

Turnover or Connection? The Influence of Employability Competencies Development
Programs of Engineering Professionals on their Relationship with their Company

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EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Abstract

As a result of globalization, the increasing needs in the engineering field is dynamically changing faster than ever. Academic degrees alone are becoming insufficient and engineering professionals are demanded by employers to broaden their competencies. The development of employability competencies could satisfy these increasing needs. However, employable professionals may become more attractive for other companies as well, potentially leading to higher turnover. This study aims to explore how engineering professionals develop employability competencies and what turnover intentions they engage in as a result of a competence development program. An instrumental case study design was used with the Architecture Competence Development Program as the case. Semi-structured interviews were held with open-ended questions to explore the participants' experience and perceptions of employability competence development. Findings revealed that the relation between the development of employability and potential turnover intentions involves one's interpretation of the opportunities for employability development by their employer. Furthermore, findings indicated that employability competencies are primarily developed through gaining work experience. Nevertheless, training programs add value by expediting the process of gaining experience and facilitating formal and informal networks. Therefore, for most respondents, participation in the training program has enhanced the employee-employer bond, reducing their intentions to leave.

Key words: Employability, Professional Competencies, Engineering, System Architects, Turnover Intentions, Training Programs

Introduction

Employees are nowadays working in a global society, where global interdependence and inequalities cannot be ignored. Awareness of this globalized world has increased the curiosity of employees about their role in a global society. Travelling across the globe for the job has become mundane, knowledge and news can be accessed on demand and communicating with overseas colleagues using internet platforms has become more and more normal (Kulkarni & Chachadi, 2014). This phenomenon, described as globalization, brings in new challenges that organizations have to contend including increased competition among organizations and fast-changing environments (Hatzichronoglou, 1996). As organizations compete on an international level, they need to alter their strategies and demand employees who are flexibly able to broaden and adapt their range of knowledge, skills, and attitudes. (Kulkarni & Chachadi, 2014).

This especially applies to the field of engineering wherein organizations demand such people that are employable (Sparks & Waits, 2011). Engineering is a profession directed towards the skilled application of a peculiar body of knowledge based on mathematics, science, and technology, in business and management. This is acquired through education and professional formation in a specific engineering discipline (Rees et al., 2006). Technical professionals are employees whose work are primarily regulated by their expertise, rather than a routine or system (Kochanski & Ledford, 2001). In short, technical professionals include most types of engineers and architects (Kochanski & Ledford, 2001). Moreover, engineering is an incredibly fast-changing industry, and employees are nowadays confronted with more challenges and competitions in getting employed compared to those of prior decades. Mohammad et al. (2004) point out that because of globalization excellent academic degrees alone are becoming insufficient, as employers require potential engineers with professional competencies and generic skills that are not taught in formal education.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Therefore, it is necessary to prepare today's engineers for the world of tomorrow. In engineering, this demands employees with broader competencies other than technical skills, such as understanding their professional, social, and ethical responsibilities (Zaharim et al., 2009).

The involvement of these broader competencies is designated as employability. In the literature, employability is often used as a broad container term (Craps et al., 2017) and researched in diverse disciplines (e.g. economics, psychology, and healthcare), arising different interpretations and definitions (Forrier & Sels, 2003). Employability in any discipline involves how individuals seize opportunities and reflect on their skills and competencies (Markes, 2006). Employability in this study is defined as competencies that consist of necessary sets of knowledge, skills, abilities, and attitudes for the successful completion of professional tasks, which employers require to be delivered by the personnel whom they employ (Lazarus 2016). One must be able to demonstrate these employability competencies to obtain or retain their job titles (Hillage & Pollard, 1998). Employable employees possess up-to-date knowledge, skills, and the capabilities to keep developing their expertise (Thijssen et al., 2008). It is beneficial for employees to keep improving their employability competencies, as this provides assurance to be employed (Nelissen et al., 2016).

Employers, however, run the risk of losing their employees to competitor employers because of the broad applicable competencies and skills of these employable employees. Therefore, enhancing the employability of employees is not without risks. Increased employability could lead to an increase in turnover (De Cuyper & De Witte, 2011). Accordingly, for employers the dilemma arises whether to invest in the employability of their employees or not. Improving employability could be beneficial for the employer on the one hand. This is because when employability competencies are adequately applied in work, this

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

could improve job performance and eventually benefit the organization (Rahmat et al., 2017). However, on the other hand employers also run the risk of losing their skilled personnel to the competitor if these employees decide to apply their competencies elsewhere (De Cuyper & De Witte, 2011). This dilemma complicates the decision of employers on how they organize investments in their employees' employability. Both findings and theoretical arguments of literature for either sides, however, is not only inconsistent but also scarce.

Having elucidated the growing global organizational need for adequate employability competencies in engineering and its arising complicated dilemma for employers, it is worthwhile to address another issue in employability research. Teijeiro et al. (2013) reveal that there is a gap between acquired graduate engineer competencies via their institution and those required by employers. The development of employability competencies in the education sector has currently primarily focused on the attributes required by graduates to meet challenges of the labor market and the perspectives of already employed engineers are rather limited (Quintini, 2011). This study attempts to overcome this gap and explores employability competencies from the perspectives of experienced engineering professions. Moreover, regarding the earlier mentioned employer's dilemma of employability, this study aims to explore how the development of employability competencies relate to the relationship between the employees and their companies within the area of engineering.

Theoretical Framework

Employability competencies

In engineering, employability competencies are highly related to non-technical competencies (Winberg et al., 2018). According to Zaharim et al. (2009) the three most agreed essential employability competencies are communication, problem-solving and interpersonal skills. Additionally, according to Kaewunruen (2017) lifelong learning and according to Lazarus (2016) self-responsibility also are essential for developing

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

employability. Together these competencies are crucial for both new entry engineers and experienced engineers to be successful in their profession. Accordingly, there is abundant evidence that employability skills have much impact on the capabilities of new entry-level job applicants to get a job (Zaharim et al., 2009). Moreover, Gokuladas (2010) reveals that the performance of students in non-technical education was a better predictor of employability than the obtained grade of these students in technical education. This implies that engineering professionals of the present need to be multidisciplinary, which requires both technical and non-technical competencies, to be successfully employed.

Employability competencies can be learned through diverse educational programs (Van der Heijden et al., 2009). In graduate engineering education at universities the non-technical competencies are progressively gaining more consideration to be included additionally to the technical competencies (Zaharim et al., 2009). For engineering professionals these competencies can be taught in training programs to stay current (Mourtos, 2003), which provide a combination of certain learning activities. Assorted learning activities comprise case studies (using real-life problems), collaborative learning (interdisciplinary teamwork and group presentations), and flipped classes (problem-solving and problem-based learning) (Kahn & O'Rourke, 2005). Therefore, an assumption of this study is that training programs expedites the development of employability competencies for already employed professionals. In the following part, five important employability competencies in engineering which emerged from this literature review will be described in detail. These competencies serve as the baseline for the operationalization of employability in this study. It is assumed that when an engineering professional masters these competencies, he or she can be perceived as employable.

Problem-solving

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Problem-solving requires learners to use the gained knowledge and propose solutions based on their understanding of the problem. This ability involves several processes: identification of problems, presentation of problems, selection of strategy, strategy implementation, and result assessment (Hwang et al., 2015). To complete the processes, good analytical and judging abilities are needed. Problem-solving is therefore a higher-order thinking skill, which comprises the ability to think, reason, and make sensible decisions, and is a valuable asset for improving one's employability (Robinson, 2000). After assessing the results, learners should be able to explain their thinking logic (Eggen & Kauchak, 2015), which relates to the necessity of adequate communication skills.

Communication

Communication is the base element of every form of human interaction and refers to the competence of presenting and exchanging ideas with others and making reflections consequently (Hwang et al., 2015). For employability, proper communication abilities enable one to express his thoughts for his intentions to be interpreted accurately by others. Effective communication enables one to establish and maintain both personal and professional relations successfully (Bharathi, 2016). For engineers, this allows them to not only to communicate effectively with other engineers but also with community at large (Zaharim et al., 2009) which improves their employability.

Interpersonal skills

Interpersonal skills are the abilities to function effectively as an individual and as a group member with the capacity to be a leader or manager as well as an effective team member (Zaharim et al., 2009). It includes the qualities and behaviors that are expressed when people interact and accordingly build relationships with one another. Interpersonal skills help in dealing with people of any kind (e.g. aggressive, unhappy, or complicated) (Mishra, 2014), and those who possess these skills are able to work productively in teams (Rasul et al., 2012).

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Employees with good interpersonal skills understand the company's strategies and expectations from them to achieve the desired goals, hence, adding value to the organization. Therefore, employers prefer candidates who possess interpersonal skills (Mishra, 2014).

Lifelong learning

Lifelong learning is a form of continuous personal development. It constitutes of the recognition of the need for lifelong learning and the ability to engage in lifelong learning (Mourtos, 2003). It involves being autonomous, with the purpose of achieving personal fulfillment, and comprises the view that everyone should be able, motivated and actively encouraged to learn throughout life (McKenzie & Wurzburg, 1997). Lifelong learning implies that individual employees become more accountable for investments in their own human capital, thus making learning an important endeavor for all employees throughout their careers (Van der Heijden et al., 2009). This is important for engineering because technologies change regularly and an engineering project is eminently complex and multidisciplinary (Kaewunruen, 2017). Therefore, engineering professionals who acknowledge and engage in lifelong learning increase their employability.

Self-responsibility

Self-responsibility in competence development stimulates the development of the ability to reflect on the employee's current position in the labor market. As a result of reflection, weaknesses can be addressed, and personal approaches can be formed to improve these weaknesses. This leads to the individual to become an independent learner, who knows what competencies he still needs to work on and what competencies are already possessed (Lazarus, 2016). Furthermore, self-responsibility comprises the different curiosities of an individual accepting the responsibility. The individual thus has ownership of action within the competencies development and therefore can decide which competencies are still lacking and subsequently accept the consequences of intentional change (Ciechanowska, 2011).

Employability and Turnover intentions

As employees increase their employability, they also become more attractive to other organizations or employers. An employable employee is more likely to leave for a perceived better job offer than an employee with less employability (Acikgoz et al., 2016). This occurrence is entitled as the turnover intention, which is the conscious and deliberate willingness to leave an organization for any reason (Tett & Meyer, 1993). Employability provides job alternatives to employees because these employees possess a high number of skills and knowledge. This creates more opportunities for highly skilled employees to move easier between different jobs, as they may become more suitable for the external labor market (Van der Vaart et al., 2015). This view is also supported by Benson (2006) who states that the marketability of employees increases for which reason they can easily switch between employers. This would be disadvantageous for employers because if these employees leave, they take with them their valuable expertise and knowledge, which consequently can lower the organizational value (Luftman & Ben-Zvi, 2010). Trevor (2001) additionally found that if highly skilled employees perceive that their organization is providing insufficient opportunities than what they expected, or their options is unaligned to their career goals, they will move to the competitor. Besides, Harden et al. (2016) another remarkable reason for one to leave the organization is perceived high workload. This could be explained since employees who cannot finish their frequently assigned tasks within a normal work week are highly probable to leave. Furthermore, Harden et al. (2016) showed that when employees earn perceived fair rewards (e.g., bonuses, special recognition) to the extent of their performance, they are less likely to leave the organization.

Purpose

As mentioned earlier in the introduction, current research focuses mainly on graduate students and aim to bring about changes in the curriculum of engineering and architecting

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

education. This study builds upon previous literature by focusing on the perspectives of those who are already employed and are bound to adapt to the changing needs of their companies. Furthermore, addressing the inconsistency in literature regarding the employer's dilemma of employability, this study aims to create a better understanding of how employability competencies can be developed and how this relates to potential turnover intentions, specifically for engineering professionals. Therefore, the main research question that will lead this study is:

How do employability competencies of engineering professionals relate to turnover intentions?

Methods

Research Design

To answer the research question, a case study research design is used. Case study research is a qualitative approach that describes in-depth how things are at a particular place and time to allow the reader to gain an experiential understanding of a specific phenomenon (Yin, 2018). According to Stake (1995), an instrumental case study allows the researcher to gain an insider's view of a phenomenon. Here, cases are instrumental and used to understand a broader phenomenon (Bryman & Bell, 2013). Therefore, the instrumental case study design is selected because the researcher wishes to understand the development of employability competencies of engineering professionals that have followed a competence development program and to examine their notions of employability competencies.

The Architecture Competence Development Program provided by strategic research group ESI of the research institute TNO was selected for this case study because it offers professional development training in becoming multidisciplinary in the engineering field. It is, therefore, a suitable example of a well-developed employability training. In the program, partakers learn professional competencies that are relevant for employability competence

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

development in the engineering field. Such competencies include system thinking and architectural competencies, personal and social leadership skills, and interpersonal networking with other system architects and senior stakeholders. Partakers have dedicated 9-12 months to complete the program. During this time partakers were tasked to work on a case based on a real-world problem. The professional competencies that partakers have learned and developed highly relate to the elaborated employability competencies, which could increase their opportunities to leave. Therefore, the Architecture Competence Development Program is a suitable case for this case study.

Participants and Recruitment

Purposeful sampling was used to approach potential participants. Sampling is the deliberate selection of the most appropriate participants to include in this study, and it is crucial for the attainment of rigor (Bryman, 2015). In the purposeful sample, the researcher actively selects the most productive sample to answer the research question (Marshall, 1996). Purposive samples may be prone to researcher bias. However, this study aims to circumvent this by making judgments based on clear criteria (Sharma, 2017).

There were three criteria for participant selection. The first was that participants had to have followed the architecture competence development program, of which it is assumed based on the theoretical framework the program increased their employability. Hence, these professionals could provide their perspectives on their increased employability and increased opportunities to leave. The second criterium was that participants had made the transition from a mono-disciplinary engineer to a higher level multi-disciplinary systems engineer. Systems engineers differ from mono-disciplinary engineers as they fulfill engineering management responsibilities additionally to their engineering responsibilities. This way, the increased employability of these professionals is evident. The last acquisitive selection criterium was to include engineering professionals who had left their company after

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

participating in the program. The reason why is that these professionals could provide specific reasons for their resignation. These selection criteria allow the researcher to select a group of participants who are suitable for this study and who are able to collectively help answer the research question.

All participants were engineering professionals, who have followed the program between 2008 and 2019. The rationale was to reach data saturation and when this was achieved, data collection was halted. Data saturation refers to the point in the research process when no new information is detected in data analysis, which signals to researchers that data collection may terminate (Faulkner & Trotter, 2017). Accordingly, after several iterative invitations, 15 professionals responded. Finally, there were two no-shows at the moments the interviews were planned to be held. Thus, 13 professionals participated in the current study. Nevertheless, it is assumed that data saturation is reached as no new information was observed after the eighth interview. Characteristics of the participants can be found in Appendix A. Additionally, thick descriptions of the participants can be found in Appendix A.

Former partakers of the Architecture Competencies Development Program were approached to participate in this study. Recruitment for the individual interviews was done through a contact person at five different participating engineering companies. All companies are characterized as large companies, employing more than 2500 workers. Via e-mail, participants for this study were recruited. First, information letters about the inquiry were shared among all engineering professionals who have partaken in the program. The information letters include the request to leave contact information when a professional is interested. Participation in this inquiry is therefore voluntary. After the Institutional Board Review approved the research protocol, informed consent documentation was sent to interested participants. After that, the researcher contacted the interested individuals to schedule and conduct an interview.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Data collection and Protocol

Before the start of data collection, an initial tree diagram of the interview guide has been formed (Appendix B). The goal of a first draft was to evaluate whether the formulated questions were straightforward and apprehensible. Feedback from the supervisor and fellow researchers were received, and the adaptations were applied (See Appendix C).

Interviews with all participants were individually conducted, audiotaped, and transcribed verbatim once. The interviews were held online via Microsoft Teams in April and May 2021 and with only the researcher. The interviews lasted no more than 55 minutes. Additionally, interviews were semi-structured and followed an interview guide flexibly enough, allowing it to evolve if necessary. Questions were open-ended and solicit experiences and perceptions of engineering professionals about the case. In the interview, the defined subjects and underlying interview questions were based on the concepts of the theoretical framework and linked with the architecture program. The interview guide can be found in appendix C.

The individual interviews are in-depth and meant to be a personal and intimate encounter in which open, direct, verbal questions were used to elicit detailed narratives and stories. The nature of semi-structured interviews allows the researcher to move through the interview guide, adapting to what the participant tells and ask relevant questions flexibly. Therefore, the interviews enable the researcher to co-create meaning with interviewees for employability competencies by reconstructing perceptions of certain events and experiences related to the program (DiCicco-Bloom & Crabtree, 2006). This is desired because by conversing and asking additional questions, any relations between employability competencies and any turnover intentions according to the engineering professional can be researched.

Topic List

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

The interview questions were formulated according to the topics of employability and turnover intentions, as illustrated in the tree diagram in Appendix A. The interview guide is based on this tree diagram, which is used to conduct the interviews (See Appendix C). The interview guide consists of five parts: background information, reminiscing the program, employability competencies, turnover intentions, and wrapping up.

Part 1 describes the background information of the participant. Part 2 helps the participant to remember the program and dig up accompanying experiences. This also helps the participant to link the subsequent questions to the program. Part 3, the topic of employability, is an operational application of the interview questions of the employability skills framework (PCRN: Employability Skills, 2018). First, the framework has been categorized into the five concepts of the theoretical framework. After that, the sample interview questions provided by this framework were adapted to suit the context of the current study. Adaptations include selecting and rephrasing relevant questions to fit the contexts and situations of an engineering professional. In this process, some questions were left out as they overlapped with other questions. For part 4, turnover intentions, the interview questions were retrieved from Eastgate (2015). It is assumed that these questions are adequate, as professors at the Massey University critiqued them whether the areas of turnover intentions are covered. Subsequently, the questions were categorized into the three concepts of turnover intentions from the theoretical framework. Part 5 is the completion phase of the interview and allows the participant to add information.

Analysis

After gathering and transcribing data, template analysis was started using Nvivo software. Template analysis is a form of thematic analysis in which the development of a template is key (Brooks et al., 2015). In template analysis, balance is sought between a high degree of structure and flexibility to fit particular research needs. In this approach, the

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

researcher is encouraged to develop themes about emerging concepts of which the data is richest. This way, exclusion of themes can be circumvented, which is less likely if themes are determined beforehand based on concepts coming from the literature review (Boeije, 2010). The topics of the tree diagram (Appendix I) were used to organize data per part of the interview, consequently adding structure to the data.

First, three interviews have been read to become familiar with the data (Brooks et al., 2015; Fereday & Muir-Cochrane, 2006). Secondly, all text sections of these interviews were assigned a code, each containing the main theme of the corresponding section. If a subsequent text section fitted to an existing code, this section was added. Otherwise, a new code was formed. After all transcripts have been coded this way, similar identified codes that related to a broader theme have been grouped together. An initial template has been crafted (See Appendix F). It was noticed that the initial template was too categorized according to the pre-formulated topics from the theoretical framework. Therefore, the initial names of categories comprising similar codes were dismissed, and an approach closer to the data has been undertaken. Major changes were made, adding more themes to the template (See Appendix G). This definitive template has been used to interpret the data in the Findings section below. The modifications in the initial template can be found in Appendix H.

Lastly, efforts to optimize the quality and validity of the analysis will be described. Since the researcher subjectively executes qualitative research, transparency is an essential overarching facet in demonstrating the quality of the study (Treharne & Riggs, 2015). There are five criteria for ensuring quality in qualitative research: credibility, transferability, dependability, confirmability, and reflexivity (Lincoln & Guba, 1985; in Korstjens & Moser, 2017). In this study, how these criteria are ensured is described as follows.

Credibility. Credibility is ensured by adding member checks. Participants received their transcripts via e-mail and were asked whether all data could be used for analysis,

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

whether personal information was anonymized sufficiently and whether there were other comments. One participant noticed a few typing errors, and another participant added a comment to the transcript to ensure his message was clear. After these adjustments have been applied, all participants agreed with the data.

Transferability. Transferability is optimized by providing a thick description of the companies and the research process for contextualizing the experiences of the participants, to enable the reader to assess whether the findings of the study are transferable to their own setting (Tracy, 2010).

Dependability and reflexivity. Dependability is established by describing modifications in the interview guidelines (Appendix C) and the development of the final template (Appendix H). This provides insight and transparency in how and which choices have been made during the research process. Similarly, reflexivity is ensured by supplementing the interview transcriptions and codings with reflexive notes by the researcher, helping to delineate the pre-conceived assumptions the researcher brings to this study (Korstjens & Moser, 2017).

Confirmability. Confirmability can be enhanced by lowering investigator bias and considering the contexts of the participants and organizations (Guba & Lincoln, 1989; in Korstjens & Moser, 2017). Therefore, investigator triangulation is used to lower investigator effects such as researcher bias (Jonsen & Jehn, 2009). Considering the investigator triangulation, a peer debrief by a fellow researcher was used. Furthermore, audio files have been transcribed as literally as possible, and no pre-defined codes are used to circumvent influencing the process of the researcher's data analysis in advance.

Findings

The following section presents the findings of the current study. Each theme that was identified in the data analysis is clarified by illustrating differences and similarities between

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

what respondents have told. Appendix I provides a table with the number of participants that substantiated particular statements. Some quotes that are used as examples were translated into English. The original quotes in Dutch can be found in Appendix J.

Employability Competencies

According to the interviewees, the most important competencies to function well in their job are soft skills, leadership, systems thinking, reflection, stakeholder management, problem-solving skills, organizational skills, and technical skills. An extensive description of the employability competencies as defined by the participants can be found in Appendix K. The surfacing finding regarding employability competencies is that for executing the complex role of a system architect, an integrated approach of multiple competencies simultaneously is involved. One interviewee could exemplify the complex role of a system architect:

P9: "Print quality is determined by all kinds of design choices throughout the entire device. And so my role is to make the design choices so that everything together works so well, the quality is at a certain level. [...] Look, we have certain structures for that, of course. We have a project organization and [...] I am responsible for print quality, but that is realized by different parts in the device that have to work together in the right way. [...] And you need the architect to think about that: what things are these parts? What does our long-term space look like? What is the roadmap? What improvements do we need to make in the next few years? And what technology do we need to do that? Well and that's one of the important roles of the architect."

Development of Employability Competencies

In all cases, the interviewees expressed that developing employability competencies is mainly done by gaining practical experience by executing work activities. It is this experience

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

which ultimately develops and forms the system architect as an engineering professional. The role of an architect is diverse and revolves around many different stakeholders and organizational processes, leading to countless situations with different complex problems.

One interviewee illustrated this by saying:

P11: “Of course, something is experience. Yeah, I guess not. You cannot say I have studied engineering and now I'm an architect. So so you have to you need some experience. Not so as a developer in the company. [...] you have to try them (referring to competencies) in in real life. Because it's always subject different.”

This was also remarked by other interviewees that stated they would have been in the same architecture role if they had not followed the program, albeit a longer road and a road with more obstacles. One interviewee added that for someone to function well in their architecting role, it also relies on their intuition.

Although development of competencies is mainly done by gaining work experience, most interviewees would recommend every domain architect to follow the program to help them grow to become a system architect. An important reason for this is that the program is beneficial to boost and facilitate the development into a system architect by providing methods and content models as helpful tools which partakers can apply in their work life. Also, the program emersed partakers into complex realistic case problems by assigning a tough task, which forced the partakers to reflect on their priorities and learned them valuable insights of themselves and their professional role. Because the assignment could be executed in a safe learning environment, meaning that it would not affect the company, partakers were able to challenge themselves and each other in ways they would not be able to in their regular work life.

Employability Competencies and Turnover intentions

Two interviewees expressed that participation in the program influenced their desire to leave the company. They said that experiencing non-technical problems and a broader view on system architecting outside the technical scope of their own company, has started a reflection on their current position in relation to their career ambitions. Therefore, the program has inspired them to look outside their architecting scope. One interviewee said the following about the influence of participation in the program on his desire to leave the company and seek a job that suits his ambitions:

P3: “Yeah, it did. I think that [program] was one of the starting points. Like I said a bit earlier, where I would be, you know, less interested in some details and more interested in a more global picture. And taking some distance from the pure technical side of technology, and turning my interest towards more like, a bigger and bigger environment. Yeah. Just like it took time also to digest all this. You know, but that [program] definitely started this reflection.”

However, in most cases, the informants conveyed that participation in the program reinforced their relationship with the company, contributing to the contentment of their job position. A big advantage of participating in such programs is that it expands the networks of partaking architects, both formal and informal. In the program, partakers had to work on a big assignment that involved discussing and presenting to the CEO and heads of departments of the companies. This way formal networks with their people higher up in the organization were facilitated. Besides, partakers were involved in team building activities and in that way were able to connect, stimulating the informal networks. One interviewee told the following:

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

P10: “The advantage of these kinds of programs, and certainly within a company like [Company 2], is generally that you get a network. The people you've sat there with, you've had a beer with at the campfire at night. You know what their family life is like, you know if they own a dog or a cat. You know all of those kinds of things and in a big company like [Company 2] that's extremely valuable.”

This person remarked that participating in such programs is valuable for expanding his informal networks, which could be rewarding for both a big company as well as the employees. Stimulating informal networks would contribute to amicable connections between employees, which could increase their devotion to the company. Another interviewee said the following: P11: “The CEO went by also also some other managers went by this, business unit manager was there. So, the company invests and takes care of their employees. And that generates some some connection between me and the company.” This interviewee expressed that because some of his higher-ups dedicated their time to come by, consequently him feeling appreciated by the company. The stimulation of these formal networks, therefore, contributes to this person’s job satisfaction.

Another way of how participation in the program has reinforced the bond with the company is by simply being selected to participate in these programs. Interviewees were aware of the costs that the company was ready to invest in them by buying the program. Furthermore, the company only selects talented people and those who have potencies to grow further in their roles. These aspects have led to interviewees experiencing feelings of appreciation by their companies.

Other factors separate from participation in the program that contribute to the subjective job satisfaction of the interviewees involves high degree of autonomy, colleagues, a pleasant organizational culture, challenging and varied job tasks, sufficient opportunities for

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

professional development and the company's sufficient effort to support solutions to workload issues. Generally, interviewees shared the opinion that these aspects support their enjoyment of their job roles. Interestingly, the interviewees who experienced these aspects negatively are the ones who held turnover intentions. For example, one interviewee said the following:

P2: "On the other hand, (the company) does not invest enough in employees. The fact that the company neglects me in my own development. In fact, sometimes I have more of the idea, that it doesn't matter what I do. It is not recognized, and I am not rewarded on if I go, too far (If I perform very well). Or so yes."

This participant experienced insufficient opportunities for professional development. The aforementioned plays a role in his discontentment with his current company and he would leave for another company offering the same job and salary elsewhere without hesitation. This implies that when companies suffice in these aspects according to their employees, the employees experience a degree of contentment to stay.

Discussion

Conclusion

The purpose of the current study is to create a better understanding of how employability competencies of engineering professionals can be developed and how this relates to any turnover intentions. This study therefore sought to answer the following research question: *How do employability competencies of engineering professionals relate to turnover intentions?* The findings revealed that the relation between the development of employability competencies and either an increase or reduction of turnover intentions

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

involves one's perception of the opportunities for employability development by their companies.

Generally, what came to the fore in the interviews was that participation in the program did not prompt turnover intentions. In most cases, respondents expressed that participation in the program has strengthened their relationship with their companies. That is to say as participation in the program has primarily expanded both formal and informal networks within the company. The expansion of networks stimulated mutual acquaintanceships between participants and fellow partakers, and between participants and higher-ups. Furthermore, by being selected to partake in the program, participants felt valued and trusted by their company. This reinforced the bond between the participant and their company. With respect to these justifications, the participant was unlikely to develop turnover intentions after participation in the program.

In a few cases, participation in the program has induced turnover intentions. However, the turnover intentions have not been prompted by the competencies learned in the program. But instead, the program incited a reflection on the respondents' current job positions relative to their career ambitions and interests. The program has introduced them to a broader world outside their technical scope, which has inspired them to look further.

Another finding of this study concerns the assumption on how employability competencies are developed. What came to the fore in the interviews was that employability competencies are primarily developed by gaining practical work experience. The role of an architect is highly autonomous and dependent on lots of factors, by which how one arranges this role and performs is considerably intuitive and personal. Nevertheless, according to the respondents training programs provide employees with helpful tools and valuable learning experiences in a safe environment where mistakes are allowed. Hence, training programs add

value in the sense that trainings can facilitate and stimulate the gain of work experience through the course of learning activities.

Theoretical implications

The remaining part of this thesis will first give explanations for the findings of the current study, substantiated by theory. Subsequently, the findings that could not be explained by theory are elaborated, after which the limitations of this study and suggestions for future work are examined. Lastly, practical implications of this study for policy practitioners and HR departments of organizations are proposed.

First of all, the findings indicated that participation in the program has expanded formal networks. This way of developing social networks is a form that contributes to the company's social capital. The stimulation of formal networks is a way to provide strong intraorganizational networks, which contribute to job contentment on social aspects of organizational life, reducing turnover intention (Moynihan & Pandey, 2007). This is because employees who perceive they have a high level of support from their colleagues and feel a sense of obligation toward their higher-ups are less likely to express turnover intention. (Moynihan & Pandey, 2007).

Secondly, respondents also expressed that participation expanded their informal networks in the company. A possible explanation for this is that informal networks in the workplace have an effect of bringing members closer together (Mossholder et al., 2005). Those who build a greater number of ties with their colleagues become more embedded in the organization and are more likely to be able to relate themselves with those around them (Burt, 2001). Therefore, having informal connections with colleagues may promote its part to job contentment (Soltis et al., 2013).

Thirdly, the findings indicated that selection to partake enhanced the mutual trust between these respondents and their companies, improving the respondent's devotion to work

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

for their company. This is in line with another study (Bulut & Culha, 2010) which found that organizational commitment was increased after participation in training programs. The explanation for this is that employees view an effective training experience as an indication that the organization is willing to invest in them and cares about them (Chiang & Jang, 2008). Besides, respondents expressed that selection by their managers to partake in the program felt rewarding, as only those with sufficient potency are picked. This could have increased the respondent's perceived access to training programs (Bartlett & Kang, 2004), contributing to their increased organizational commitment and job contentment.

The Employability Paradox

The relation between employability and turnover intentions as discussed in the theoretical framework and as discussed in the findings above are inconsistent with each other. This contradiction also exists in academic literature and is entitled as the employability paradox. What is primarily discussed in the literature review are the assumptions that increased employability, also increases the marketability of employees, making them suitable for the external labor market (Benson, 2006; Trevor, 2001; Van der Vaart et al., 2015). It was initially thought that this could consequently result in an increased risk of turnover for employers. Reconsidering this line of reasoning afterwards, this view follows the logic of the human capital theory, which has its focal points on individual resources and the contribution of individuals' investments in competencies (Becker, 1993; in Berntson et al., 2006).

The relation between employability and turnover intentions as emerged in the findings of this study, however, mainly illuminates the reduction of turnover intentions as a result of company investments in employability. An explanation for this is that organizational commitment plays a preeminent role in the relationship between employability and turnover intention. The reason for this is that the more committed an employee becomes to the organization, the less likely this employee is to develop intentions to leave (Johnson et al.,

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

2009). This line of reasoning is conforming to the social exchange theory, which asserts that commitment to the organization increases when the organization invests in the employee's employability. That is to say because the employee feels the desire to retaliate these investments (Eisenberger et al., 1986). As respondents expressed, they felt valued by having the opportunity to follow the program, which was a big investment of their companies. Hence, the perceived organizational support of the respondents increased, subsequently increasing their commitment to the organization (Cropanzano & Mitchell, 2005).

What remains uncovered by the employability paradox literature is the finding of the respondents that expressed they had intentions to leave after participating in the program. The reason for their turnover intentions were not the employability competencies per se but rather by experiencing a wider scope, the program ignited a reflection on their personal interests and desires in relation to their career ambitions. This finding cannot be explained by either the human capital theory or the social exchange theory on employability.

Limitations

The scope of this study was limited in terms of recruiting engineering professionals from small and medium-sized engineering companies. This study only involved participants from big engineering companies, which are presently still increasing in size. Therefore, this study includes the experiences of those who are impacted by growing and big companies. An advantage that big organizations have pertaining to smaller ones is that they can afford educational departments and offer significant investments in training programs. In contrast, a smaller company is limited on its budget. Therefore, the findings and implications of this study are limited to organizational contexts that derive from big companies.

Furthermore, a possible limitation is that the study is conducted on the assumption that job satisfaction is the contrary of turnover intention. This is, however, not a serious limitation, as it is found that job satisfaction is the key predictor for turnover intentions (Mueller et al.,

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

1994). Still, it is important to bear in mind that the intention to leave can surface from other reasons than job satisfaction, such as personal life factors (e.g., family moving away).

Future research

Further research might usefully explore how employability competencies for engineering professionals can be developed through experience, exploring specific contexts and methods that encourage developing such essential competencies. This way, the specific mechanisms of the experiential practice of developing competencies can be mapped and further researched.

Moreover, what remains uncovered by the employability paradox literature is the finding of the respondents that expressed they had intentions to leave after participating in the program. The reason for their turnover intentions were not the employability competencies per se but rather by experiencing a wider scope, the program ignited a reflection on their personal interests and desires in relation to their career ambitions. This finding cannot be explained by either the human capital theory or the social exchange theory on employability. Future research could therefore explore how training programs function as a mechanism of inspirational means to start reflections on personal interests, which could induce an increase of turnover intentions.

Practical implications

The findings of this study have several important implications for policy practitioners and HR departments of organizations that contemplate whether they should invest in training programs as a means to increase employability of their employees. The current study has shown what benefits competence development programs offer to their partakers on positive attitudes towards their organization and their expanding networks. Despite the little efforts of such programs in developing employability competencies, according to the respondents, such programs have made this development process less frustrating and faster by offering practical

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

content as helpful tools and valuable learning experiences. Moreover, the power of the expansion of networks through training programs must not be underestimated and can, over time, benefit both the employee as well as the organization. In addition, the selection process to partake in training programs should continue as a nomination process as it lets partakers feel rewarded and valued by their companies. This is more rewarding than simply requiring participation in a predetermined number of training each year (Bartlett & Kang, 2004). In turn, selected employees tend to work harder, attach themselves to their companies and demonstrate organizational citizenship. Accordingly, in a broad sense, a decent approach to the access to organizational training increases both the partaker's commitment as well as other colleagues' commitment to the company (Podsakoff et al., 2000).

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EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Appendix A – Tables of Participant Characteristics and Thick Descriptions of Companies

Participant	Age	Educational level	Years active with current employer	Number of working hours per week	Followed training program in:	Status of intention to stay/leave the organization:
Participant 1	36	PhD	6	40	2017-2018	Stay
Participant 2	47	MSc	23	36	2016-2017	Neutral
Participant 3	35	PhD	9	40	2015-2016	Leave
Participant 4	37	PhD	5	40	2018-2019	Stay
Participant 5	38	PhD	7	40	2018-2019	Stay
Participant 6	45	PhD	8	40	2018-2019	Stay
Participant 8	58	MSc	32	40	2018-2019	Stay
Participant 9	42	MSc	18	40	2018-2019	Stay
Participant 10	30	MSc	7	40	2018-2019	Stay
Participant 11	40	MSc	13	40	2018-2019	Stay
Participant 12	60	HTS (HBO)	20*	40	2008-2009	Has left
Participant 13	48	MSc	23	40	2008-2009	Stay
Participant 14	47	MSc	23	40	2018-2019	Stay

**has left his old employer, but has worked 20 years for this employer.*

Thick Descriptions

Company 1	The company is active in semiconductor operations. Has its headquarters based in the Netherlands and includes over 2.000 employees focused on R&D, manufacturing, product development, business operations, legal and sales.
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EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Company 2	The company is active in semiconductor industry. Has its headquarters in the Netherlands and includes over 25.000 employees focused on R&D, manufacturing, customer support, and corporate functions.
Company 3	The company is active in the printing technology industry. Has its headquarters in the Netherlands and includes over 2.500 employees focused on R&D, manufacturing, and logistics centers.
Company 4	The company is active in medical technological systems. Has its headquarters in the Netherlands and includes over 80.000 employees focused on software development, sales, R&D, marketing, procurement and quality.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Appendix B – Tree Diagram Interview Questions

Topic	Construct	Question	Source
Employability	Lifelong learning skills	<ul style="list-style-type: none"> • What were your strengths and weaknesses during the program? >And how do these strengths and weaknesses overlap with your current • What are your greatest strengths and weaknesses concerning your work? • How do you deal with mistakes? 	Zaharim et al., 2009; Kaewuenr uen, 2017; Winberg et al. 2018
	Self-responsibility	<ul style="list-style-type: none"> • How do you take control of your own learning? • How have you gained opportunities to develop yourself? >How have you created opportunities yourself? • How do you reflect on your job responsibilities? >[Could you tell me about a time you had to reflect on your performance as a result of not performing according to expectation?] 	
Interpersonal skills		<ul style="list-style-type: none"> • To what extent did the teamworking match with the teamwork you encounter in your current work? 	Zaharim et al., 2009
		<ul style="list-style-type: none"> • How do you undertake working collaboratively with your colleagues? >What aspects do you take in mind? >What is hard/why is it hard? Easy? 	
		<ul style="list-style-type: none"> • How do you handle dissension (disagreement in opinion) between colleagues? • Could you describe a time when you had problems with your supervisor and how you addressed them? 	
Communication skills		<ul style="list-style-type: none"> • In the program, did you have to work with someone from different backgrounds? 	Zaharim et al., 2009; Kaewuenr uen, 2017

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

		<ul style="list-style-type: none"> • Could you tell about a time you had to adjust your communication style to a person from a different background? • How do you respond to negative feedback? • What challenges have you faced in communicating with your manager/supervisor? >How have you handles these? 	
	Problem-solving skills	<ul style="list-style-type: none"> • Could you provide an example of how you have handled a critical decision while a supervisor is unavailable? • Could you tell me about a time you had to change your planned course of action at the last moment? >How did you re-evaluate your priorities? • Could you tell me about a time you faces a significant obstacle that you had to overcome to succeed in your work? 	Zaharim et al., 2009; Kaewuenr uen, 2017
Turnover-intentions	Perceived workload	<ul style="list-style-type: none"> • Do you think your current job position gives you work/life balance? >If yes, how? >If no, why not? 	Eastgate, 2015; Harden et al., 2016
	Outdated technical skills	<ul style="list-style-type: none"> • To what extent do you have autonomy within your current role? >Could you provide some examples of which topics you are able to make decisions about? >Could you provide some examples of which matters are outside your power? 	Eastgate, 2015; Harden et al., 2016
	Perceived fair rewards	<ul style="list-style-type: none"> • How satisfied are you with your job? • What do you like most about your job and why? • What do you like least about your job and why? 	Eastgate, 2015; Harden et al., 2016

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Turnover	<ul style="list-style-type: none">• Are you planning on staying at your job or will you be looking for another job? >If you are staying, what is keeping you? >If you are leaving, what are you looking for within a new job?• How do you feel about the program? Positive/negative? >Why? What are benefits of such programs to you?	Eastgate, 2015
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Appendix C – Interview guide

Pilot version

<p>Background information and demographic questions</p> <ul style="list-style-type: none">• How many hours per week do you work?• What best describes your ethnic group?• What is your highest level of education?• How old are you?• Are you married, in a relationship, or single?• Do you have any children?
<p>Employability</p> <p>Interpersonal skills</p> <ul style="list-style-type: none">• How did you develop relationships with your colleagues you are working the most with at this moment?• How have you resolved conflicts between coworkers?• How would you handle a member of a large team who disagrees and causes delay or friction?• Could you describe a time when you had problems with your supervisor and how you addressed them?• What do you think defines a leader?/ What characteristics makes someone a leader?• How would you describe yourself at sizing up others? <p>Communication skills</p> <ul style="list-style-type: none">• How have you communicated with your coworkers when you got stuck in your work?• How would you approach participation in a team that is unusually large?• If a customer had serious complaints (e.g. about a product or coworker), how would you respond? <p>Problem-solving skills</p> <ul style="list-style-type: none">• Could you provide an example of how you have handled a critical decision while a supervisor is unavailable?• How would you solve a problem when you do not have all the information and there is an urgent deadline? <p>Lifelong learning skills</p> <ul style="list-style-type: none">• What are your greatest strengths and weaknesses concerning your work?• How would you deal with sudden changes in your job responsibilities?• Could you describe your understanding of how your job support the company's goals and mission? <p>Self-responsibility</p> <ul style="list-style-type: none">• Do you believe you have control over the competencies you develop? If yes: >How do you take control over the competencies you develop? If no: >Why do you think that?• How have you taken control over your professional growth?

How do you reflect on your capabilities?

Turnover-intentions

Perceived workload

- How long have you been with your current employer?
- How long have you been in your current role in the company?
- Do you think your current job position gives you work/life balance?
>If yes, how?

>If no, why not?

Outdated technical skills

- Do you feel as though you have autonomy within your current role?
>If yes, how?
>If no, why is that?

Perceived fair rewards

- How satisfied are you with your job?
- What do you like most about your job and why?
- What do you like least about your job and why?

Turnover

- Are you planning on staying at your job or will you be looking for another job?
>If you are staying, what is keeping you?
>If you are leaving, what are you looking for within a new job?

Training program

- How did the architecture program affect your professional capabilities?
- What did you learn from the architecture program?
- Do you feel that you would have answered the previous questions differently if you were to answer these before following the architecture program?
>If yes, how?

>If no, why is that?

Feedback from fellow researchers

- Goeie! Ik denk dat het beter is om te beginnen met een construct dat het minst gevoelig ligt. Je begint al best wel snel over conflicten; van wat ik heb gelezen is het het beste om te starten met iets wat meer toegankelijk is, in het middenstuk echt de diepte ingaan en weer afsluiten met iets luchtigers. Lastig met onze onderwerpen maar misschien goed om in ons achterhoofd te houden
- Meer omgaan met conflicten – zou ik zeker als interpersoonlijk zien! (als antwoord op de vraag: of problemen met de supervisor wel als interpersoonlijk te beschouwen is)
- Interpersoonlijk zie ik meer als een overkoepelend begrip voor omgaan met anderen. Communicatie hoort daar dus sowieso al bij.
- Het programma-onderdeel zou ik eerder naar voren halen, zodat de participanten worden ‘opgewarmd’ met hun herinneringen over hun ervaringen. Zo gaan zij de vragen meer zelf al relateren aan het programma.

Feedback from university supervisor

- Ik zou zeker niet naar ethnic group, relationship en kinderen vragen. Deze zijn hier niet relevant en kunnen als invasief worden aangemerkt. Vraag wel hoe lang ze dit werk al doen.
- Probeer hier toegankelijker vragen te stellen. Ze zijn nu zeer theoretisch van aard. Vraag hoe mensen het samenwerken met anderen aanpakken, waar ze op letten; hoe ze omgaan met onenigheid; enz. Doe dit voor al je vragen, niet alleen deze.
- Termen als competencies, capabilities zijn erg abstract al gauw. Probeer dit ook toegankelijker te maken. De vraag "Do you believe" is ook erg omslachtig. Zeg eerder iets als heb je de mogelijkheid om aan je eigen ontwikkeling te werken oid.
- Wat kun je wel zelf besluiten? Wat niet? (in plaats van heb je autonomie binnen je rol?)

Final version

Short introduction:

- Greet participant and ask how they are doing
- Who am I? Researching your views on what you have learned during and after the domain architect program
- Interview will last approximately 55 minutes

Repeat following statements:

- When processing the interview transcripts and codes etc. I will completely anonymize your identity and pseudonymize your company name.
- I also would like to state again that you can halt the interview at any time and withdraw from the research. For this, you do not need to have a reason.
- If you at any point during this interview do not want to answer a question, you are free to pass this question. There will be no consequences here either.
- Informed consent has been received in good order via Surffile sender link prior to the interview.
- Ask permission to record audio of this interview for transcription purposes and the recording will immediately be deleted afterwards.

Start recording

<p>Part 1 Background information</p>
<p>Could you tell me something about yourself:</p> <ul style="list-style-type: none"> - Your age? - Your highest level of education? - How many hours your work per week? - How long you have been with your current employer? - How long you have been doing your current job?
<p>Part 2 Reminiscing Domain Architecture Program</p>
<p>Introductory sentence: You have followed the [program] in [year], is that right? I am curious to what you remember about this program and therefore I would like to know: Can you tell me more about the program?</p> <ul style="list-style-type: none"> - How did you end up with this program? - Could you provide some examples of what you have learned from the program? - How has the program influenced your current way of working?
<p>Part 3 Employability competencies</p>
<p><i>*Occasionally I ask whether the program had any influence on the participant's perception on the topic</i></p> <p>How would you define the skills you need to succeed in your work field?</p> <p>Lifelong learning skills:</p> <ul style="list-style-type: none"> - What were your strengths and weaknesses during the program? - How do these points overlap with your current work? - How do you learn from these points? - How do you deal with mistakes? <p>Self-responsibility</p> <ul style="list-style-type: none"> - How do you take control of your own learning process? - How do you perceive learning opportunities? Does one gain or create them? - How have you gained/created those opportunities yourself? - How do you reflect on your own learning process? <p>Interpersonal skills</p> <ul style="list-style-type: none"> - To what extent does the teamworking process in the program match with the teamworking in your current work? - How do you undertake working collaboratively? - What aspects do you consider? - How do you handle dissension (i.e. disagreement in opinion) between colleagues? - Could you describe a time when you had problems with your supervisor and how you addressed them?

Communication skills

- Could you tell about a time you had to adjust your communication style to a person from a different background?
- How do you respond to negative feedback?
- What challenges have you faced in communicating with your manager/supervisor?
- How do you handle these?

Problem-solving skills

- Could you provide an example of how you have handles a critical decision while your supervisor was unavailable?
- Could you tell me about a time you had to change your planned course of action?
- How did you re-evaluate your priorities?
- Could you tell me about a time you faced a significant obstacle that you had to overcome to succeed in your work?

How does one develop important architectural competencies according to you?

Part 4
Turnover-intentions

Perceived workload

- Do you think your current job gives you the right work/life balance?
- Why is that?

Outdated technical skills

- To what extent do you have autonomy within your current role?
- Could you provide some examples of which issues you are able to make decisions about?
- Could you provide some examples of which issues are outside your power?

Perceived fair rewards

- How satisfied are you with your job?
- What do you like most about your job and why?
- What do you like least about your job and why?

Turnover

- Are you planning on staying at your job?
- What is keeping you // What are you looking for in a new job?
- How do you feel about the program? (Positive vs negative)
- What are benefits and pitfalls of such programs to you?

Part 5
Wrapping up

We are almost finished with the interview. But before we finish, I would like to ask one last question:

- What haven't I asked you today that you think would be valuable for me to know?
- Do you have any questions for me?

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

End recording

Thank the participant for partaking in the research.

- Restate that withdrawal from the research is possible, even after the interview.
- The participant receives, once fully transcribed, the transcription of the interview for the member check. When the participant agrees, the transcription can be used for the research analysis.

Appendix D - Information letters



Utrecht University



Information letter 1: invitation

We are two Master's students from Educational Sciences at Utrecht University, the Netherlands. We cooperate with TNO-ESI and are very interested in the impacts of the [insert name that is applicable] programme you have participated in and we are contacting you to take part in a research study about the programme.

The study has two different aims for each student. One is to research how the [insert name] programme has affected employability, the other is to research the use of professional skills on the job after training.

Both aims serve the purpose of gaining insight into the programme and how to improve future learning by your colleagues. As a former participant of the programme, you are an important person to fulfil this purpose.

If you take part in this study, one of us would contact you and we would plan an interview at a time convenient to you. The interview would last 55 minutes. What's in this for you is that you will be provided with a summary of results after completion of the project; you could refresh what you learned during the programme and; you will contribute to science and to the future of the ASE-2 programme. We are aware of the importance of anonymity and confidentiality and take this into account. We are looking forward to hear from you.

Thank you.

Kind regards,

Baan Hoang & Carmen Poort
Utrecht University



Utrecht University



Information letter 2: prior to participation

Dear [participant's name],

Thank you for your interest in participating in the research about the [name] programme you have finished. Given the fact that you have finished the programme [insert] years ago, you have been assigned to the study about the development of employability competencies. This study aims to explore what and how you have developed employability competencies as a result of the programme and your perspectives on and experiences about the programme.

Several steps will be taken to protect your anonymity and identity. The audio of the interview will be recorded and stored in an encrypted folder provided by Utrecht University, where only the student and the student's supervisor has access to. This is for transcribing purposes only and the audio file will be deleted immediately the interview has been fully transcribed. In the transcript of the interview, your name will be pseudonymized, as well as the name of the company you work for. In the final version of the research findings that are to be shared with you and your company, direct quotes will be deleted so no sayings can be traced back to the speaker.

Please find in this mail a Surffile sender link with in it the informed consent letter. If you agree with the statements, I ask you kindly to sign the letter and return it to me via Surffile sender. Because the informed consent involves personal information, this has to be done through Surffile sender. If you have any further questions about the research, you can contact me at this e-mail address. I am looking forward to our conversation!

Kind regards,

Baan Hoang

Appendix E - Informed Consent



Utrecht University



Informed consent

Dear participant,

You are being invited to participate in a research study on the development of employability competencies as a result of the [insert name programme]. The study concerns students' research for a Master's programme in Educational Sciences. As a part of the research, interviews will be held.

The interview will take place online and you will be sent an invitation to join a video call. The interview will take 55 minutes during which we will go through the information again first. Then, I will ask your permission to record the interview. During the remainder, I will ask questions about the topic of the study.

There are no anticipated risks or discomforts related to this research. However, if you feel uncomfortable with any part of this study at any time, you have the right to terminate participation without consequence.

In order to protect your anonymity and identity, your name and the name of your company will be pseudonymized in the transcript of the interview.

Your participation in this research is completely voluntary. Although I cannot offer you any compensation, I can provide you with the final results and findings of the study. If you change your mind about participation, you may withdraw from the study at any time for any reason. This applies to withdrawal during the interview as well. If you do this, you will have the choice of allowing the information contributed until the time of withdrawal to be included in the study, or to have it removed and destroyed. Here again, there will be no further consequences. If you have any further questions regarding your rights as a participant, you may contact the researcher at t.hoang@students.uu.nl or you can contact the university's ethical board through their website (find the contact form on <https://uu-ser.sites.uu.nl/contact-information/>).

By signing this informed consent, I declare that I have read the above information regarding this research study and consent to participate in this study.

_____ [name]

_____ Signature

_____ Date

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Appendix F - Initial template

Background information

- Age
- Education level
- Years with current employer (company)
- Years in current job
- Work hours per week

Architecture Program evaluation

- Opinions (negative/positive)
- Experiences
- Personal view on learning outcomes

Employability competencies

- Lifelong learning
 - o Recognition of the need of learning
 - o Engage in learning
- Interpersonal
 - o Functioning on individual level
 - o Functioning as team member
 - o Functioning as a leader
- Communication
 - o Communicating with others on individual level
 - o Communicating with others on group level
 - o Communicating with others on organizational level
- Problem-solving
 - o Critical thinking skills
 - o Reasoning/argumentation skills
 - o Sensible decision making skills
- Self-responsibility
 - o Self-reflection
 - o Ownership of action withing competencies development

Turnover intention

- Perceived workload
 - o Work hours and perception on this
 - o
- Outdated technical skills
 - o Less career goals opportunities
 - o Not investing in them
- Perceived fair rewards
 - o Recognition
- Increasing employability
 - o Opportunities outside company
- Other reasons for turnover

Appendix G - Final Template with code descriptions

Background information: Participant tells background information which provides the context for the development of employability competencies and the (non)-intentions to leave the organization

- **Age:** The participant tells his age which may contribute to his (non)-desire to leave the organization and his perception on to what extent he learned from the content of the program
- **Education level:** The participant tells his highest level of education which provides context of his former formal education.
- **Years with current employer (company):** The participant tells the number of years he is active with his current employer, which provides context on how long he has been working for his current company
- **Years in current job:** The participant tells the number of years he is active in his current job role, which provides context when he has changed his job role and whether the training had any influence on it
- **Work hours per week:** The participant tells the number of hours he works per week, which provides context for his perception of workload.

Competencies: The participant tells what competencies are relevant and important to master to function well in the role of a systems architect.

- **Broad view- systems thinking:** Involves the capability to have an overview on all relevant processes and what project teams are doing. Being knowledgeable about technologies on a shallow level and should be able to understand to a limited extent what his engineers in different specialisms are doing and struggling with.
- **Leadership:** Involves the ability to be a leader as system architects do not have authoritarian power to assign tasks to their colleagues and engineers working on a lower level.
 - **Being decisive:** Involves the ability to make sound decisions in which most interests reach a consensus and that those interests that cannot be met do agree with the decision that is made.
 - **Being responsible:** Involves the ability to be responsible for the actions by the architect himself and his teams and engineers.
 - **Convincing skills:** Involves the ability to convince others in order to reach consensus or to move forwards in the project. Being convincing also involves emitting confidence about statements and choices.
 - **Delegating skills:** Involves the ability to assign the right tasks adequately to the right teams or units of the organization. Delegating also involves the ability to give trust to other teams for carrying out the tasks correctly
 - **Facilitating skills:** Involves the ability to facilitate processes of tasks by project teams and engineers, by which the project and the organization moves forward. Facilitating also involves the ability to decompose a complex problem and translate it to manageable tasks for the project teams and engineers.
- **Organizational skills:** Involves the consciousness and the ability to have feeling for business-related and organizational topics.
 - **Market awareness:** Involves the ability to be knowledgeable about global market developments and what technologies are currently relevant.
 - **Organizational sensitivity:** Involves the consciousness and understanding of factors that help thrive and move the company forward. Organizational sensitivity also includes the ability to think of the organization in a bigger

picture. For example, what decisions are sustainable and help to be beneficial for the company in the long-term?

- **Problem-solving:** Involves the ability to critically and analytically, and make adequate judgments accordingly.
 - **Critical thinking:** Involves the ability to think critically, analytically and accordingly invent and facilitate creative solutions for complex problems.
 - **Decomposing and structuring problem:** Involves the ability to understand the complex problem and accordingly structure and decompose the problem into manageable parts. This also involves the ability to listen to others in order to understand the problem.
- **Reflection:** Involves the process of evaluating on how project-related processes take place and decide what is going well and what could be improved.
 - **Group reflection:** Reflection on group level. For example, how well the project team is doing.
 - **Reflection started by external feedback:** Reflection on personal level that is initiated by others. For example, critical feedback received by colleagues and whether personal actions have to be made.
 - **Self-reflection:** Reflection on personal level that is initiated by the architect himself. This is an internal way of reflecting on the architect's functioning and whether actions should be taken.
- **Soft skills:** Involves the social skills that consist of collaborating and communicating with others. Moreover, interpersonal skills are part of soft skills.
 - **Collaboration skills:** Involves working together with colleagues, reaching consensus and conflict resolution.
 - **Communication skills:** Involves the ability to express thoughts to be interpreted accurately by others. Communication also involves the ability to listen and understand others.
 - **Interpersonal skills:** Involves the ability to connect with people and the ability to build relationships with colleagues.
- **Stakeholder management:** Is the ability to act in the landscape of different stakeholders. Stakeholder management involves the ability to adequately translate different interests to different parties in order to reach consensus, and to keep different stakeholders in the loop.
- **Technical hard skills:** Involves the understanding of technical knowledge, which is worked primarily with in the engineering field.

Development of competencies: Involves the ways in which competencies are developed or to be developed.

- **Following training programs:** Involves the development of competencies via training programs.
 - **Following ESI program:** Involves the development of competencies via the Architecture Competence Development Program by ESI.
 - **Program expands network:** Involves the networking within the company and the group who taught the program, by which the probabilities of learning opportunities increase.
 - **Formal:** Involves networking in formal way. For example, getting in touch with supervisors, managers or the company boss.
 - **Informal:** Involves networking in informal way. For example, getting in touch with colleagues and fellow architects.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

- **Program provides tools:** Involves the provision of helpful methods, models and theory which serve as tools, which partakers could learn and apply in their life.
- **Program provides valuable learning experiences:** Participating in the program yields valuable learning experiences in a safe learning environment which can taken along to gain work experience.
 - **External expectations of role:** Participating in program learns what others (e.g., bosses, managers, fellow architects) expect from the complex role of a system architect.
 - **Realistic work experiences:** Participating in the program involves working on a real life-like complex case which brings in valuable realistic learning experience.
 - **Self knowledge:** Participating in the program puts partakers out of their comfort zone, by which they learn norms, values and insights about themselves in the role of an architect.
- **Perceptions on training programs:** Involves the perceptions on how training programs can stimulate development of competencies.
- **Other:** Involves other ways of developing competencies than following training programs according to participants.
 - **Own intuitions:** Development of competencies is partly based on one's intuitions. For example, one naturally seeks learning opportunities while the other stays (unconsciously) within one specific discipline.
 - **Personal experiences:** Involves the development of competencies as a result of personal life experiences. For example, one participant told he had his own startup since he started college, by which he learned many business-related competencies.
 - **Work experiences:** The development of competencies by doing your work on the job. By being exposed in the role of an architect, one learns and gains work experience by which he can develop competencies.

Company related (Job satisfaction vs Turnover intention): Involves all codes that are related to the company, job satisfaction or turnover intentions.

- **Job satisfaction reasons:** Involves all codes that could be reasons that contribute to job contentment.
 - **Provision of opportunities for professional development:** Participant finds that his company sufficiently provides him with learning opportunities or career opportunities.
 - **Personal:** Participants finds that his personal life factors, such as the commute time to his home with his family, is good enough and contributes to his job contentment.
 - **Autonomy:** Participant finds that the high degree of autonomy of his role contributes to his job contentment
 - **Work-private life balance:** Participant finds that his work-private balance is good and finds that the company sufficiently supports this balance.
 - **Organization culture and ambiance:** Participant finds the organizational culture pleasant and therefore contributes to his job contentment.
 - **People/colleagues:** Participant finds the people and colleagues of the company nice, fun and pleasant and therefore contributes to his job contentment.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

- **Acknowledgment:** Participant gets acknowledged for his efforts by his company and therefore feels useful for the company, which contributes to his job contentment
- **No attractive job alternatives:** Participant finds that there is no other attractive job alternatives, and therefore stays with the company.
- **Product fits personal vision:** Participant is proud on the products and services his company produces, because the products and services suits his personal vision.
- **Challenging work:** Participant finds his work challenging and not too easy, which he likes about his work.
- **Variating work:** Participant finds his work diverse and likes this about his work.
- **Participation in program:** Participant finds being selected for and partaking in the program rewarding, which contributes to his job contentment.
 - **Attitudes:** Includes the attitudes of the participant towards the program.
 - **Positive:** Includes the positive attitudes of the participant towards the program.
 - **Subjective points of improvement for program:** Includes the points of improvement for the program in the future.
 - **Offers opportunities within company:** Participation in the program offers new opportunities within the company.
 - **Networks:** Participation in the program offers expansion of networks, which contributes to job contentment.
 - **Safe learning environment:** The program provided a safe learning environment in which learning from mistakes and experiments was encouraged in order to gain valuable insights.
 - **No influence on position in company:** Participation in the program has no influence on current job position in company.
- **Job dissatisfaction reasons:** Involves all codes that could be reasons to contribute to the dissatisfaction with their job.
 - **Organizational processes:** Working for a big company includes slow, bureaucratic, routine processes which is not liked by some participants.
 - **Conflicting interests:** Sometimes the interest of the participant and others (e.g., company) conflict each other.
 - **No acknowledgment:** Participant finds that he does not get enough acknowledged for his efforts for the company.
 - **Personal reasons:** Involves personal reasons to dislike the job, such as private life factors and growing other ambitions or interests.
 - **Program as starting point to reflect on own interests:** Participation in the program has ignited a reflection on current job position and career ambitions.
 - **Bored with role/ no opportunities to develop:** Job role does not fit personal ambitions anymore and no career opportunities are provided by the company.

Appendix H - Modifications in templates

The changes between the initial template and the final template can be explained by the fact that the approach for the initial template was found to be too focused on the concepts of the literature review. This was concluded after three transcripts were initially coded with the initial template, and many pieces of interview transcripts were left uncoded. The final template was generated after 8 interviews were coded line by line, in order to be more corresponding to what the participants said. This way, themes and codes that did not fit the initial template could still be comprised.

Within the main code ‘Employability competencies’, some codes were changed, and some were added. This code aimed to answer the question: ‘what are the employability competencies for system architects?’ The additions and changes include:

- Broad view- systems thinking: added.
- Leadership: added.
 - Being decisive: added.
 - Being responsible: added.
 - Convincing skills: added.
 - Delegating skills: added.
 - Facilitating skills: added.
- Organizational skills: added.
 - Market awareness: added.
 - Organizational sensitivity: added.
- Self-responsibility: was changed to Reflection.
 - Group reflection: added.
 - Reflection started by external feedback: added.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Self-reflection: added.

- Interpersonal skills and Communication: combined and added under Soft skills.

Collaboration skills: added.

- Stakeholder management: added.
- Technical hard skills: added.

The main code 'Development of competencies' was added, as none of the initial template codes comprised the development of competencies, however, contains important information to answer the research question. This code aimed to answer the question: 'how are competencies developed?'

- Following training programs: added. Statements whether competencies are developed with the help of participation of training programs were comprised in this code
- Other: added. Statements on how competencies are developed other than following training programs were formed into this code.

Own intuitions: added.

Personal experiences: added.

Work experience: added.

The following main codes aimed to answer the question: 'how do employability competencies relate to turnover-intentions'. To answer this question, all statements of participants' opinions related to the company and its processes are included.

The main code 'Architecture Program evaluation' was changed into the sub-subcode 'participation in program' of the subcode 'Job satisfaction reasons' of the main code 'Company related (job satisfaction vs Turnover intention). Initially, the idea was to include all statements regarding the program, both negative and positively related to job satisfaction under the initial main code. However, since most respondents stated that participation in the program contributed to their job contentment, this change was made. For three participants

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

this was not the case (i.e., p2, p3 and p12). Their participation in the program contributed either nothing to their relationship with their company (i.e., p2) or has started the desire to leave (i.e., p3 and p12).

The main code 'Turnover intention' was changed to the main code 'Company related (Job satisfaction vs Turnover intention)', because the initial code did not address the statements related to the job satisfaction of participants. In this code, two subcodes have been added, each addressing either the codes related to job satisfaction or the codes related to job dissatisfaction.

Within 'Job dissatisfaction reasons', all codes that regard the discontentment of participants with their jobs or what would be factors that would increase their probability to have turnover intentions are included.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Appendix I - Table results

This appendix includes a table with the frequencies of participants that substantiated their statements.

Statement	Mentioned by participants
<i>Employability competencies</i>	
Soft skills, as a competency, are important	1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14
Leadership, as a competency, is important	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14
Reflection, as a competency, is important	1, 3, 6, 9, 11
Stakeholder management, as a competency, is important	3, 5, 6, 8, 9, 12, 13
Problem solving, as a competency, is important	1, 3, 8, 9, 11, 12, 13
Organizational skills, as a competency, are important	1, 3, 9, 10, 11, 13, 14
Systems thinking, as a competency, is important	4, 5, 6, 8, 9, 10, 11, 12, 13, 14
Technical hard skills, as a competency, are important	1, 2, 4, 8, 9
<i>Development of employability competencies</i>	
Competencies are developed by participating in training programs because it facilitates and speeds up development process	1, 3, 5, 6, 9, 11, 13
Competencies are developed by doing your job and gaining work experience	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Competencies are developed based on one's own intuitions	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14
Competencies are developed by personal life experiences	5, 6, 9, 10
<i>Job satisfaction</i>	
The company provides sufficient opportunities for professional development	5, 8, 9, 10, 11, 13
The company sufficiently acknowledges my efforts	1, 6, 9, 10, 11, 13, 14
The high degree of autonomy contributes to my job contentment	1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14
The organizational culture and its people contribute to my job contentment	2, 5, 6, 8, 9, 10, 13
There are no attractive job alternatives	1, 5, 10
The product/services of the company suits my personal vision which makes me proud on my company	10, 11, 13
I find my work varied	4, 8, 9, 13
I find my work challenging	1, 5, 6, 8, 9, 10
<i>Job dissatisfaction</i>	
I dislike the slow, bureaucratic process of my organization	3, 4, 10, 12
The company does not acknowledge my efforts	2, 12

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

Getting bored with my role would be a reason for me to look for another job	2, 9, 10, 12, 13
Personal life reasons, such as moving away, would play a major role in my intention to leave the company	4, 9, 10
<i>Architecture Competence Development Program</i>	
Participation in the program has strengthened my relationship with the company	1, 4, 5, 6, 9, 10, 11, 13, 14
Participation in the program has started my desire to look further my job and company	3, 12

Appendix J - Translation quotes

Quote in text	Original quote
<p>P9: “Print quality is determined by all kinds of design choices throughout the entire device. And so my role is to make the design choices so that everything together works so well, the quality is at a certain level. [...] Look, we have certain structures for that, of course. We have a project organization and [...] I am responsible for print quality, but that is realized by different parts in the device that have to work together in the right way. [...] And you need the architect to think about that: what things are these parts? What does our long term space look like? What is the roadmap? What improvements do we need to make in the next few years? And what technology do we need to do that? Well and that's one of the important roles of the architect.”</p>	<p>P9: “Printkwaliteit wordt bepaald door allerlei ontwerpkeuzes in het hele apparaat. En mijn rol is dus om de ontwerpkeuzes zo te maken, dat alles samen zo goed werkt, de kwaliteit op een bepaald niveau zit. [...] Kijk, we hebben daar natuurlijk een bepaalde structuren voor. We hebben een projectorganisatie en [...] ik ben verantwoordelijk voor printkwaliteit, maar dat wordt gerealiseerd door verschillende onderdelen in het apparaat die op de goede manier samen moeten werken. [...] En je hebt de architect nodig om daarover na te denken van welke dingen zijn dat? Hoe ziet onze lange termijn de ruimte? Wat is de roadmap welke verbeteringen moeten wij in de komende jaren nog doorvoeren? En welke technologie hebben daar dan voor nodig? Nou en dat is één van de belangrijke rollen van de architect.”</p>
<p>P10: “The advantage of these kinds of programs, and certainly within a company like [Company 2], is generally that you get a</p>	<p>P10: “Het voordeel van dit soort programma’s en zeker binnen een bedrijf als [bedrijf 2], is over het algemeen dat je een</p>

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

network. The people you've sat there with, you've had a beer with at the campfire at night. You know what their family life is like, you know if they own a dog or a cat. You know all of those kinds of things and in a big company like [Company 2] that's extremely valuable.”

network krijgt. De mensen die je daar hebt gezeten, je hebt 's avonds een kampvuur, een biertje mee gedronken. Je weet hoe hun gezinsleven eruit ziet, je weet of ze een hond of een kat hebben. Je weet allemaal van dat soort dingen en in een groot bedrijf zoals [bedrijf 2] is dat extreem belangrijk.”

P2: “On the other hand, (the company) does not invest enough in employees. The fact that the company neglects me in my own development. In fact, sometimes I have more of the idea, that it doesn't matter what I do. It is not recognized, and I am not rewarded on if I go, too far (If I do well). Or so yes.”

P2: “Aan de andere kant, investeert (het bedrijf) te weinig in medewerkers. Dat het bedrijf mij laat rusten (laat zitten), is in mijn eigen ontwikkeling. In feite heb ik soms meer het idee. Dat het maakt niet uit wat ik doe. Dat wordt niet erkend, zeg, maar wordt niet beloond op als ik oké, te ver gaan. Ofzo ja.”

Appendix K – Elaborative Descriptions of Employability Competencies

According to the interviewees, the most important competencies to function well in their job are soft skills, leadership, systems thinking, reflection, stakeholder management, problem-solving skills, organizational skills, and technical skills.

The **technical skills** form the knowledge base of architects' jobs. These skills are acquired through their formal education and are necessary to discuss content-related topics of their jobs.

Systems thinking is additionally important as it is impossible for the architect to be knowledgeable about all complex technologies in detail. The architect needs to be knowledgeable about these technologies on a shallow level and should be able to understand to a limited extent what his engineers in different specialisms are doing and struggling with. The systems thinking ability allows the incorporation of all specialistic technical knowledge and a combination and integration of it as a whole.

Organizational skills involve one's ability to understand organizational sensitivity and awareness of the market. Organizational sensitivity involves the awareness of the company being part of a bigger financially driven system and that one's decisions and actions have consequences for parts or the entire organization. Awareness of the market includes being up-to-date about technologies and market developments.

Reflection involves group reflection, reflection initiated by external feedback, and self-reflection. All three forms involve the evaluation of how project-related processes take place and deciding what is going well and what could be improved. The three forms are distinguished by group level, personal level initiated by others, and personal level initiated by the individual himself. An important factor to facilitate reflection is the transparency and open organizational culture where issues can be discussed in an honest and constructive manner.

EMPLOYABILITY OF ENGINEERING PROFESSIONALS

The **leadership skills** consist of decision-making, responsibility, convincing, delegation, and facilitating skills. Possession of this competence is important as architects do not have the authority to assign tasks to their colleagues and engineers working on a lower level. Architects have to use their convincing skills to gain support for their thought-out decisions. Consequently, architects should facilitate processes by delegating the right tasks to the right units of the project group and take the responsibility for the smooth course of events.

The **soft skills** consist of collaboration, communication, and interpersonal skills. More specifically, collaboration involves conflict resolution, reaching a consensus, and working together. Based on the nature of their job, system architects need to possess soft skills as the job involves collaborating, communicating, and establishing relations with his colleagues, engineers distributed over different project teams, and managers. Mastery of soft skills is essential to facilitate the many different processes that are happening simultaneously in the project.

Stakeholder management is the ability to bridge gaps between different stakeholders or stakeholder groups. Different stakeholders have different interests, and these are often in conflict or too far away from each other.