trend. It was stressed that people have different paces in learning and training digital tools.

Lastly, a more experienced employee showed that digital tools provide more time to construct an inclusive work environment. There are many repetitive tasks in the sector, and automation and digitisation facilitate faster completion of tasks. This saved time is proposed to build a more inclusive work culture.

5.5.2 Impact of gendered work culture on the usage of digital tools

Figure 5.4 presents the factors that lead to a different reaction to the usage of digital tools.

	Category 1	Category 2	Category 3
Pressure on schedule and budget	■	■	
Nature of work activities and location		■	■
Conservative mindset		■	■
Age		■	■
Hierarchy	■		

Figure 5.4: comparison of interview results (impact on the usage of digital tools)

Regardless of the experience in the sector, it was stated that the pressure on time and budget leads to reluctant behaviour to adopt new tools in their work routines. Moreover, the pressure results in a tight deadline and does not allow employees to learn new tools.

It was identified that characteristics of the construction industry do not facilitate implementing the new tools and using them at work. For instance, construction projects involve physical activities to deliver tangible products. Due to these characteristics, people are in favour of the traditional method. Moreover, at the construction sites, infrastructure for using digital tools is limited compared to the office work environment. The site is more exposed to dust and hazards, which does not enable easy usage of digital tools.

More experienced employees showed a resistant reaction to the digitisation trend. It was identified that senior employees presented limited usage of digital tools compared to younger employees. For example, senior employees stated that they see that the world is changing around them. However, they are not using much of digital tools. It was shown that there is a trend of resistant reactions depending on their familiarity with digital tools, and the older generation showed a more concerning response to the use of the tools.

On the contrary, recently, employees who started their careers showed that hierarchy plays an important role in using digital tools. For instance, due to the hierarchy between team members, a higher-position employee can impose a new tool in a project, while the client can push project-participating organisations to use certain tools in a project environment. Moreover, it was shown that male employees in category 1 chose more optional vocabulary to express, whereas female employees tended to select obligatory words.

5.5.3 Gendered work experience

Gendered experience that was observed in the interviewees are compared in Figure 5.5.

	Category 1	Category 2	Category 3
Education-to-work transition	- Female employees encounter challenges in job searcing: (1) apply for overqualified position, (2) try different methods, (3) job interviews while pregnant, and (4) refuse to focus on gender issue - Male interviewees did not mention challenges related to gender		- Sexist job interview
Early career experience	- While mentoring programme, male employee acquired practical skills and observed passion of the senior employees, which encouraged him to stay in the industry - Female employee has an experience of not welcomed and involved in the oragnisation in her early career experience - Female employees are not taken seriously, when recently graduated		- Remote work environment result in challenging early career experience of recent-hired employees, who joined during the pandemic
Work practice	- Both genders agreed that the work culture could be aggressive and hostile - Male interviewee percieved the passion and commitment inspriting - Female interviewees found methods to cope with the issue - Different way to perceive maternal leave	- Management position represents numerically male dominant work environment - Construction sites are not facilitated for women - Female employees find ways of coping to the culture - Inappropriate jokes were experienced by a female employee	- Balancing responsibility between work and family leads female employees to leave the sector - Male employees face challenges in balancing the work-life balance, but some do not have issue - Discrimination through ambiguity
Network practice	- Both genders expressed concern about losing personal relationship with colleagues	- Interviewees observed newly hired employees encounter challenges in adopting to the new work environment	
Promotion practice	- Being woman in the sector exert pressure on female employees of proving their capability and expertise for the career opportunities	- Glass ceiling and positive descrimination against gender was experienced by a female employee	- Subjective promotion decision making, which may be influenced by subconsious bias

Figure 5.5: Comparison of interview results (Gendered work experience)

Education-to-work transition

Women in construction encounter challenges before entering the sector. Both female early career employees and a member of a related activist group shared their challenges in the education-to-work transition period. Female students or job seekers encounter challenges in gaining job interview opportunities and interviews that ask about gender-related issues. For instance, when a female job seeker is pregnant, the employer could refuse to hire the candidate or call the gender role issue into question. Moreover, it was distinguished that male employees did not mention any of the gender-related issues in the education-to-work transition period.

Early career experience

After the entry into the industry, the gendered experience continues. For example, some female employees experience not being welcomed to the industry or organisation and not taken seriously, while male employees are illustrated as inspiring periods where practical skills and passion for the industry are obtained.

Work practice

Even though both genders consented that the work culture in the construction sector could be aggressive and hostile, the two genders perceived differently and the gendered experience was observed in all the interviewee categories. The male employee recognised the commitment and passion of senior employees as inspiring, while many female employees have built a coping strategy for the culture. For instance, one stated that patience is key to adapting to the culture, and another tried to find her passion and commitment to working at construction sites. Meanwhile, some male interviewees expressed that they did not experience any challenges or did not mention gender-related challenges.

More experienced female employees demonstrated that male employees in management positions vastly outnumber women. Furthermore, construction sites are not facilitated for female employees, and inappropriate jokes were experienced by both early-career women and more experienced female employees.

Both genders addressed the issue of balancing work and family balance. Even though a few male employees struggle to balance work and family duties, it is an inevitable setback for female employees in the sector. Moreover, a male interviewee in their early career stated that maternal leave is very respected, contrasting with female employees' reactions.

Work-life balance is also observed as an impact that all interviewees in the categories recognised. A male interviewee in his early career does not enjoy the remote work allowed by digital communication, as the work and life boundaries become unclear. In contrast, male employees in senior positions have two reactions to the On the other hand, both female early career professionals and more experienced showed a positive reaction to the remote work environment, as it promotes easier work-life balance. Female employees in all categories show a favourable opinion.

Networking practice

It was shown that interviewees in all three categories agreed that using digital tools results in difficulty in building networks and relationships between colleagues due to digital communication. Early career professionals indicated an issue in building a relationship with colleagues, as digital communication does not allow informal conversation before and after the meeting. On the other hand, more experienced employees and members of a related activist group are more concerned that it does not help the newly hired employees build relationships to adapt to the new work environment.

Promotion practice

Early career women expressed that Women in construction constantly feel they need to prove their capability and expertise for career opportunities. Female employees in management positions presented a glass ceiling and positive discrimination in promotion practices. Furthermore, all interviewees agreed that the promotion decision

is made based on the subjective opinion of individuals' opinion and performance, while a member of the activist group pointed out that subconscious bias plays a role in the promotion decision-making.

6

DISCUSSION

This chapter will present the reinterpretation of the research data based on the findings of previous studies documented in Chapter 3. The first Section, Section 6.1, will discuss the comparison of research findings and theory presented in Chapter 6.2 will present the research findings. Section 6.3 will follow, providing the limitation of the study. Then, Section 6.4 will suggest future research based on the presented limitation of the study, and Section 6.5 will lastly address the added value of the research to the scientific field and the construction sector.

6.1 COMPARISON OF RESEARCH FINDINGS AND THEORY

This study detected relative differences and similarities to the theory that was presented in Chapter 3. Therefore, this chapter will compare the empirical findings and theory. First, Section 6.1.1 will compare the garnered work culture presented in theory. The following sections will compare the answer to SQ1 and compare how the research finding is different. Secondly, Section 6.1.2 will present how the usage of digital tools can influence the gendered work culture, which answers SQ2 (a), then following Section 6.1.3 will discuss the impact of gendered work culture on the usage of digital tools, answering SQ2 (b).

6.1.1 Dutch construction industry gendered work culture

How work culture is perceived in the context of Dutch construction industry:
The research finding suggests that the Dutch construction industry has different work cultures depending on the job location (office-based and site-based). Early career professionals agreed that, especially on the construction site, the work conditions might be harsh and aggressive due to the long working hours and pressure on budget, schedule, and quality. It shows a comparable work culture described in the earlier studies (Dainty et al. [2000]; Navarro-Astor et al. [2017]; Naoum et al. [2020]). The study of Zhang et al. [2021] stated that this demanding work environment has negatively influenced the pursuit of early female professionals' career development. On the contrary, more experienced employees agreed with the aggressive and hostile gendered work culture, which was perceived as conservative. Moreover, some female employees demonstrated that it does not bother them much; a few female employees excelled in their performance in the sector and held very high positions. Contrasting their statement, gendered experiences were identified, which will be discussed in Section 6.2. Furthermore, despite the outstanding performance, it was found that the sector remained to be numerically male-dominant due to the leakages of female (potential) employees. It was shown that many female students do not choose to study related to the construction sector, as shown in the many existing studies (Powell and Sang [2013]; Hickey and Cui [2020]; Maurer et al. [2021]. These findings correspond to the statement of Powell and Sang [2013], and Hickey and Cui [2020]: Women's retention and recruiting are negatively impacted by the current workplace culture.

Additionally, Gale [1994] presented that building activities encourage the construction culture, which is gender-blind organisational culture. This study also

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recognised the impact of construction activities on building organisational culture. According to the study findings, it promotes loyalty and collaboration among employees and encourages new employees. However, loyalty to the company and the sector can lead to conservatism. When this study questioned interviewees to illustrate the work culture of the construction industry, it was found that they focused more on a conservative characteristic of the sector. Further, this conservative mindset influences the acceptance of changes - in digitisation in this study.

6.1.2 Impact of digital tools on gendered work culture

Fernández-Macías [2018] and Grover et al. [2022] showed digitisation at work could affect (1) work conditions, (2) tasks and occupation, and (3) organisational structure and individuals' standard of behaviour. In this research, it was also found that the usage of digital tools at work can have an impact on change in people's attitudes, tasks and occupations, and working environment and conditions.

Work condition change - enabled by digital communication
After the COVID-19 pandemic, many companies employed digitised communication tools; therefore, remote working has become more common, as the tools enable face-to-face communication [Kudyba et al., 2020]. This study also demonstrated that the attitude toward digital tools has changed: more people are willing to communicate online, as the entry barrier to digital communication has become lower. Communication in the digital environment results in both positive and negative results in the work culture. The online communication methods, firstly, caused misunderstanding and a lack of informal communication. As people are not sitting in a physically shared place, people have less chance to acquire knowledge unconsciously. Besides, less informal interaction happens, as online meetings tend to be more straightforward. This is partially contrasting to the findings of Cijan et al. [2019]: digital tools allow easier and more effective communication, but these benefits result in less bonding and relationship-building opportunities with their colleagues.

However, this study discovered that it might result in exclusion and digital inequality. *Digital inequality* is a critical issue that influences work culture [Hai et al., 2021]. It was demonstrated that it leads to the exclusion of people unfamiliar with digital tools or working mostly on construction sites. The early career professionals discussed the disconnect between employees working in offices and on construction sites, as employees working in the office were sent home while site workers were required to be on-site during the pandemic. Further, senior employees presented exclusion of the older generation, who are not frequent users of digital tools. Durand et al. [2021] suggested that many features can result in digital exclusion, and Carlo and Bonifacio [2020] discussed the digital generation gap led by the accommodation of digital tools in the workforce, which could be the reason more experienced employees showed concern about digital exclusion in ages.

In contrast to the study of Borg and Scott-Young [2021a], it was not shown that digital competence and skills encouraged the faster process of being part of the organisation. Instead, it was shown that new employees' socialisation was disturbed due to the digitised working environment. (This topic will be presented in detail in the following section.)

Organisational structure change
This study also found that using digital tools allows fair information sharing, as the employees can access the data storage. This supports the study of Hilbert [2011]. Access to relevant information is identified as one of the dimensions by Mor Barak

[2017]. However, the study found an issue with fair information sharing. At the company level, it was shown that there is a concern about the sensitivity of information - who can access what information, when the information can be publicly shared within the company, and who has which authority, which results in a lopsided data sharing digitally, providing different access and control of information.

It was uncovered that the usage of digital tools encourages effective communication. First, early professionals' opinion is more heard and respected because of the data-driven result of digital tools. It was shown that freshly graduated employees, female employees more specifically, were not respected. Similarly, Powell and Sang [2013] showed that younger construction employees encounter a negative reaction on the construction site. Task-related digital tools support their opinion, as digital tools use data and information and provide data-driven results and perspective. Secondly, visualisation facilitated by digital tools encourages more effective communication, helping to convince old-schooled employees as it provides various points of view in a 3D model that is not offered in the paper.

Change in tasks

Besides, the possibility of automation and digitisation of repetitive tasks was suggested, which corresponds to the study of Sebastian [2011]; Kudyba et al. [2020]. Automating and digitising repetitive tasks result in a shift in tasks - the employees are required to control and check the process rather than create and calculate designs. This change and digitised process were indicated as saving time, and the saved time could be used to invest in building a more inclusive work environment.

Moreover, this study showed the hierarchical culture of the construction industry. If human labour is found redundant or employees are resistant to accept and employ the new tools, following digitisation trends, it may result in the dismissal of some employees. This study presented job insecurity since digital tools can substitute their labour, and their labour becomes reluctant.

Influence individuals' standard of behaviour

Digital skills and knowledge enable the new employees to bridge the knowledge-experience gap [Jacobsson and Linderoth, 2021]. The early career professionals in this study also identified that the digital tools and their digital-related skills allow more female employees to prove their ability and provide competitive advantages, especially when they are recently graduated. Moreover, digital-related knowledge helps the employees to be heard and voice their opinion to more experienced senior colleagues when the interviewees are undermined, as data supports the opinion. Besides, this study found that the data-driven perspective removes bias from the conversation; therefore, a decision can be made without bias based on data-driven results.

6.1.3 Impact of work culture on digital tools

This study found that characteristics of the construction industry affect employees' reactions to using digital tools. The construction industry is stressed that there is high pressure on schedule and budget due to low margins. First, construction organisations and the workforce resist using digital tools due to the pressure. Due to the high cost of failure, organisations cannot lose time adopting uncertain tools. Therefore, the construction industry was not a front runner in introducing digital tools to the business [Turk, 2021], which characterises the industry with conservatism.

The conservative feature of the sector leads to employees, especially more experienced employees, unfamiliar with new digital tools. When employees are unfamiliar with the new tools, they tend to show a resistant reaction. The restive reaction leads to unable to catch up with the digitisation trend, eventually, exclusion.

On the other hand, the nature of construction activities and location also affect the usage of digital tools. In the construction site, people are familiar with conducting work activities physically; therefore, construction site workers favour traditional methods. Moreover, construction sites are not facilitated to use digital tools, being exposed to dust and hazard; therefore, digital tools are limited.

Hierarchy plays an important role in implementing new tools in work practice. According to the findings of this study, digital tools are accepted and used: (1) when an employee leading position is willing to adopt and use new tools in the project, (2) when digital tools are enforced to be used by the organisation, (3) when client demand the project to use a specific tool or digital environment, and (4) when the digital tools bring distinctive benefits in their tasks and easy to use. First, when a team embarks on a project, the project team sets the project environment, such as systems and organisational structure. In this process, the team leader plays an important role. The team members follow the lead if the manager agrees to use a new tool. Moreover, implementing new digital tools can be enforced at an organisational level. For instance, when the organisation desires to adopt a new tool, training and workshops will be provided, and eventually, when the organisation decides not to provide service of the old system or tool, the individuals are driven to a new system environment.

6.2 RESEARCH FINDING: GENDERED EXPERIENCE

1 EDUCATION-TO-WORK TRANSITION

The study reveals that many female employees in the sector have encountered challenges in entering the sector in the education-to-work transition period. As Rosa et al. [2017]; Hickey and Cui [2020] presented, female job applicants, are questioned and examined based on gender stereotypes. More specifically, it was shown that the sector is uncertain about the female employees' capability and resistant to accepting prospective female employees as a potential employment pool Gann and Senker [1998]; Zhang et al. [2021]. This gendered interview experience is because of difficulty balancing work and family duties [Dainty et al., 2000; Hatipkarasulu and Roff, 2011; Rosa et al., 2017; Naoum et al., 2020], which employer questions during the job interviews [Hickey and Cui, 2020]. For instance, a pregnant female candidate is afraid of going to a job interview. Moreover, sexist job interviews were also encountered in this research, where the female applicant did not feel comfortable.

The sector's recruitment processes showed that it is informal, where network and personal contact with the company were involved. This finding supports the statements of Dainty et al. [2000] and Navarro-Astor et al. [2017]. It was revealed that a common recruiting process involves employing networking practices, such as (1) participating in a company event, (2) working on a school and collaborative company assignment, (3) using personal contact, and (4) using online job search platforms.

Participation in company events, school-company collaborative assignments and the online job searching platform allow prospective female employees to show their technical expertise and characteristics to employers as they can build personal re-

lationships. Moreover, an assignment that companies collaborate with schools provides a chance to prove their ability and technical knowledge. As mentioned above, digital tools demonstrate their capability and expertise; therefore, the skills related to digital tools would be helpful for female students to present their abilities and provide a competitive opportunity for jobs.

Rosa et al. [2017] suggested that networking events may set barriers for female students, as the network practice often takes place around male-friendly activities [Rosa et al., 2017], which, however, is opposed to the finding of this study. The networking opportunity was provided equally to women, and it provided job opportunities to female students and job seekers.

Even though the job searcher does not attend any network events, the online job searching platform allows the individuals to be noticed and present their abilities and educational backgrounds. Furthermore, during this process, employers do not consider other barriers, such as family-work balance, are not considered but focus on skills and technical knowledge, which changes the perspective of the employer.

Rosa et al. [2017] and Hickey and Cui [2020] presented that women candidates are often questioned and examined based on subconscious bias and gender stereotypes. However, as digital tools allow employees to work remotely, gender becomes trivial. Furthermore, as employees work remotely, they are not required to be at the construction site as much as before, where many female employees face challenges with harsh conditions [Bagilhole et al., 2002; Ness, 2011; Powell and Sang, 2013; Perrenoud et al., 2020], therefore it is not necessary for the employers to question the female candidates' capability to work in the construction sites. Hence, remote working encourages employers to trivialise gender stereotypes.

2 EARLY CAREER EXPERIENCE

This study presents gendered early career experience even after entering the construction industry. Some female employees in the sector do not feel welcomed to the organisation due to diversity features, not only genders but also race and ethnicity. Training allows new employees to enter the organisation quickly [Borg and Scott-Young, 2021a], and the opportunity to participate in various events and activities is essential for the inclusion of an organisation [Mor Barak, 2017]. Nonetheless, not every construction company arrange training program for freshly hired employees. Some organisations provide a wide range of training programs to promote adaptation to the new working environment and grasp the organisational culture.

Firstly, the training system provides the new entrants with the opportunity to gain technical expertise and socialise with colleagues. The program allows new employees to exchange work-related knowledge. This supports the findings of Fielden et al. [2001]. Further, the training program enables networking and socialisation opportunities, as newcomers can build relationships from the programs. In a mentoring program, where more experienced staff and new employees are paired, there is a mutual learning process [Jacobsson and Linderoth, 2021]. For instance, the recently employed staff grasp and understand the organisation's culture and sense the loyalty and commitment to the organisation, while senior employees can learn updated technical expertise, which could be digitally related competence. Therefore, new employees can feel that they are accepted and belong to the organisation, and their entrance and acclimatisation to the new organisations are encouraged by the training practices.

On the contrary, it was distinguished that a disturbance was caused to the socialisation of the freshly hired employees due to the COVID-19 pandemic. The working condition, especially the physical work location and work, are separated [Fernández-Macías, 2018; Kudyba et al., 2020]. This study showed that the training system of new employees was carried out through a mixture of offline and online, contrasting and adding the finding of Worrall et al. [2010]. The author presented that the training boosts the pace of new employees entering the organisation; however, according to this research, it did not function as anticipated for new employees who were introduced to the new organisations during the pandemic. Furthermore, this phenomenon is more apparent in organisations that do not provide organised training programs. The remote working environment did not allow newcomers to grasp the culture due to the lack of physical or personal contact as they needed to develop knowledge by asking questions and providing their opinion under *'do it yourself'* culture. On the other hand, in the organisations that provided online training course options during the pandemic, it was presented that it enables the employees to follow the course at their pace and review when they did not understand, yet it does not allow socialisation opportunities with other new employees.

The study indicated that recent graduates at work are not taken seriously and are not respected. As mentioned above, digital tools help early career professionals to be heard and respected because data-driven results and perspective help to support their opinion. Moreover, visualising digital tools helps professionals in their early career stage facilitate communication. Hence, the digital tools and the results from the tools can improve early career professionals' experience.

3 WORK PRACTICE

Both male and female employees agreed that the construction industry, especially the site work environment, could be aggressive and harsh because of the pressure on schedule, budget, and safety issues. Moreover, fewer female employees are in the sector, which leads to poor facilities for female personnel. This study distinguished that men and women perceive the culture differently. Male employees are more focused on the commitment and achievement of employees who try to deliver reliable products under pressure and harsh conditions. However, many female employees showed various coping strategies to the work culture to stay in the sector.

Work-life balance is identified as a crucial issue by both genders. It was shown that many male employees also face issues finding personal and professional life balance, while for women in construction, it is an inevitable problem. Furthermore, using digital tools in communication and remote work environments made balancing work and life more manageable as people can manage their personal time better. An opposite reaction to work-life balance after remote working. It was expressed that male participants were not in favour of the change as the work and life boundary is blurred, while female employees showed positive reactions. The contrasting reaction could be related to the finding of Hatipkarasulu and Roff [2011]: family-work balance is traditionally an issue for female employees, but remote work shift family responsibility on men.

This study found that women in construction fall under two categories: (1) cannot stand the gendered work culture and leave the sector, or (2) stay in the sector and excel in their careers. This can be because many female employees in the sector are often perceived to have fewer skills than existing employees [Mrowczyk, 2020]; therefore, many women in construction suppose that they need to outperform to prove their capability in the field [Bagilhole et al., 2002; Whittock, 2010; Dean, 2020]. According to the study, digital tools changed the perception of more experienced staff to female employees. Their digital-related expertise and experience helped

them to gain respect and give competitive advantages.

This study found that the expertise and skills engaged with digital practices allowed female employees to be more recognised and voice their opinion as data supports their arguments. Besides, visualisation and simulation made the decision-makers understand the arguments. Similarly, Lavikka et al. [2018] showed that data-driven perspectives support the modelling of BIM. Participating in the decision-making process is a crucial aspect of work culture as it is a major element of an inclusive work environment [Mor Barak, 2017].

Moreover, data, which plays an important role in the digitised work environment, remove bias and prejudice in decision-making. Individuals make decisions or behave based on their beliefs, value, and underlying assumptions [Schein, 1984; Korte and Chermack, 2007]. Behind their standards, gender stereotypes and subconscious bias are present. For instance, this study showed that female employees were often assumed to be secretaries in meetings or perceived to have less technical knowledge. However, the usage of digital tools and decision support from data do not allow subconscious bias or gender stereotypes to affect the process of making important decisions.

4 NETWORK PRACTICE

In the network activities and events, people share knowledge and resources [Nair and Vohra, 2015; Maurer et al., 2021]. This study also identified the importance of networking in career development and relationship building.

Previous studies showed that network events are numerically male-centred. As the industry consists of more male employees [Navarro-Astor et al., 2017], and the network activities involve male-friendly activities [Rosa et al., 2017]. Besides, the author stated that women employees are often not invited to network events. Conversely, this study found that the network events and activities included both genders and focused on building relationships and belonging to the group. As presented in other existing studies, the network practice allows employees to share their career ambition and exchange work knowledge, therefore, be aware of the career development opportunity that arises.

Additionally, the study identified a few aspects of networking events hosted in the online environment. The online network events enable more various people to join the events, even employees who could not join the events due to family responsibilities. Moreover, as it enables the engagement of project participants abroad, it encourages integration and alignment between colleagues at a distance. However, the online setting network activities do not provide flexibility during the events, which does not provide autonomy. People were assigned to a room or a group of people, making it more challenging to build relationships. These drawbacks of online settings mostly affected employees in their early careers. It was found that more experienced staff merely felt the inconvenience in networking as they had already built a professional network and developed career advancement and technical expertise; however, early professionals were disturbed that the online networking activities did not help them acclimate to the new working environment.

Similarly, this study also determined that digitised communication results in losing personal contact and informal communication between coworkers. Online meetings and communication platforms allow instant conversation between colleagues in the distance [Kudyba et al., 2020], and promote a cooperative work environment [Grover et al., 2022]. Whereas, it was presented that as it does not deliver non-verbal

communication perfectly compared to in-person communication, it is problematic to establish relations with other colleagues. Moreover, online meetings do not allow informal communication opportunities before or after the meeting. As a result, when staffs encounter each other in person at the office, it becomes a small meeting, which progress and issues about an ongoing project.

On the contrary, it was identified that virtual communication promotes effective information sharing, showing efficiency, practicality, and connectivity in information delivery. It supports Cijan et al. [2019]'s finding that it enables quicker and easier discussion. Therefore, using digital tools in communication can enhance the ideological influence of sharing individuals' values and diverse opinions [Jacobsson and Linderoth, 2021; Grover et al., 2022]. Meanwhile, it was indicated that digital tools could be used to deliver the information fit-for-purpose, where employees are informed about critical information, and people who wish to know about the details can follow a link and learn about the issue. Digital tools were presented to encourage fair information sharing [Cijan et al., 2019]. However, at the management level, in contrast, digital tools can lead to concern for information sensitivity, as mentioned above.

5 PROMOTION PRACTICE

Women in construction are under pressure to prove their expertise for career advancement. As digital tools allow many female employees to demonstrate their knowledge and capability, the digital-related skills would provide combative advantages for female employees to be noticed when Thieu's expertise is undermined.

Furthermore, the study's findings indicate that allocating tasks and positions are predominantly carried out subjectively. Although some organisations or managers have criteria and frameworks for promotion, the decision is made by managers or superiors. It implies that despite the objective criteria, the selection is made subjectively. It needs attention, as subconscious bias can influence the decision. Furthermore, as mentioned before, gender stereotypes can contribute to the final decision. It was demonstrated that digital systems could function as a preventive measure. The decision can be reviewed and compared with the decision made by digital tools and collected data in the organisation. In this way, it can be prevented from bias and prejudice influencing decisions.

In short, the following consequences were presented in the gendered experience:

- *1 Education-to-work transition* First, networking events allow female employees to demonstrate their proficiency and provide female candidates with a way to find a job. Second, job searching platforms provide female job seekers to be noticed and present their expertise. Lastly, digital skills and knowledge provide competitive advantages in the selection process. As a result, using digital tools makes gender stereotypes and subconscious bias less critical during the process.

- *2 Early career experience* The online working environment disturbed newcomers' accommodation in the new environment due to the lack of informal and personal contact. However, the data-driven results from digital tools help early career professionals to facilitate communication and help them to be respected and heard.

- *3 Work practice* Digital-related knowledge enabled female employees to be respected and break the gender stereotypical norm that women cannot perform as other male colleagues do. Data shown in digital tools allowed them to voice their opinion and support non-biased decisions. Moreover, working condition

change (remote work environment and attitude toward digital communication) enabled more female employees to join and continue working in the sector, as they can balance family and work roles better.

- *4 Network practice* As mentioned above, digital communication challenges building relationships between coworkers due to a lack of personal and informal conversation. In contrast, it presents an opportunity to join online for whoever cannot join in person.

- *5 Promotion practice* Digital-related skills enable female employees to demonstrate their knowledge and skills, providing career advancement benefits. In addition, using data and support for the decision can lead to a non-biased decision in the promotion and allocation of tasks & positions because it hampers subconscious bias from playing a role in the promotion decision.

6.3 LIMITATION OF THE STUDY

The study's limitations were found in two categories: limitations to the research methods and obtained data.

The interviews were carried out both in person and online setting. It is unsure whether the interview method influenced the answer of the answer. The interview setting may affect the interviewee's motivation in sharing their experience, especially negative experiences. Some of the answers could be very personal and to share such experience requires personal contact and a closer relationship. Moreover, as the study identified, the online meeting setting does not allow participants to deliver and share non-verbal communication, which may hinder showing openness to the interviewer.

The research concluded after interviewing people, which could represent a limited perspective of the workforce in the industry. Besides, the data was collected after setting a framework from the findings of the previous studies. The empirical studies focus on the US, the UK, and the Australian construction industry. Therefore, there is a chance that some aspects that are very distinctive in the Dutch construction sector were not asked elaborate.

Additionally, the pre-set framework used to ask questions may limit the range of answers. Asking for experience at work is quite a broad range scope, specifically the interviewees who have been working many years in the sector. Consequently, the result and conclusion may not represent all the work forces' experiences or the entire industry. Besides, the term *'digital tools'* can be a broad topic to discuss in a digitised work environment.

Moreover, the research recruited interviewees using a snowball method, which indicates that the interviews collected similar opinions and experiences of people. Likewise, the interviewees have a more or less similar educational background. Besides, the background of the interviewees can affect the interviewees' experience. Personal experience is a subjective topic, and the same topic and incident can be interpreted differently depending on the backgrounds of individuals, such as educational background, cultural background, ethnicity, and nationality. This research included four internationals in the research. It may have an impact on a misinterpretation of the culture and environment as the different background plays a role in understanding the culture.

The interview framework used for the data collection was designed broadly, which does not allow focusing on one aspect; therefore, the phenomenon and the

experiences are not deeply questioned to understand the context of the experience and details fully. This degrades the result analysis and discussion points.

Lastly, the research was conducted in English, which is not the first language for many interviewees, and it may lead to the mistranslation of their experience. Moreover, the language of the interview may have limited potential interviewees to participate in the interview. Some invited people answered that they were not comfortable interviewing in English. As a result, there is a possibility that the findings do not represent the work experience of the entire industry. On the other hand, it can be argued that the research participants primarily work in big construction firms, which may represent a reasonably good part of the industry. Moreover, the research participants work in 14 companies and different industry disciplines (consultancy, contracting, engineering office, and architectural studios). However, one person's opinion and experience do not represent the whole organisation's culture.

6.4 FUTURE RESEARCH

This section will suggest future research based on the limitation of the research. First, the evaluation and validity of the result can be examined by conducting bigger-scale research and collecting quantitative data. It will help the researcher grasp a general idea of people working in the construction sector. Besides, it can unify the data collection method to have an identical set for the data collection.

Secondly, future research can set a smaller scope for data collection, as one's work experience is a broad topic to share and discuss. Besides, digital tools can be narrowed down to several aspects in future research, such as digital communication and work-related digital tools. On the other hand, preliminary interviews can be employed before developing the interview framework. Therefore, the interview has a higher chance of asking more relevant topics and collecting applicable data to the Dutch construction sector.

Future research can investigate broader diversity aspects, for instance, ethnicity and nationality, as all elements influence one's experience. In other words, gender is not the only factor that has an impact on their experience.

6.5 CONTRIBUTION TO SCIENCE

The research adds value to the construction sector's practical and scientific fields. Firstly, the findings can be used to review the work condition and environment of diverse actors in the industry, leading to a better working environment. As a result, better performance can be promised and partially settle the skill shortage issues in the industry as it can encourage retention of existing female employees and attract more female students to the field.

At the beginning of the document, it was stated that women in construction topics were not explored much in the Netherlands, and the topic of 'female employees in their early career' has not been much focused on and studied individually. Therefore, this study can drive more attention to the demographic group. It provides a good opportunity for the Dutch construction industry to look back at the sector's work environment and reorganise and reform the organisations if more attention is needed to provide equal opportunity to diverse employees - not only women.

Moreover, this study was conducted after the COVID-19 pandemic, when most employees experienced remote working. Therefore, the realisation and awareness of digitisation at work have been raised. Therefore it adds value to the study. Moreover, various actors in the sector acknowledged the importance of digital tools regardless of their age, position at work, gender, work experience, work field, etc. Hence, the answers to interviews may differ compared to the pre-COVID period, and it contributes to the scientific field.

7 | CONCLUSION

7.1 ANSWERS TO RESEARCH QUESTION

In Chapter 1, research questions were formulated, and sub-research questions were established to answer the research question. This Chapter will provide a conclusion, answering research questions. The research questions are as follows:

"How is the usage of digital tools influencing and influenced by the gendered work culture in the construction industry toward early career experiences of female employees?"

The following sub-research questions are established to answer the research question more comprehensively.

- *Sub-Question 1: What are the elements of gendered work culture and digital tools that have an impact on early career experiences of female employees?*

- *Sub-Question 2 (a): How do the usage of digital tools influence the gendered work culture?*

- *Sub-Question 2 (b): How do the gendered work culture influence the usage of digital tools?*

- *Sub-Question 3: How do these changes have an impact on the early career experience of female employees in the industry?*

SQ1: What are the elements of gendered work culture and digital tools that have an impact on early career experiences of female employees?

The study identified the career advancement barriers for early career women in the construction sector. These career development challenges are widely labelled as personal factors and organisational factors. Personal factors include family-work balance, pay, and stress, while organisational factors involve recruitment and selection, training, allocation of tasks and positions, work climate and condition, career opportunities, and network.

Implementation of digital tools at work changes several aspects of work and employment: (1) working conditions, (2) tasks and occupation, and (3) organisational structure and relationship.

Working condition The digitised work environment allows automation and digital communication. An automated process can lead to human labour redundancy, whereas digital communication changes trivialise the physical location and work tasks. *Tasks and occupation* Automated processes also affect tasks and occupation. The automated procedures change required tasks and skill requirements in the recruitment system. Furthermore, as the skill requirement changes, digital skills and knowledge provide more career opportunities. Lastly, the digitisation trend at work results in *change in organisational structure and relationship.* Data is stored digitally;

therefore, the information is more accessible and transparent. Digital communication allows diverse actors to share their opinion, and the information and messages are delivered easier and faster. As a result, digital communication tools can be used for ideological influence. Moreover, as mentioned above, the importance of digital-related skills and knowledge is stressed; therefore, the skill sets related to digital tools enable individuals to be noticed and recognised. Additionally, digital competence can be used to build a relationship. Employees can have an opportunity for a mutual learning process - bridging the knowledge and experience gap.

SQ2 (a): How do the usage of digital tools influence the gendered work culture?

Four categories of the digital tools were identified: (1) Digital communication tools, (2) task-related digitised progrmmmes, such as BIM and Python, (3) digital documenting programmes, such as MS Office, and (4) document/file sharing tools. These tools showed that it could impact work condition, organisational structure, and influence individuals' standards of behaviour.

Work condition change
Digital communication and remote working have become more common after the COVID-19 pandemic. The online communication changes work condition of construction employees: people work in offices are no longer required to work in offices. This change results in (1) miscommunication, (2) less opportunity for bonding and relationship building with colleagues, and (3) exclusion. *Misunderstanding* is caused as people are not working in a physically shared space, therefore people have less opportunity to obtain knowledge unconsciously by overhearing others' conversation. The online communication does not allow informal conversation before or after meetings, which leads to *losing personal relationship with colleagues.* Furthermore, as mentioned above, site employees were enforced to work physically when other office employees were sent home during pandemic, resulting in *exclusion*. Besides, digital tools also results in *exclusion in age*, as elder generation is not generally familiar with digital tools. Additionally, digital working environment distress the socialisation of new employees.

Organisational structure change
As the digital tools uses data to generate results, which helps female early career professions to *gain respect and being heard.* Moreover, the visualisation which is a major benefit of digital tools help convincing old-schooled employees.

Influence individuals' standards of behaviour
Digital related skills allow female employees to *demonstrate their capability and expertise*. Additionally, the data-driven perspective *removes bias* in decision-making.

SQ2 (b): How do the gendered work culture influence the usage of digital tools?
High pressure in time and cost does not promote the usage of digital tools at work. The pressure puts a burden on construction organisations in implementing new tools and leads slow reaction to introduce new tools in the organisation.

Conservatism that is characterised in the sector hampers faster adoption of digital tools in daily work routines. The employees are not frequent users of digital tools, therefore showing reluctant reaction to the digital tools, leading to digital exclusion.

Physical structures are constructed in the construction sector. Employees prefer using old procedures over digital ones since they are less familiar with them. Additionally, due to dust and other dangerous components, building sites lack digital

equipment.

Digital tool use is significantly impacted by hierarchy: hierarchy among project participants, within an organisation, and inside a team. The actors in the hierarchy are led to follow an actor at a higher position.

SQ3: How do these changes have an impact on the early career experience of female employees in the industry?

The impact of digital tools on gendered work culture can eventually influence the early career experience of female employees in the construction sector.

Education-to-work transition The participating in networking events encourage female job seekers to establish their expertise. Besides, job searching platform encourage female appliers to present their knowledge and skills and break gender stereotypical norm. Additionally, the change in tasks and occupations resulted in restructuring skill requirements for recruitment. This belittled the gender stereotypes and subconscious bias in the selection process and encourage more female employees with digital-related skills and knowledge to join the profession. Lastly, the digital-related competence provides advantage during the selection process.

Early career experience The change in working condition - dominant remote working environment - results in disturbance in on-boarding process of new comers. On the other hand, the data-driven results of digital tools help early female career professionals to be respected and heard.

Work practice Digital tools and knowledge allow female employees to demonstrate their skills, eventually it enables breaking gender stereotypical norm that women cannot perform as other male colleagues. Besides, remote working makes easier balance in work-life balance.

Networking practice Online networking environment promotes participation of people regardless of location or personal issues to build networks for career opportunities and information sharing. Conversely, the online working environment does not provide opportunities for building relationships with other colleagues.

Promotion practice As mentioned earlier, digital-related knowledge enable female employees to demonstrate their capability, therefore, it provides the female employees a career development opportunities. Besides, usage of the digital tools in promotion decision-making will remove subconscious bias in the process because of the data-driven perspective.

7.2 RECOMMENDATION FOR BUILDING INCLUSIVE WORK ENVIRONMENT FOR EARLY CAREER PROFESSIONALS IN THE CONSTRUCTION INDUSTRY

Promote training for using digital tools

It was shown that many people are still resistant to the usage of digital tools and there is a big gap in the utilisation of digital tools at work. For instance, some employs digital tools to document report, whereas others use digital tools to create design from algorithm and automate their tasks. The digital tools will not have a great impact on the early career professionals' experience when the digital tools are

not utilised or digital tools are used limited. Therefore, to increase the impact of the tools and reduce the gap in the usage of the digital tools.

Training will also resolve issue of exclusion of people who struggle to use the digital tools. It was suggested that many older generation and people who are not familiar with the digital tools are afraid of not catching up the pace of digitisation and lose their job. Training programmes can ease the issue of the exclusion and the significant gap in the usage of the tools, and maximise the impact eventually.

Mutual learning programme

As Jacobsson and Linderoth [2021] showed mutual learning process occurs when new comers and more experienced staffs are paired. This can be employed to encourage usage of digital tools: pair of recently hired employees with digital skills and senior employees. In this process, more experienced employees will be able to obtain digital skills and get trained to use the digital tools, while new employees can develop practical skills and knowledge.

Digital tools training and education at school

Schools can provide students an education programme for digital tools that are used in practice. From this students can enhance their digital skills and it will provide competitive benefits for the students to obtain job opportunities as many construction organisations are changing skill requirement due to the digitisation trend. Then, the students will be also able to transfer the skills later in mutual learning programme after entering the sector.

Network practice

This study found that remote working disturb socialisation of new employees and interrupt relationship bonding between colleagues. Therefore, more networking opportunities should be provided for new comers to adapt to the new working environment, and socialising opportunities for the existing employees.

On-boarding programme

For the recent hired employees, structured on-boarding programmes can be organised to accommodate them to the new culture and work environment. Construction organisations can give more focus on the soft side of the training program, address organisational culture and custom.

Provide network programmes and informal conversation

Moreover, the organisations can organise the network prgrammes and informal conversation opportunities. For instance, when the network events are hosted online, then more flexible interaction should be allowed between participants. Moreover, the offline networking opportunities should be also accompanied.

Employees need to utilise well the opportunities in the office. It was found that the employees employ hybrid work - a few days working from home and the rest commute to the office. When employees go to offices or construction sites, employees need to exploit the opportunity of in-person conversation opportunities, sharing personal life, progress of project etc.

Development of data analysis programme for pormotion

This study determined that the usage of digital tools enable more objective decision on promotion as the digital tools uses information and the result is shown based on the data-driven perspective. Moreover, in this process the subconscious bias is prohibited to influence the decision. For a fairer promotion decision, data analysis programme for the promotion can be developed.

8 | REFLECTION

My interest and concern for women's rights and their voice begin in my university life – being one of 10 women among 100s of students studying for an engineering bachelor's degree. But I think my little frustration against this issue started to develop in my deep, deep mind when I was growing up. I grew up in a very traditional family. Until I went to high school and got busy studying, my family used to visit my grandparents every weekend. They were very warm and loving, but in their deep mind, there was a concept of patriarchy. When watching TV, sometimes they say, "Oh, women should behave like one", or "Men should not enter the kitchen". They did not explicitly say those things to my brother or me, but this ideology kind of applied to my parents. For example, during the Luna New Year's festival – in Korean, it's Seol-nal - all women in the family, including my mom, cook and clean for the whole family. During Seol-Nal, I could see the contrast in the house. In the kitchen, women would be cooking and sweating, and in the living room, men would watch TV, play games and sleep until the meal was ready. After the festival, my mom used to get very sick from all the chores. So I grew up seeing traditional gender roles, and the belief of patriarchy applied to my mom. This situation made me frustrated with the idea and male-centred societies in general. Then I went to a university to study architectural engineering. In my programme, there were around 100 students in my batch, and only 10 of us were women. Rarely teachers mention inappropriate sexism jokes in the class, which I felt it is very unprofessional. Back then, my friends and I just used to laugh it off and showed no reaction. I took a break from the university, so my friends were earlier in the job-seeking process. Once my female friend told me that she was in a group job interview, in which she was the only female applicant. The first question to her was, "Let's say we hire you. Are you going to get married and leave the company? We, as a company, are investing in you, and if you have children and leave or take time off, it is a lot of loss for us." Then the interviewers continued asking other male applicants technical questions related to the industry and their studies. Until the end of the interview, she was not asked any other questions related to her study and the practice, but very personal and sexist questions. I was pretty shocked when I heard that story from her, even because it is a huge company to which everyone in the school wanted to apply. It is common for women to get these questions, asking about their willingness to travel and work after getting married. The work requirements - chance to travel, even abroad, long working hours, physical work conditions - are applied to everyone, regardless of gender. However, these questions and requirements seem to be questioned only to female employees. Another story comes from another friend who worked as a student intern in a construction company. Her duty was to inspect and check if everything was in process as planned. When she and her supervisor found a defect and communicated with skilled workers on site, what came back was yelling and harassment. They said women do not know anything about the field, emphasising their work experience. They did not want to hear anything and eventually started to listen when another male student-intern talked to them about the same thing. This coloured behaviour and bad treatment to women do not stop even after getting a job. Work culture is very male-centred, and women are expected to serve coffee even though they have the same diploma and work experience as other male new employees. Moreover, the wage gap is prevalent, and it is not hidden. So it is natural that women get less paid than men. Korean society nowadays is very segregated: richer and poorer,

younger and older, male and female, heterosexual and queer community, etc. The difference is not respected and understood but considered wrong. I do not expect the world and people's perspectives would be changed in one day, but I want to be part of the progress, making small changes where differences can be respected and acknowledged.

Looking back at this study, it was a challenging experience for me. I often felt lost, and the process did not go as planned. However, I truly enjoyed working on it and learning how to deal with difficulties. Especially the interviews were the phase I enjoyed the most. Initially, it was very challenging to recruit interviewees on my own; however, the interviews allowed me to listen to people who have been working in the sector for many years. It was an inspiring month to learn much from the interviewees and the process. The interview provided me with valuable opportunities to talk to people whom I could never imagine to hear personal stories. Throughout the interview, I could see that there is still an issue of diversity in the sector, which encouraged me to continue making small changes. Besides, I learned how to trust myself and management from the process. This research was my first project to manage and deal with uncertainties independently. I expect to use this valuable lesson and skills in my practice.

REFERENCES

Akins, R. B., Tolson, H., and Cole, B. R. (2005). Stability of response characteristics of a Delphi panel: Application of bootstrap data expansion.

Alexandra, V., Ehrhart, K. H., and Randel, A. E. (2021). Cultural intelligence, perceived inclusion, and cultural diversity in workgroups. *Personality and Individual Differences*, 168:110285.

Arvidsson, V., Holmström, J., and Lyytinen, K. (2014). Information systems use as strategy practice: A multi-dimensional view of strategic information system implementation and use. *The Journal of Strategic Information Systems*, 23(1):45–61.

Bagilhole, B. M., Dainty, A. R. J., and Neale, R. H. (2002). A Woman Engineer's Experiences of Working on British Construction Sites*. *Int. J. Eng.*, 18(4):422–429.

Baiden, B. K., Price, A. D., and Dainty, A. R. (2006). The extent of team integration within construction projects. *International Journal of Project Management*, 24(1):13–23.

Barriball, L. and While, A. (1994). Collecting data using a semi structured interview: a discussion. *Journal of Advanced Nursing*, 19:328–335.

Bechky, B. A. (2003). Sharing Meaning Across Occupational Communities: The Transformation of Understanding on a Production Floor. *Organization Science*, 14(3):312–330.

Besné, A., Pérez, M. , Necchi, S., Peña, E., Fonseca, D., Navarro, I., and Redondo, E. (2021). A Systematic Review of Current Strategies and Methods for BIM Implementation in the Academic Field. *Applied Sciences*, 11(12):5530.

Blaikie, N. W. H. and Priest, J. (2019). *Designing social research: The logic of anticipation*. John Wiley & Sons.

Bock, T. (2015). The future of construction automation: Technological disruption and the upcoming ubiquity of robotics. *Automation in Construction*, 59:113–121.

Borg, J. and Scott-Young, C. M. (2021a). Supporting early career project managers in construction: a multi-vocal study. *Engineering, Construction and Architectural Management*.

Borg, J. and Scott-Young, C. M. (2021b). Why are early career professionals leaving the construction industry?

Bygballe, L. E., Swärd, A. R., and Vaagaasar, A. L. (2016). Coordinating in construction projects and the emergence of synchronized readiness. *International Journal of Project Management*, 34(8):1479–1492.

Cao, D., Li, H., Wang, G., Luo, X., and Tan, D. (2018). Relationship Network Structure and Organizational Competitiveness: Evidence from BIM Implementation Practices in the Construction Industry. *Journal of Management in Engineering*, 34(3):04018005.

Carlo, S. and Bonifacio, F. (2020). "You Don't Need Instagram, It's for YoungPeople": Intergenerational Relationshipsand ICTs Learning Among Older Adults. In Gao, Q. and Zhou, J., editors, *Human Aspects of IT for the Aged Population. Technology and Society*, volume 12209 of *Lecture Notes in Computer Science*, pages 29–41. Springer International Publishing, Cham.

Che Ibrahim, C. K. I., Costello, S. B., and Wilkinson, S. (2015). Key indicators influencing the management of team integration in construction projects. *International Journal of Managing Projects in Business*, 8(2):300–323.

Choi, J. O., Shane, J. S., and Chih, Y.-Y. (2022). Diversity and Inclusion in the Engineering-Construction Industry. *Journal of Management in Engineering*, 38(2).

Cijan, A., Jenič, L., Lamovšek, A., and Stemberger, J. (2019). How digitalization changes the workplace. *Dynamic Relationships Management Journal*, 8(1):3–12.

Connley, C. (2019). Just 9.1% of America's construction workers are women—here's what it's like to be one of them.

Cypress, B. S. (2015). Qualitative research: The "what," "why," "who," and "how"! *Dimensions of Critical Care Nursing*, 34(6):356–361.

Dainty, A. R. J., Asce, M., and Lingard, H. (2006). Indirect Discrimination in Construction Organizations and the Impact on Women's Careers. *Journal of Management in Engineering*, 22(3):108–118.

Dainty, A. R. J., Neale, R. H., and Bagilhole, B. M. (2000). COMPARISON OF MEN'S AND WOMEN'S CAREERS IN U.K. CONSTRUCTION INDUSTRY. *JOURNAL OF PROFESSIONAL ISSUES IN ENGINEERING EDUCATION AND PRACTICE.*

Dean, S. (2020). The 8 Biggest Challenges Women Say They Face in Construction.

Deep, S., Gajendran, T., and Jefferies, M. (2020). Factors Influencing Power and Dependence for Collaboration among Construction Project Participants. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 12(2):06520001.

Delve (2022). Thematic Analysis — Explanation and Step by Step Example.

Downey, S. N., Van Der Werff, L., Thomas, K. M., and Plaut, V. C. (2015). The role of diversity practices and inclusion in promoting trust and employee engagement. *Journal of Applied Social Psychology*, 45:35–44.

Durand, A., Zijlstra, T., Van Oort, N., Hoogendoorn-Lanser, S., and Hoogendoorn, S. (2021). Access denied? Digital inequality in transport services. *Transport Reviews*, 42(1):32–57.

Elliot, S. (2009). Developing organizational capabilities in SMEs: Enabling environmentally sustainable ICT. In *BLED 2009 Proceedings*, pages 237–249.

European Construction Sector Observatory (2019). Building Information Modelling in the EU construction sector - Trend Paper Series. Technical report, European Construction Sector Observatory.

European Construction Sector Observatory (ECSO) (2021). European Construction Sector Observatory Country profile Netherlands. Technical report, European Construction Sector Observatory.

Fernández-Macías, E. (2018). Automation, digitalisation and platforms: Implications for work and employment. Technical report, European Founder for the Improvement of Living and Working Conditions.

Fernando, N. G., Amaratunga, D., and Haigh, R. (2014). The career advancement of the professional women in the UK construction industry: The career success factors. *Journal of Engineering, Design and Technology*, 12(1):53–70.

Fielden, S. L., Davidson, M. J., Gale, A., and Davey, C. L. (2001). Women, equality and construction. *Journal of Management Development*, 20(4):262–1711.

Flick, U. (2009). *An introduction to qualitative research*. Sage Publications, 4 edition.

Franz, B., Leicht, R., Molenaar, K., and Messner, J. (2017). Impact of Team Integration and Group Cohesion on Project Delivery Performance. *Journal of Construction Engineering and Management*, 143(1):04016088.

Friese, S. (2022). ATLAS.ti 22 Windows - User Manual.

Gale, A. W. (1994). Women in Non-traditional Occupations: the Construction Industry. *Women in Management Review*, 9(2):3–14.

Gann, D. and Senker, P. (1998). Construction skills training for the next millennium. *Construction Management and Economics*, 16(5):569–580.

Grover, V., Tseng, S. L., and Pu, W. (2022). A theoretical perspective on organizational culture and digitalization. *Information & Management*, 59(4):103639.

Guest, G., MacQueen, K., and Namey, E. (2014). Introduction to Applied Thematic Analysis. In *Applied Thematic Analysis*, pages 3–20. SAGE Publications, Inc.

Hai, T. N., Van, Q. N., and Tuyet, M. N. T. (2021). Digital transformation: Opportunities and challenges for leaders in the emerging countries in response to covid-19 pandemic. *Emerging Science Journal*, 5(Special Issue):21–36.

Hasson, F., Keeney MRes, S., and McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing*, 32(4):1008–1015.

Hatipkarasulu, Y. and Roff, S. E. (2011). Women in Construction: An Early Historical Perspective. In *ASC Annual International Conference Proceedings*, pages 1–7.

Hickey, P. J. and Cui, Q. (2020). Gender Diversity in US Construction Industry Leaders. *J. Manage. Eng.*, 36(5).

Hilbert, M. (2011). Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics. *Women's Studies International Forum*, 34(6):479–489.

Hoff, M. (2021). The construction industry's off-putting treatment of women is making its labor shortage worse.

Höglund, B. and Larsson, M. (2019). Ethical dilemmas and legal aspects in contraceptive counselling for women with intellectual disability -Focus group interviews among midwives in Sweden. *J Appl Res Intellect Disabil.*, 32:1558–1566.

Hossain, M. A. and Nadeem, A. (2019). Towards digitizing the construction industry: State of the art of construction 4.0. In *ISEC 2019 - 10th International Structural Engineering and Construction Conference*. ISEC Press.

Isensee, C., Teuteberg, F., Griese, K. M., and Topi, C. (2020). The relationship between organizational culture, sustainability, and digitalization in SMEs: A systematic review. *Journal of Cleaner Production*, 275:122944.

Jacobsson, M. and Linderoth, H. C. J. (2021). Newly graduated students' role as ambassadors for digitalisation in construction firms. *Construction Management and Economics*, 39(9):759–772.

Jansen, W. S., Otten, S., and van der Zee, K. I. (2015). Being part of diversity: The effects of an all-inclusive multicultural diversity approach on majority members' perceived inclusion and support for organizational diversity efforts. *Group Processes and Intergroup Relations*, 18(6):817–832.

Karakhan, A. A., Gambatese, J. A., Simmons, D. R., and Al-Bayati, A. J. (2021). Identifying Pertinent Indicators for Assessing and Fostering Diversity, Equity, and Inclusion of the Construction Workforce. *J. Manage. Eng. J. Manage. Eng*, page 37.

Khairil Izam Che Ibrahim, C., Costello, S. B., and Wilkinson, S. (2013). Development of a conceptual team integration performance index for alliance projects. *Construction Management and Economics*, 31(11):1128–1143.

Korte, R. F. and Chermack, T. J. (2007). Changing organizational culture with scenario planning. *Futures*, 39(6):645–656.

Kudyba, S., Fjermestad, J., and Davenport, T. (2020). A research model for identifying factors that drive effective decision-making and the future of work. *Journal of Intellectual Capital*, 21(6):835–851.

Kulkarni, K., Muia, J., Boulaftali, Y., Blondon, M., and Lauw, M. N. (2018). Early career professionals: A challenging road. *Res Pract Thromb Haemost*, 2:11–13.

Larsson, J. and Larsson, L. (2020). Integration, Application and Importance of Collaboration in Sustainable Project Management. *Sustainability*, 12(585):1–17.

Lavikka, R., Kallio, J., Casey, T., and Airaksinen, M. (2018). Digital disruption of the AEC industry: technology-oriented scenarios for possible future development paths. *Construction Management and Economics*, 36(11):635–650.

Lingard, H. and Francis, V. (2004). The work-life experiences of office and site-based employees in the Australian construction industry The work-life experiences of office and site-based employees in the Australian construction industry. *Construction Management and Economics*, 22(9):991–1002.

Lirio, P., Lee, M. D., Williams, M. L., Haugen, L. K., and Kossek, E. E. (2008). The inclusion challenge with reduced-load professionals: The role of the manager. *Human Resource Management*, 47(3):443–461.

Maurer, J. A., Choi, D., and Hur, H. (2021). Building a Diverse Engineering and Construction Industry: Public and Private Sector Retention of Women in the Civil Engineering Workforce. *Journal of Management in Engineering*, 37(4):04021028.

McKay, R., Patrick, F., Avery, D. R., and Morris, M. A. (2009). A TALE OF TWO CLIMATES: DIVERSITY CLIMATE FROM SUBORDINATES' AND MANAGERS' PERSPECTIVES AND THEIR ROLE IN STORE UNIT SALES PERFORMANCE. *PERSONNEL PSYCHOLOGY*, 62:767–791.

Melville, N. P. and Ross, S. M. (2010). INFORMATION SYSTEMS INNOVATION FOR ENVIRONMENTAL SUSTAINABILITY 1. *ISSUES AND OPINIONS*, 34(1):122.

Menches, C. L. and Abraham, D. M. (2007). Women in Construction-Tapping the Untapped Resource to Meet Future Demands. *J. Const. Eng. Manage.*, 133(9):701–707.

Miller, F. A. (1998). Strategic Culture Change: The Door to Achieving High Performance and Inclusion. *Public Personnel Management*, 27:151–160.

Mooney, J. (2014). Women in Construction: Still Harassed, Discriminated Against.

Mor Barak, M. E. (2017). *Managing Diversity: Toward a globally inclusive workplace*. SAFE Publications Ltd., California, 4 edition.

Mrowczyk, A. (2020). Women in the Construction Industry. Barriers and solutions.

Nair, N. and Vohra, N. (2015). Diversity and Inclusion at the Workplace : A Review of Research and Perspectives. *Indian Institute of Management*, 2(3).

Naoum, S. G., Harris, J., Rizzuto, J., and Egbu, C. (2020). Gender in the construction industry: Literature review and a comparative 2 survey of men's and women's perceptions in UK construction consultancies. *Journal of Managmenet in Engineering*, 36(2).

Navarro-Astor, E., Román-Onsalo, M., and Infante-Perea, M. (2017). Women's career development in the construction industry across 15 years: main barriers.

Negroponte, N. (1995). *Being Digital*. Hodder & Stoughton.

Ness, K. (2011). Constructing Masculinity in the Building Trades: 'Most Jobs in the Construction Industry Can Be Done by Women'. *Gender, Work and Organisation*, 19(6):654–676.

Oo, B. L., Lim, B., and Feng, S. (2020). Early career women in construction: Are their career expectations being met? *Construction Economics and Building*, 20(3):1–19.

Oraee, M., Hosseini, M. R., Papadonikolaki, E., Palliyaguru, R., and Arashpour, M. (2017). Collaboration in BIM-based construction networks: A bibliometric-qualitative literature review. *International Journal of Project Management*, 35(7):1288–1301.

Oyewobi, L. O., Oke, A. E., Adeneye, T. D., and Jimoh, R. A. (2019). Influence of organizational commitment on work–life balance and organizational performance of female construction professionals. *Engineering, Construction and Architectural Management*, 26(10):2243–2263.

Pelled, L. H., Ledford, G. E., and Mohrman, S. A. (2002). DEMOGRAPHIC DISSIMILARITY AND WORKPLACE INCLUSION. *Journal of Mangement Studies*, 36(7):1013–1031.

Perera, S., Nanayakkara, S., Rodrigo, M. N., Senaratne, S., and Weinand, R. (2020). Blockchain technology: Is it hype or real in the construction industry? *Journal of Industrial Information Integration*, 17.

Perrenoud, A. J., Bigelow, B. F., and Perkins, E. M. (2020). Advancing Women in Construction: Gender Differences in Attraction and Retention Factors with Managers in the Electrical Construction Industry. *Journal of Management in Engineering*, 36(5):04020043.

Phelps, A. F. and Reddy, M. (2009). The Influence of Boundary Objects on Group Collaboration in Construction Project Teams. *Proceedings of the ACM 2009 international conference on Supporting group work*, GROUP '09:125–128.

Pless, N. M. and Maak, T. (2004). Building an Inclusive Diversity Culture: Principles, Processes. *Source: Journal of Business Ethics*, 54(2):129–147.

Powell, A. and Sang, K. J. (2013). Equality, diversity and inclusion in the construction industry.

Reynolds, N. and Diamantopoulos, A. (1998). The effect of pretest method on error detection rates: experimental evidence. *European Journal of Marketing*, 32(6):480–498.

Richards, C., Stevens, E., and Pearce, R. (2022). The Inclusive Workplace: Building Community by Making the Workplace Human/Humane.

Roberson, Q. M. (2006). Disentangling the meanings of diversity and inclusion in organizations. *Group and Organization Management*, 31(2):212–236.

Rosa, J. E., Hon, C. K., Xia, B., and Lamari, F. (2017). Challenges, success factors and strategies for women's career development in the australian construction industry. *Construction Economics and Building*, 17(3):27–46.

Ryan, F., Coughlan, M., and Cronin, P. (2009). Interviewing in qualitative research: The one-to-one interview. *International Journal of Therapy and Rehabilitation*, 16(6):309–314.

Schein, Edgar, H. (1984). Coming to a new awareness oforganisational culture. *Sloan Management Review*, 25(2):3–16.

Sebastian, R. (2011). Changing roles of the clients, architects and contractors through BIM. *Engineering, Construction and Architectural Management*, 18(2):176–187.

Sekayi, D. and Kennedy, A. (2017). Qualitative delphi method: A four round process with a worked example. *Qualitative Report*, 22(10):2755–2763.

Sempane, M., Rieger, H., and Goodt, G. (2022). Job Satisfaction in relation to Organisational Culture. *SA Journal of Industrial Psychology*, 28(2):23–30.

Shirazi, B., Langford, D. A., and Rowlinson, S. M. (1996). Organizational structures in the construction industry. *Construction Management and Economics*, 14(3):199–212.

Shore, L. M., Randel, A. E., Chung, B. G., Dean, M. A., Ehrhart, K. H., and Singh, G. (2011). Inclusion and diversity in work groups: A review and model for future research.

Silbey, S. S. (2016). Why Do So Many Women Who Study Engineering Leave the Field? *Harvard Business Review*.

Skulmoski, G. J., Hartman, F. T., and Krahn, J. (2007). The Delphi Method for Graduate Research The Delphi Method for Graduate Research 2. *Journal of Information Technology Education*, 6.

Slavinski, T. and Todorović, M. (2019). The impact of digitalisation on the organisational capability changes-Evidence from Serbia. *Advances in Economics, Business and Management Research*, 108:244–250.

Solebello, N., Tschirhart, M., and Leiter, J. (2016). The paradox of inclusion and exclusion in membership associations. *Human Relations*, 69(2):439–460.

Steinmeier, D. (2020). Diversity, Inclusion, and Digital Preservation. *Patterns*, 1(9).

Thomas, J. and Mengel, T. (2008). Preparing project managers to deal with complexity – Advanced project management education. *International Journal of Project Management*, 26(3):304–315.

Turk, (2021). Structured analysis of ICT adoption in the European construction industry. *International Journal of Construction Management*.

United Nations Human Rights (2014). Gender stereotypes and Stereotyping and women's rights. Technical report, United Nations (Office of the High Commissioner for Human Rights), Geneva.

Wallace, J., Hunt, J., and Richards, C. (1999). The relationship between organisational culture, organisational climate and managerial values. *The International Journal of Public Sector Management*, 12(7):951–3558.

White, M. (2012). Digital workplaces: Vision and reality. *Business Information Review*, 29(4):205–214.

Whittock, M. (2010). Women's experiences of non-traditional employment: is gender equality in this area a possibility? *Construction Management & Econominics*, 20(5):449–456.

Wolfgruber, D., Stürmer, L., and Einwiller, S. (2021). Talking inclusion into being: communication as a facilitator and obstructor of an inclusive work environment. *Personnel Review*.

Worrall, L., Harris, K., Stewart, R., Thomas, A., and McDermott, P. (2010). Barriers to women in the UK construction industry. *Engineering, Construction and Architectural Management*, 17(3):268–281.

Wright, T. (2013). Uncovering sexuality and gender: an intersectional examination of women's experience in UK construction. *Construction Management and Economics*, 31(8):832–844.

Wu, G., Zhao, X., Zuo, J., and Zillante, G. (2019). Effects of team diversity on project performance in construction projects. *Engineering, Construction and Architectural Management*, 26(3):408–423.

Yu, A. T. and Shen, G. Q. (2013). Problems and solutions of requirements management for construction projects under the traditional procurement systems.

Yu, A. T., Shen, G. Q., and Chan, E. H. (2010). Managing employers' requirements in construction industry: Experiences and challenges. *Facilities*, 28(7):371–382.

Zhang, R. P., Holdsworth, S., Turner, M., and Myla, M. (2021). Does gender really matter? A closer look at early career women in construction. *Construction Management and Economics*, 39(8):669–686.

APPENDIX

A | ATLAS.TI CODING

This chapter shows the coding that was used for the review of previous studies.

Figure A.1: Word cloud from Atlas.ti for female professions' career challenges

Table A.1: Open coding procedure

Repeated words and statement	Code	Category
Either/or approach to career and family, choice between a successful career or a family life, maternity leave, childcare programs, career breaks, work-life conflict, zig-zag career path, raising children, balance between personal goals and professional goals	Family-work balance	Personal factors
Wage, pensions, staff benefits, less pay for equivalent work, salary, wage	Pay	
Insomnia, conflict, physical and mental health problem, role stress, pressure	Stress	
Process of gaining employment, initial entry to employment, apply for a job, recruitment process, recruitment, hiring, joining the work force	Recruitment and selection	Education-to-work transition period
Opportunity to develop practical skills, support, training needs, mentoring,	Training	Early career experience
project-based nature, hierarchical order, job norms, expectation, builders bum, attitude, perception, behaviour, organisational structure, organisational climate, work relationship, work image, competition amongst colleagues, organisational culture, long hours, expectation of mobility, long working hours, geographically disparate locations, job norm, not flexible work schedule, hostile conditions of building sites, high time commitment, no culture of part-time hours, nomadic nature of site work, high demand n working hours, tight time schedule, demanding workload	Work culture and condition	Work practice
Working in administrative work, technical career, repetitive minor tasks, undervalued and low potential for career advancement	Allocation of tasks and position	
Potential for career advancement, professional opportunity, career barrier, opportunity for advancement, career progression, opportunity to progress the career, career advancement opportunity, mentoring	Career opportunity	Promotion practice
Social capital, informal contacts, networking events, participate in sport activities, social opportunities, coffee, drink, relationship,	Network	Networking practice

Figure A.2: Interconnection between career challenge factors from ATLAS.ti, where green colour represents personal factors; red colour is corresponding to organisational factor; and orange-coloured-codes are part of work culture and condition.
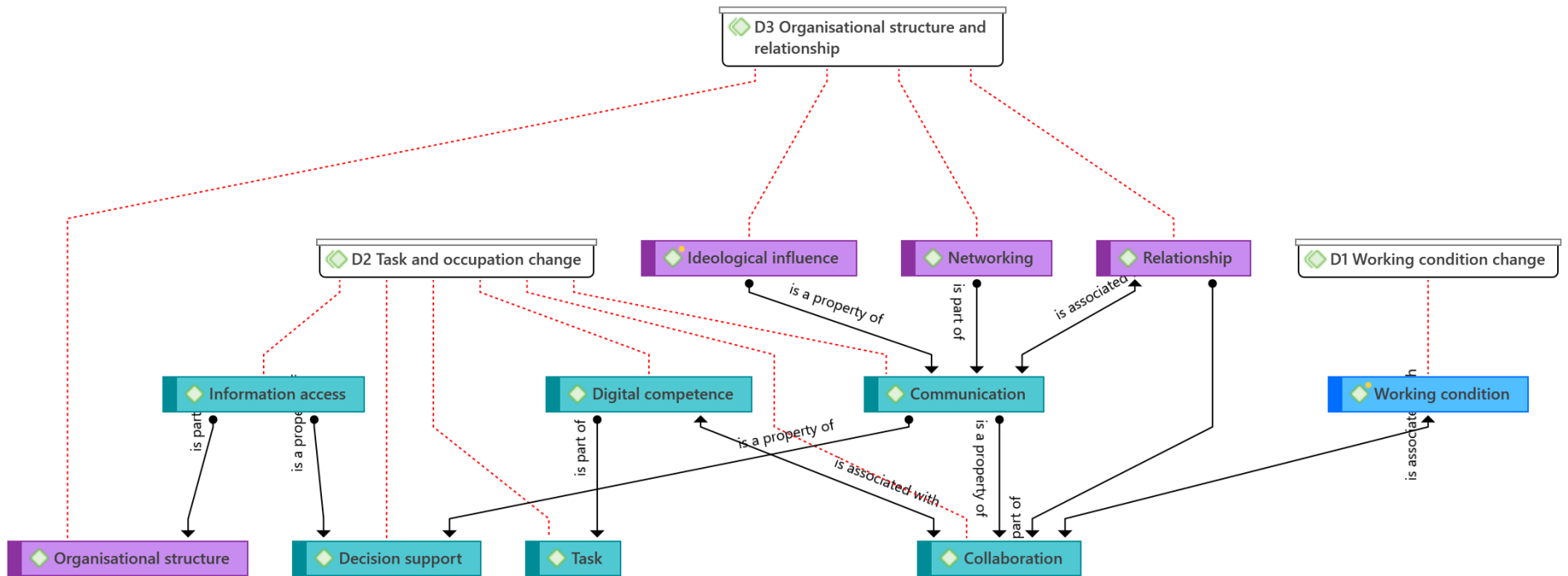
Figure A.3: Impact of implementation of digital tools on work and employment and its interconnection
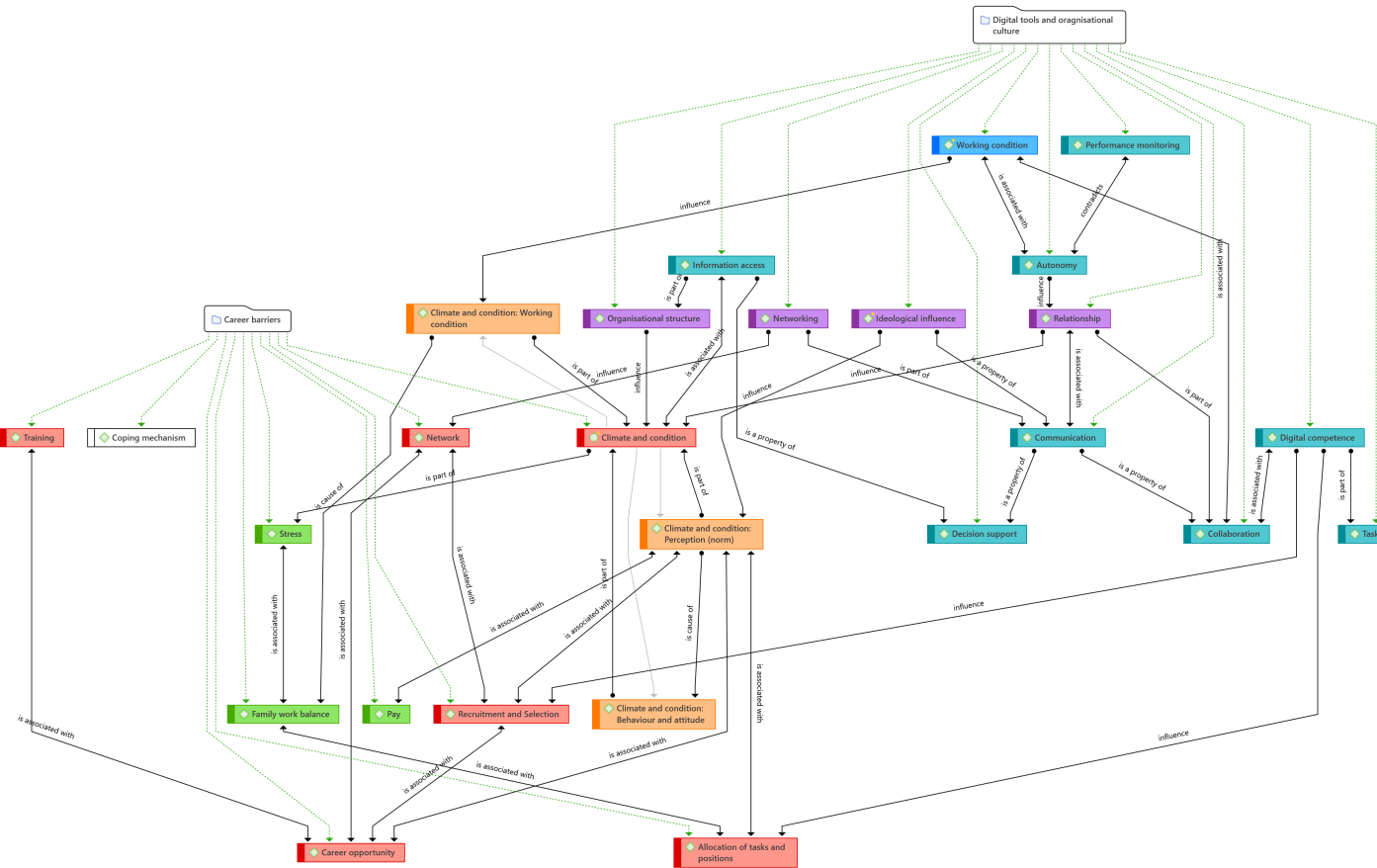
Figure A.4: Interconnection between the impacts of digital tools and the career challenges for female employees in the construction industry

Table A.2: Themes and codes for the data analysis (From Theme 01 to Theme 03)

Theme	Code	Keywords
01 Work culture	Building culture	build, on-site, working outside, building activities, live construction, loyalty, physical, outside, outdoor, constructing, fabricate
	Conservatism	old-fashioned, old-schooled, conservative, traditional, not taking risk, routines, un-inventive, un-progressive
	Fragmentation	fragmented, contractual relationship, collaborate, work together, cooperate, relationship, separation
	Hierarchical culture	top-down culture, practical, order, straight forward
	Male-centered	male-dominated, marginalised, male sector, male centered
	Problem-solving mindset	creative, proactive, reactive, intelligent tasks, solving and fixing problem, expertise-based, knowledge-based
	Work environment/condition	heavy job, perform outside, safety issues, physical, construction site, office work environment, aggressive work environment
	Pressure from the market condition	deadline, time pressure, underestimated challenges, monetary pressure, uncertainty of the market condition, failure cost, market trend, market rhythm
02 Influence of work culture on digital tools	Conservative Mindset	old-schooled, conservative, do not want change, afraid of change, not familiar procedure, less open-minded
	Hierarchical culture	market condition, manager's decision, client's requirement, organisations' decision, hierarchical relationship between organisations
	Pressure on money and time	market push, high pressure on budget and schedule
03 Influence of digital tools on work culture	Attitude change	willingness, motivation, demonstrate capability, removal of bias, neutral, experience of digital, perception, attitude, misunderstand, personal contact, understand personal circumstances, easier demonstration
	Change in tasks and occupation	automation, remote working, digitisation of process, algorithm, programming, checking, shift of work, quicker decision, collaboration with foreign countries
	Change in working condition	remote working, working from home, automation, digital communication, digitised decision making, change in collaboration
	Exclusion	separation, losing personal contact, difficulty in building relationship, slow process for inclusion
	Change in relationship building	team building, bonding, collaboration

Table A.3: Theme:04 Gendered experience

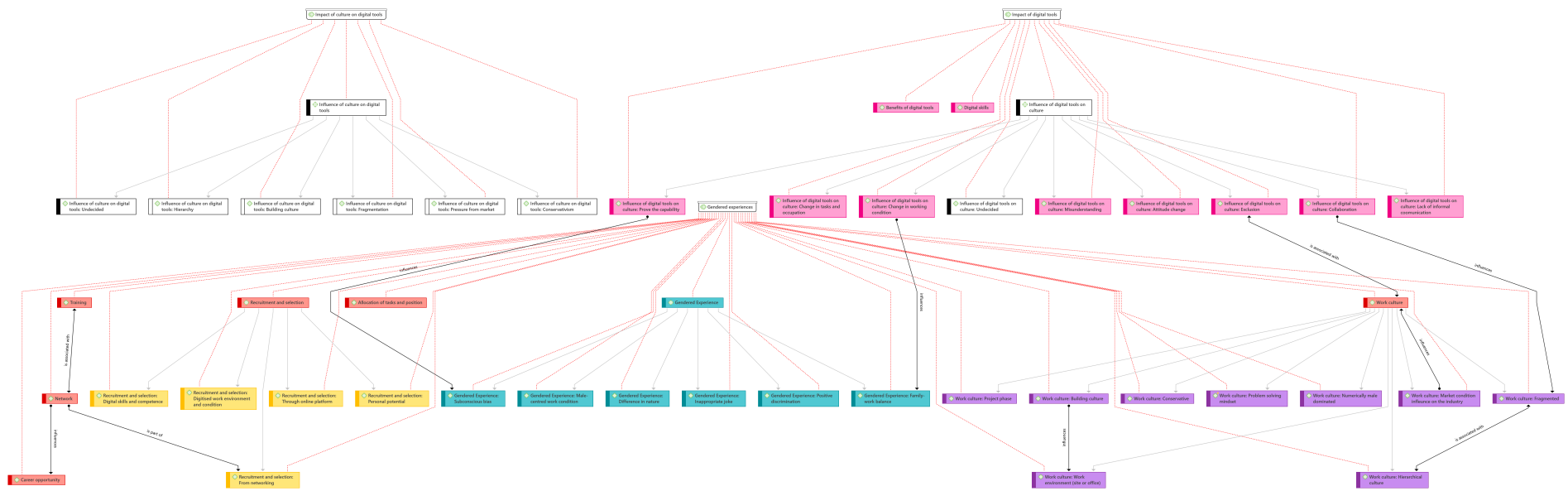| Theme:	sub-code	Keywords
Allocation of tasks and position		performance measurement, promotion, career advancement, performance, assessment, monitoring, job requirement, career development, career opportunity
Work practice	Family-work balance	balancing family and work duties, complying family responsibility, work and life balance, working from home, remote working, managing personal time
	Subconscious bias	unconscious judgement, bias, gender stereotypes, biased decision
	Others	positive discrimination, male-centered work condition, inappropriate jokes, not proper messages/-comments
Network		building relationship, network events, coffee break, informal conversation, company events, company get together, community, online activities/events, drinks
Recruitment and selection		hiring process, recruiting, HR, employment, job interview, job searching, join the work force
Training		on-boarding, traineeship, training courses
Work culture	Building culture	build, on-site, working outside, building activities, live construction, loyalty, physical, outside, outdoor, constructing, fabricate
	Conservatism	old-fashioned, old-schooled, conservative, traditional, not taking risk, routines, un-inventive, un-progressive
	Fragmentation	fragmented, contractual relationship, collaborate, work together, cooperate, relationship, separation
	Hierarchical culture	top-down culture, practical, order, straight forward
	Male-centered	male-dominated, marginalised, male sector, male centered
	Problem-solving mindset	creative, proactive, reactive, intelligent tasks, solving and fixing problem, expertise-based, knowledge-based
	Work environment/condition	heavy job, perform outside, safety issues, physical, construction site, office work environment, aggressive work environment
	Pressure from the market condition	deadline, time pressure, underestimated challenges, monetary pressure, uncertainty of the market condition, failure cost, market trend, market rhythm

Figure A.5: Interconnection from data analysis

B | HUMAN RESEARCH ETHICS

This chapter shows the documents that were used for the approval of Human Research Ethic Committee (HREC). This process of the research is crucial as the research collects data from human resource and it contains the data collection of personal information, such as work experience year, position at work, name and email for the administrative purpose.

B.1 INTERVIEW INFORMED CONSENT

You are invited to participate in a research study titled [temporary title - Toward an inclusive work environment in the construction industry using digital project management practices]. This study is being done by Emma Jeongeun Lee, an MSc Construction Management and Engineering student] from TU Delft.

The purpose of this research study is to investigate construction industry's work and organisational culture and the impact of it on the early career experience of younger female employees. The interview will take approximately 45 to 75 minutes. The collected data will be used for an analysis of the research. The collected personal data with this informed consent will be used strictly for administrative purposes and it will not be stored together with the interview transcript.

The interviewees for this study are categorised into three groups: early career professionals in the construction industry, professionals in executive, managerial, or supervisory role in the construction industry, and members of a related topic activist group. You will be asked to elaborate (1) your early career experience, (2) work practices, including communication and networking and (3) promotion practices in the industry based on your expertise and experience; however, depending on your role and position, the interview duration for each part will differ.

The research may include asking the participants to elaborate any episode or experience at work related to mistreatment – the interview does not explicitly ask to describe the participants' personal information that they do not desire to share, however the interview's answer may contain the discussion of their experience at work that are sensitive and personal. Therefore, the interview may be distressful for people who experienced and traumatised.

As with any online and offline activity, the risk of a breach is always possible. To the best of our ability, your answers in this study will remain confidential. We will minimize any risks by storing all the collected data after misidentifying any directly identifiable information of the participants to avoid the participants being placed in a difficult situation of a data leak. As stated above, the personal data collected with this informed consent will be used for administrative purposes and stored separately with the interview audio/video recordings and interview transcripts. After the interview, the transcript will be sent to the interviewee. This transcript will not contain any personal data. Some parts of the interview can be quoted in the thesis document; however, it will be anonymised in a way that does not provide any identifying information about participants. The data will only be shared between the responsible researchers, and all the data will be destroyed one month after the result of research is published.

Participation in this study is voluntary, and you can withdraw anytime. You are free to omit any questions. All personal and research data collected from the

interview will be used only for administrative and research purposes and will be destroyed one month after the grading of the thesis. If there is any questions or doubt, feel free to contact the research student.

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information dated *29/09/2022*, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
3. I understand that taking part in the study involves:	☐	☐
1. Data collection of personal information (e.g., occupation (position at work), working experience years; *2. Data collection of personal experience at work ; and* *3. Data collection of personal opinion based on your experience, expertise and opinion on the relationship between work (organisational) culture and digital tools;*		
4. I understand that the study will end *December 2022. 1*	☐	☐
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
5. I understand that taking part in the study involves the following risks that is described below, and I understand that these will be mitigated.	☐	☐
The research may include asking the participants to elaborate any episode or experience at work related to mistreatment – the interview does not explicitly ask to describe the participants' personal information that they do not desire to share, however the interview's answer may contain the discussion of their experience at work and sensitive and personal information . Therefore, the interview may be distressful for people who experienced and traumatised. The interview may lead to higher stress level and anxiety recalling the traumatic event.		
6. I understand that taking part in the study also involves collecting specific personally identifiable information (PII), and associated personally identifiable research data (PIRD), with the potential risk of my identity being revealed.	☐	☐
Followings are the PII and PIRD that will be collected throughout the research: • *Year of work experience in the construction sector* • *Occupation (position at work)* • *Career experience in the construction industry* *There is a risk that this research data is revealed and harm societal or personal reputation, however, it is minimised by anonymising identifiable information and it is documented in the Risk Management Plan and Data Management Plan. If you wish to see the documents, please contact the researcher.*		
7. I understand that some of this PIRD is considered as sensitive data within GDPR legislation.	☐	☐
8. I understand that the following steps will be taken to minimise the threat of a data breach, and protect my identity in the event of such a breach:	☐	☐
Data will be stored in a TU Delft Project Drive, which allows restricted access and only responsible researchers can have an access. All the collected data will be anonymous, in a level that identification of participants will not be able.		
9. I understand that personal information collected about me that can identify me, such as *work experience year in the construction industry, occupation, and experience at work*, will not be shared beyond the study team.	☐	☐
10. I understand that the (identifiable) personal data I provide will be destroyed *one month after the thesis grading.*	☐	☐
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
11. I understand that after the research study **de-identified information** will be used for *documentation of the master's thesis and the document will be shared in the repository of the TU Delft.*	☐	☐
After the interview, transcript will be sent to the interviewees. In case of doubt, the interviewees can reach the researcher within two weeks to add or delete some part. Part of the interview can be quoted to the thesis document after deidentifying any personal or identifiable data. No response within two weeks will be considered as an approval of transcript and the quotation of the contents in the thesis. The research data (recording and transcript) will be destroyed one month after grading of the thesis.		
12. I agree that my responses, views or other input can be quoted anonymously in research outputs	☐	☐

---

1 The end date is an estimation of the end date. Depending on the process, it can be changed.

Signatures

_____ _____ ____ /____ /____

Name of participant [printed]   Signature   Date

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____ _____ ____ /____ /____

Researcher name [printed]   Signature   Date

Study contact details for further information: Jeongeun-Emma Lee

B.2   DATA MANAGEMENT PLAN

MSc Thesis: Toward a more inclusive work environment in the construction industry

0. Administrative questions

1. Name of data management support staff consulted during the preparation of this plan.

Civil Engineering and Geosciences Data Steward: Lora Amstrong

2. Date of consultation with support staff.

2022-05-25

I. Data description and collection or re-use of existing data

3. Provide a general description of the type of data you will be working with, including any re-used data:

Type of data	File format(s)	How will data be collected (for re-used data: source and terms of use)?	Purpose of processing	Storage location	Who will have access to the data
Informed consent	PDF files	email	To record the consent of research participants	Project drive	Researcher and Research Supervisors
Email addresses	.csv file	The informed consent form	The administrative purpose for reaching out and arranging an online meeting, if required	Project drive	Researcher and Research Supervisors
Gender	.csv file	An interview	To understand their perspective and experience based on the gender group	Project drive	Researcher and Research Supervisors
Occupation (Position at work)	.csv file	An interview	To understand their perspective and experience based on their position and occupation.	Project drive	Researcher and Research Supervisors
Answers to the interview questions that contain the personal experience and their opinion	.csv file	An interview	To understand what issues they experienced at work and the effect of digital tools on the work and organisational culture	Project drive	Researcher and Research Supervisors
Job title and work experience	.csv file	An interview	To understand whether their opinion differs depending on the job title and experience	Project drive	Researcher and Research Supervisors

4. How much data storage will you require during the project lifetime?

- < 250 GB

II. Documentation and data quality

5. What documentation will accompany data?

- Methodology of data collection

III. Storage and backup during research process

6. Where will the data (and code, if applicable) be stored and backed-up during the project lifetime?

- Project Storage at TU Delft

IV. Legal and ethical requirements, codes of conduct

7. Does your research involve human subjects or 3rd party datasets collected from human participants?

- Yes

8A. Will you work with personal data? (information about an identified or identifiable natural person)

*If you are not sure which option to select, ask your**Faculty Data Steward** for advice. You can also check with the **privacy website** or contact the privacy team: privacy-tud@tudelft.nl*

- Yes

The research involves interviews with various people in the construction industry. The interview aims to understand work experience in the construction industry and its impact on younger women in the industry. Moreover, the impact and role of digital tools on the work culture - whether the digital tools have a positive, neutral, or negative influence on the work/organisational culture will be examined. The interview will ask interviewees to elaborate on their work experience in the industry (education-to-work transition period, early career experience, work practice, including communication and networking, and promotion practices).

8B. Will you work with any types of confidential or classified data or code as listed below? (tick all that apply)

*If you are not sure which option to select, ask your**Faculty Data Steward** for advice.*

- No, I will not work with any confidential or classified data/code

The research collects data from a series of interviews. The interview will ask the participants to elaborate on their work experience in the construction industry and provide their opinion on implementing digital tools at work and their impact on the organisational culture in which they are involved, based on their experience and expertise. The question may direct the participants to elaborate on negative personal experiences at work. However, it will not involve sharing confidential or classified data.

9. How will ownership of the data and intellectual property rights to the data be managed?

*For projects involving commercially-sensitive research or research involving third parties, seek advice of your**Faculty Contract Manager** when answering this question. If this is not the case, you can use the example below.*

Authorised project supervisors and the research student will use and access the data during the research.

When the research is finalised, the research data will follow and respect TU Delft Research Data Framework Policy and be available in a research data repository according to the FAIR principle. The original transcript of the interviews will not be publicly shared, but some parts of the interview can be part of the thesis result and discussion.

After the interview, the transcript will be sent to the interviewee in order for them to review it. They can request to add or remove some parts within two weeks. No response will be considered as an approval of the contents in the transcript and quotation of it in the thesis. This is explicitly mentioned in the informed consent form and reminded at the end of the interview.

The documentation (thesis) will not share any personally identifiable information or personally identifiable research data. In other words, when the part of the interview is cited in the thesis, it will not identify any identifiable information of the participants. Moreover, the consent form informs the participants that the de-identified data will be used to document the thesis.

10. Which personal data will you process? Tick all that apply

- Gender, date of birth and/or age
- Other types of personal data - please explain below
- Data collected in Informed Consent form (names and email addresses)
- Signed consent forms
- Special categories of personal data (specify which): race, ethnicity, criminal offence data, political beliefs, union membership, religion, sex life, health data, biometric or genetic data

The research involves data collection of participants' names, email addresses (for administrative purposes), gender, and personal data, for instance, occupation (position at work and work experience years in construction). Besides, to get the agreement from the participants to proceed with interviews, the participants will be asked to sign the informed consent form, which includes the purpose, the process of the research, how the data will be used and processed, then their name and email address will be collected again for an administrative purpose. The collected data and informed consent form will be stored in the TU Project Drive and strictly used for administrative purposes.

Email addresses are collected to contact to schedule the interview. When the interview is arranged online, the email addresses will be used for the online meeting.

Gender and working experience years in construction are collected to compare the answers to the interview to understand how their opinions differ. The age of the research participants will not be asked.

Job titles and years of experience will be asked to understand how their opinion differs depending on the job titles and the years of experience.

Special categories of personal data may be collected from the interview, as they can be partially relevant to the interview questions. For instance, the interviewer can ask if they perceive the construction industry as being harsh on women and ask about their experience as an early career woman in the industry. But the interview question will not explicitly ask about their gender, ethnicity, sexual orientation, etc. But there is a possibility that the interviewees may reveal sensitive types of personal data while answering the interview questions.

The informed consent form and interview transcript will be stored in the project drive but separately; therefore, it cannot identify the participants by comparing the answers and personal details collected from the informed consent form. The transcript will be stored anonymously; for example, the file name will be transcript participant X and will not be linked with the informed consent form. Therefore, it is not possible to identify participants from the project drive.

11. Please list the categories of data subjects

- Early career professionals in the construction industry or recent graduates of higher education in design, engineering, and management;
- Members of a related activist group; and
- professionals in managerial, supervisory and executive roles in the construction industry.

12. Will you be sharing personal data with individuals/organisations outside of the EEA (European Economic Area)?

- No

15. What is the legal ground for personal data processing?

- Informed consent

16. Please describe the informed consent procedure you will follow:

1. The informed consent form will be created following the TU Delft Informed Consent Form guidelines.
2. When the potential participants are sorted, they will be contacted asking whether they would like to participate in the research (The potential participants will be informed of the followings:
   - Purpose of the research
   - Summary of the research
   - The procedure of the research
   - What kinds of data will be collected and processed by the researcher
3. The informed consent form will be distributed if the participants want to engage in the research. The informed consent form will be a written file. The distribution will be conducted online base (through email)

17. Where will you store the signed consent forms?

- Same storage solutions as explained in question 6

It will be stored separately with recordings and transcripts of interviews

18. Does the processing of the personal data result in a high risk to the data subjects?

If the processing of the personal data results in a high risk to the data subjects, it is required to perform a Data Protection Impact Assessment (DPIA). In order to determine if there is a high risk for the data subjects, please check if any of the options below that are applicable to the processing of the personal data during your research (check all that apply).
If two or more of the options listed below apply, you will have to complete the DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to receive support with DPIA.
If only one of the options listed below applies, your project might need a DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to get advice as to whether DPIA is necessary.
If you have any additional comments, please add them in the box below.

- Sensitive personal data
- None of the above applies

Sensitive personal data will not be explicitly asked during the interview session; however, there is a chance that the participants will reveal some of their personal data when answering interview questions.
Moreover, after consultation with the TU Delft Privacy Team, the team concluded that there is no vulnerable subjects involved in the research. (see the comment on the following question (19).

19. Did the privacy team advise you to perform a DPIA?

- No

Answer from the TU Delft Privacy Team:
Thank you for your further explanation. Based on this information and the other documentation and information you've sent to the Privacy team, my conclusion is that it is not necessary to perform a DPIA, because the processing of personal data in your project is not likely to create a high risk to the rights and freedoms of the participants. I therefore took into consideration that there are no vulnerable subjects involved in the project (the participants are not in a dependent relationship to for instance their employer). Even though sensitive personal data (like personal experience at work related to exclusion or mistreatment) and possibly special categories of personal data (like sexual orientation and ethnicity) are collected, this fact alone doesn't lead to the conclusion that a DPIA is necessary.

22. What will happen with personal research data after the end of the research project?

- Personal research data will be destroyed after the end of the research project

The personal data will be only used for administrative and research purposes and this data will be destroyed after 1 month of grading.

V. Data sharing and long-term preservation

27. Apart from personal data mentioned in question 22, will any other data be publicly shared?

- I do not work with any data other than personal data

My research contains

- personal data (gender, position at work and working experience years);
- Personal contact information, such as emails, for an administrative purposes; and
- Their career experiences and opinions

29. How will you share research data (and code), including the one mentioned in question 22?

- No data can be publicly shared - please explain below

Original research data will not be publicly shared.

VI. Data management responsibilities and resources

33. Is TU Delft the lead institution for this project?

- Yes, the only institution involved

34. If you leave TU Delft (or are unavailable), who is going to be responsible for the data resulting from this project?

My thesis committee: Paul Chan , John Heintz and Marian G.C. Bosch-Rekveld

I will make sure to inform my supervisors of the responsibility.

35. What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

4TU.ResearchData is able to archive 1TB of data per researcher per year free of charge for all TU Delft researchers. We do not expect to exceed this and therefore there are no additional costs of long term preservation.

C | DATA COLLECTION PROTOCOL

This chapter shows the data collection protocol. This study involves data collection through (1) review of previous studies and (2) semi-structured interviews. Interview protocol for each interviewees group can be found in Appendix C.2, C.3, and C.4

C.1 INTERVIEW

The semi-structured interviews, of around 45 minutes to 75 minutes, consist of 7 parts: introduction, education-to-work transit, early career experience, work practices, communication and relationship practices, promotion practices, and closing.

The structure of the interviews allows collection of coherent information from interviewees, which enables the answers to be compared on the same basis. The interview protocol involves pre-defined questions that are organised to guide respondents narrating their work experiences in order. This interview protocol includes open questions and a room for follow up questions.

Three versions of the interview protocol have been developed to make good use of the interviewees' time. The overall structure (7 parts) of the protocol remains the same for each protocol; however, minor adjustments were made to the questions depending on the positions and roles of the interviewees. Therefore, the duration of each part will differ.

C.2 INTERVIEW PROTOCOL FOR EARLY CAREER PROFES-SIONALS IN THE CONSTRUCTION INDUSTRY

PART 1: INTRODUCTION

Introduction of the interview involves sharing following information:

Brief reminder of study:
Thank you for participating in this interview. This interview is for my master's thesis with a topic of making construction industry more inclusive toward younger women who starts their career in the industry and effect of digital tools in the industry's exclusive work culture. This interview will help me to understand your experience and how the digitalisation can influence the work environment.

A reminder of the recording of the interview session:
As I informed you earlier with the informed consent form, this interview will be recorded. Can I start to record now?[1]

---

1 The recording starts from this point.

Introducing the interviewer and interviewee:
Could you introduce yourself briefly please, including your work experience years in the industry and position at work?

PART 2: EDUCATION-TO-WORK TRANSITION PERIOD

After the introduction of the interview session, the interview focuses on the education-to-work transition period of the interviewee.

Recruitment and selection practices:
1. How would you illustrate your process of entering companies, including job searching, recruitment and selection processes?

   a. How did you find vacancies - was it through online platform or informal recruitment that uses networks?

PART 3: EARLY CAREER EXPERIENCE

Early career challenge:
2. What are (were) career challenges that you faced in your early career in the construction industry so far?

   a. Did this affect your decision or intention to leave or stay in the industry?
   b. How did you overcome this challenge?
   c. Do you think digital tools have an impact on this challenge?

Training and on-boarding practices:
3. Do you think you are (were) provided a wide range of training and support to acquire work-relevant skills to promote your entry and retention to the company?

   a. If yes, could you elaborate more about the experience related to that?
   b. If not, what kind of programmes would have helped you to feel a sense of belonging to the organisation and get used to the new work environment?
   c. How these practices include digital tools? and how does it make you feel?

Work culture:
4. How would you describe work culture and environment of your company and the industry that you experienced?

   a. Does it affect your decision to leave or stay in the industry?
   b. How digital tools are engaged and connected to the work culture that you described?

PART 4: WORK PRACTICES

Engagement of digital tools in work:
5. How digital tools are engaged in your work practice?

   a. How does it have an impact on work culture in your organisation?
   b. How does it make you feel in the team or organisation?

Impact of organisational culture on digital tools:
6. How organisational culture influence on accepting the digital tools at work?

   a. What is the perception or attitude of you toward the usage of digital tools at work?
   b. Is there any resistance to use digital tools at work from your colleagues? If yes, what are the factors that make them to be resistant to the tools?
   c. How the organisational culture influences the implementation of the digital tools?

Operational roles - Allocation of positions and activities:
7. Do you think you have been allocated to positions, tasks, and projects fairly? and Why?

    a. *Do you think your work and skills and less acknowledged, therefore being offered tasks and projects that require less responsibility? Why?*

    b. *How are the performance management systems - monitors individuals' performance, assessing the training needs, and allocating development opportunities - in your organisation?*

    c. *Does it include digital tools?*

PART 5: NETWORKING PRACTICES

Communication:
8. How communication takes place at work?

    a. *Does it involve digital tools?*

    b. *What is the impact of the digital tools in communication?*

    c. *Does it have an impact on organisational culture and how do you feel in the organisation?*

Networking practices:
9. How is the informal and formal networking taking place in your company?

    a. *How digital tools are engaged in theses networking practices? and what is the impact of it?*

    b. *How does it influence the work culture and work practices?*

PART 6: CLOSING

Summary of the discussion and reminder of transcript:
Thank you for your answers. [Summary of the interview]
I will send you the transcript of the interview, so you can reach me out in case you want to add or not sure about some parts within two weeks.

Lastly, the following question will be asked before closing:
Do you consider that there is any other person who I can talk to obtain more insight about the work experience in construction? Whom?

C.3   INTERVIEW PROTOCOL FOR PROFESSIONALS IN EXECUTIVE, MANAGERIAL, OR SUPERVISORY ROLE IN THE CONSTRUCTION INDUSTRY

PART 1: INTRODUCTION

Introduction of the interview involves sharing following information:

Brief reminder of study:
Thank you for participating in this interview. This interview is for my master's thesis with a topic of making construction industry more inclusive toward younger women who starts their career in the industry and effect of digital tools in the industry's exclusive work culture. This interview will help me to understand your experience and how the digitalisation can

influence the work environment.

A reminder of the recording of the interview session:
As I informed you earlier with the informed consent form, this interview will be recorded. Can I start to record now?

Introducing the interviewer and interviewee:
Could you introduce yourself briefly please, including your work experience years in the industry and position at work?

PART 2: WORK PRACTICES

As the interview aims to understand what affects younger female employees' decision to stay in construction, the interviewees with longer work experience years will not discuss their education-to-work transition period and early career experience.

Work culture:
1. How would you describe work culture and environment of your company and the industry that you experienced?

    a. Did it affect your decision or intention to leave or stay in the industry?
    b. What was (is) your career challenges?
    c. How did you overcome with this?

Digital tools:
2. How digital tools are involved in work activities?

    a. How has it been changed throughout your career? Was there any change in tasks and occupation?
    b. Does it affect organisational culture that you mentioned before?
    c. What is your opinion on this change, or do you have special experience related to this change?

3. How does organisational culture influence on the acceptance of digital tools at work?

    a. What is the perception or attitude of employees toward the usage of digital tools at work?
    b. What is the reaction of employees toward using digital tools at work?
    c. Is there any resistance to using digital tools practices at work from the employees?

PART 3: NETWORKING PRACTICES

Communication:
4. How communication takes place at work?

    a. Does it involve digital tools?
    b. What is the impact of the digital tools in communication?
    c. Does it have an impact on organisational culture, for instance, how people behave and treat each other?

Networking practices:
5. How is the informal and formal networking taking place at work?

    a. How digital tools are implemented in this informal/formal networking and what is the impact of it?

b. *If the digital tools are not engaged, how can it be engaged in the networking practices?*

c. *How doe it influence the work culture and work practices?*

PART 4: PROMOTION

Development and Operational role - allocation of positions and activities:
6. How do you allocate your team members to positions and projects? What are the factors that you consider?

a. *How do you monitor and assess the performance of your team members? (How are the **performance management system** in your organisation?*

PART 5: CLOSING

Summary of the discussion and reminder of transcript:
Thank you for your answers. [Summary of the interview]
I will send you the transcript of the interview, so you can reach me out in case you want to add or not sure about some parts within two weeks.

Lastly, the following question will be asked before closing:
Do you consider that there is any other person who I can talk to obtain more insight about the work experience in construction? Whom?

C.4 INTERVIEW PROTOCOL FOR MEMBERS OF A RELATED TOPIC ACTIVIST GROUP

PART 1: INTRODUCTION

Introduction of the interview involves sharing following information:

Brief reminder of study:
Thank you for participating in this interview. This interview is for my master's thesis with a topic of making construction industry more inclusive toward younger women who starts their career in the industry and effect of digital tools in the industry's exclusive work culture. This interview will help me to understand your experience and how the digitalisation can influence the work environment.

A reminder of the recording of the interview session:
As I informed you earlier with the informed consent form, this interview will be recorded. Can I start to record now?[2]

Introducing the interviewer and interviewee:
Could you introduce yourself briefly please? If you have a work experience in construction, could you tell me how many years of work experience you have and what is (was) your position?

PART 2: EUDCATION-TO-WORK TRANSITION PERIOD

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[2] The recording starts from this point.

Recruitment and selection practices:

1. How are the recruitment and selection practices taken place in the construction industry?

    a. How do people find vacancies - is it through onlibe platform or infomal recruitment?

PART 3: EARLY CAREER EXPERIENCE

Career challenges:

2. What are the common challenges that are faced in early careers in the construction industry as a woman?

Traineeship and onboarding practices:

    3. How are training takes place, when new employees enter companies?

Work culture:

4. How would you describe work culture and environment of the industry?

    a. How does it affect the decision of employees in the sector?
    b. What can be done to improve the work culture and environment? and can it include digital tools?

PART 4: WORK PRACTICES

Operational roles - allocation of positions and activities:

5. How are the performance management systems in the industry in general?

Digital tools:

6. What is the trend of usage of digital tools at work in the industry?

    a. How does it affect work activities?
    b. Does it have an impact on work culture (people's perception, behaviour, and attitude)?

PART 5: NETWORKING PRACTICES

Communication practices:

7. How communication takes place in the industry? and what is the impact of these practices in the organisational culture?

Networking practices:

8. How do informal and formal networking take place?

    a. Does it include digital tools?
    b. How does it affect organisational culture of the industry?

PART 6: PROMOTION

9. How are promotion practices taken place in general?

    a. How are employees' performance monitored in general?
    b. How career development opportunities are provided to the employees?

PART 5: CLOSING

Summary of the discussion and reminder of transcript:
Thank you for your answers. [Summary of the interview]
I will send you the transcript of the interview, so you can reach me out in case you want to add or not sure about some parts within two weeks.

Lastly, the following question will be asked before closing:
Do you consider that there is any other person who I can talk to obtain more insight about the work experience in construction? Whom?