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Masterarbeit

Factors leading to retention and organizational turnover in software engineering: a conceptual model

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Abstract

Since several years the software engineering industry is facing high financial and intellectual loss due to employees frequently leaving the companies. Therefore it is important to understand the reasons and intentions of employees to counteract these factors and foster retention. There is a certain body of knowledge regarding retention and turnover from other domains, however the knowledge regarding software engineering is rather limited.

This thesis proposes a conceptual model for turnover in the IT domain. It is based on knowledge collected in a comprehensive snowball literature research based on a tentative start set of papers from several domains. The model was then tested in the perspective of a company that is known as a good place to work by conducting an explorative questionnaire case study with several employees of said company.

The results of the survey showed some support of the propositions, but there is no statistically significant evidence of the relationship between the factors and turnover or retention mainly because of the small size of the population sample. Nevertheless, several insights could be gained from the survey results, such as identifying social support as one of the most important personal aspects for many participants. These findings led to a revision of the model to better reflect the situation perceived from the survey results. This revised model requires another study to support it, though. Based on the findings of the study, the thesis closes with some suggestions regarding future research in the context of this project.

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1 Introduction

Like many technology driven industries, IT suffers from the shortage of qualified skilled personnel. In 2018, Michael Booz from LinkedIn reported that the turnover rates in the software sector were the highest of all sectors with 13.2% per year [Boo18]. Even thirty years ago, such or even higher rates of up to 80 percent were reported in the IT sector [DL13]. Additionally to the high turnover rates, in many cases the duration of employment at the same employer is rather low, too.

This has multiple negative effects for companies. Most obvious is the loss of workforce until the replacing employee is hired. But actually, it needs much longer until the new employee is briefed and used to the workflow. DeMarco et al. assume that the costs for finding, hiring and introducing a new employee are around four and a half to five months worth of salary [DL13]. But there are other non-monetary deficits that are frequently reported as well like loss of knowledge and troubles in maintaining abandoned code in software products [RZDM16]. Furthermore, as a reaction to the short retention periods, the company structure can degenerate. The cause is a promotion of many relatively new employees to management positions to increase the bond between the company and the particular employee and thereby counteract early turnover intentions. Consequently, there is an overhang in management with just a small group of non-managing workers. According to DeMarco et al. this is a sign of an unhealthy company situation [DL13].

All these phenomena have a negative impact on the productivity and financial situation of the employing companies. Hence, it is important to reduce turnover and foster retention to minimize these negative effects. Therefore, it is required to understand which factors support peoples' turnover intentions and how they could be convinced to stay. The collection of these factors is the main goal of this thesis.

This chapter continues with some details on the scope of the thesis as well as the research question and process used for the research project. Finally, the overall structure of the thesis is described.

1.1 Scope

Surprisingly large companies like Google or Amazon struggle with employees leaving after just 12 months again[1] even though they are known as well-paying employers for IT staff. While the current literature in management and industrial-organizational psychology does cover parts of the reasons for turnover in the IT domain, there is still a gap when it comes to companies that are already regarded as good employers. Therefore, the focus of the present thesis lays on the factors for retention and turnover in the context of companies that are known as favourable places to work. Based on factors retrieved from literature, they should be evaluated in a quantitative way.

[1] see "Full List of Employee Tenure at Fortune 500 Companies".
https://www.payscale.com/data-packages/employee-loyalty/full-list

Difficulties in reaching meaningful sample sizes during the COVID-19 pandemic made the present work shift from an empirical model verification design to a company-related exploratory case study, enabled through a questionnaire. Due to the small sample size available for the study included in this research project, the project is considered to be a case study giving directions and hints on where future research in the domain of IT retention and turnover should lay its focus.

1.2 Research Question

This thesis analyses the reasons for IT employees to stay at or leave their current job. The research focuses on the answer for the question:

"Which factors foster retention and hinder turnover from the perspective of employees in IT domain?"

This question consists of two subquestions:

1. Which factors foster retention from the perspective of employees in IT domain?
2. Which factors hinder turnover from the perspective of employees in IT domain?

To answer the questions, it is required to gather existing knowledge, aggregate the collected information and develop a conceptual theory model which is tested afterwards by conducting a descriptive survey study in the setting of an exemplary software engineering company.

1.3 Thesis Structure

The current chapter covers the initial motivation for the project as well as the main goal of the research and its scope. To gain an overview about the current research state regarding the topic as well as potential factors for the model, a snowball literature research was performed. The methodology and the findings of it are described in chapter 2. Previous researches into a similar topic and with comparable procedures are portrayed there as well. Based on the potential factors from that chapter, a conceptual model was constructed by categorizing the factors and setting up relationships between them. Chapter 3 provides a visual and tabular representation of the model.

To cover the second step of the research, a survey was designed and performed at a company that qualifies as a good place to work. The description in chapter 4 reaches from the selection of the type of study over the creation of the questionnaire to the execution of the study. The responses that were received in the study are collected and analysed in chapter 5. These analysis results are then discussed in chapter 6 which also includes a comparison to the similar research projects from chapter 2. The main part of the thesis leads to the conclusions in chapter 7. It contains a summary of the whole thesis with answers to the research question as well as a brief outlook on possibilities for future research.

This is followed by the literature references used in this thesis and the appendix containing a presentation of the final questionnaire used in the study and detailed descriptive statistics for the questionnaire items.

2 Literature Review

This chapter deals with the gathering of knowledge from existing research in terms of the methodical approaches as well as the subject itself. The results are later used as a base to form the model for the factors of retention and turnover intentions in software engineering domain.

To get this research correct in a scientific manner, it is important to do the literature review in a systematic way [KC07]. The following section explains the technique used in this thesis. The other two sections of this chapter focus on related studies with comparable goals or approaches and the gathered background knowledge that is used for the model building in the next chapter.

2.1 Snowball Research

To perform the collection of knowledge, a snowballing literature research approach was selected. This approach in context of software engineering research was described and evaluated by Wohlin in [Woh14].

The basic principle is an iterative process that cycles through a list of potential candidates and evaluates them by different criteria. In the beginning, a set of potential candidates - the tentative start set - is selected which is brought into the evaluation process. According to Wohlin, a good start set fulfills several criteria. As researchers tend to cross-reference their papers in clusters, it is important that the initial set of papers does not only cover one of these clusters. To ensure the coverage of several clusters, it is recommended that there are few to no direct cross references between the papers of the set. Further, papers of "several different publishers, years and authors" should be used to improve diversity [Woh14]. As the wording of paper titles might affect the occurrence in search results, it is recommended to use synonyms as well during the initial search for candidates.

For this thesis, a tentative start set was provided by the supervisor. It contained the following papers:

- C. George. "Retaining professional workers: what makes them stay?" In: *Employee Relations* 37.1 (Jan. 2015) [Geo15]
- J.P. Hausknecht et al. "Targeted employee retention: Performance-based and job-related differences in reported reasons for staying" In: *Human Resource Management* 48.2 (2009) [HRH09]
- B.C. Holtom et al. "5 Turnover and Retention Research: A Glance at the Past, a Closer Review of the Present, and a Venture into the Future" In: *Academy of Management Annals* 2.1 (Jan. 2008) [HMLE08]
- P. Hom et al. "One Hundred Years of Employee Turnover Theory and Research" In: *Journal of Applied Psychology* 102 (Jan. 2017) [HLSH17]

- S. Laumer. “Non-Monetary Solutions for Retaining the IT Workforce” In: *AMCIS 2009 Proceedings* (Jan. 2009) [Lau09]
- T. Mitchell et al. “Why People Stay: Using Job Embeddedness to Predict Voluntary Turnover” In: *Academy of Management Journal* 44 (Dec. 2001) [MHL+01]
- G. Pare et al. “The impact of human resources practices on IT personnel commitment, citizenship behaviors, and turnover intentions” (Dec. 2000) [PTL00]

Most of the criteria described above are fulfilled with this particular set of papers. The span of publication dates covers 17 years from 2000 to 2017 leading to a large temporal diversity. Furthermore, almost all of them are written by different groups of authors and published in different publications. Thus it is likely that the papers are from different clusters.

On the other hand, three of the seven papers have some interconnection. Georges paper from 2015 [Geo15] references the summary paper of B.C. Holtom et al. [HMLE08] published in 2008. It is a review of the changes in the research field over the last couple of decades. It refers in turn to the one published by T. Mitchell et al. [MHL+01] in 2001 for which even the team of authors is very similar to the summary paper. Nevertheless it was decided to keep it in the start set as it provides some methodological overview. The paper by Hom et al. [HLSH17] is more like a summary of research in the turnover and retention field over the last 100 years but it does not provide substantial details for models and factors itself. Thus it was removed from the start set. As the other five papers offer various topics in the field of retention and turnover factors and have a high diversity regarding the authors and publications, after examining their content, they were retained in the actual start set.

All the papers that were included in the start set were then forwarded to the snowballing iteration loop. For each paper that is put into the iteration, all references of it are checked as well as all papers which are referencing this particular paper. The first part is the backward snowballing. It uses the literature reference list provided by the paper and filters them by checking criteria similar to the ones from the start set. To minimize the time effort needed, it is recommended to perform the easiest checks first. This covers the language of the papers as well as the year of publication or its type. Papers that were excluded or included in previous iterations are removed as well to avoid duplicates and inconsistency. After the examination of these meta criteria, the remaining candidates are further examined by the information that is available from the reference list. Both the publication and the authors may give hints on the relevance of the paper. The title of the paper is another valuable criterion for the inclusion or exclusion of papers. The actual reference and its context in the referencing paper is a final hint that can be used without needing the effort to actually look for the referenced paper. The final inclusion should then be based on the content of the referenced paper. There it is recommended to start with the abstract and then proceed with the most relevant sections to finally get to a decision. [Woh14]

The second part of snowballing research is the forward snowballing. It is a similar approach but covers the papers that reference the present paper. For each paper on the list, similar criteria as in the backward snowballing are used to decide on the inclusion or exclusion of the paper. This includes the title and abstract as well as the position in the paper, where the present paper is cited. All papers that are included in either the back- or forward snowballing steps are then prepared to be used in another iteration of snowballing. For this thesis, according to the suggestion by Wohlin, Google Scholar was used to obtain the list of references for each paper [Woh14]. It was selected to avoid bias with using research libraries of a single publisher.

For the present study, the number of iterations was limited to a two-step research, meaning that in the first step the start set candidates were investigated as described above and in the second iteration the selected start set papers were then used in the back and forward snowballing. As a deviation of the process described by Wohlin, except for the start set, the content of the paper was only examined after the snowball research as it was not needed for another iteration. Thus the tentatively inclusion in the list of results does not automatically mean that the papers were ultimately used for this thesis.

The first investigated paper from the start set by George has 78 references [Geo15]. As part of the backward snowballing, 53 of the 78 papers were excluded based on their title or abstract. Another nine papers were excluded after examining the context of the citation. Two papers had to be excluded due to being not accessible for the author of this study while two other papers were already present in the start set. The remaining twelve papers were included in the result list of the backward snowball research iteration. Due to the sheer amount of citations in the forward snowballing, only those papers which have larger amounts of citations themselves were considered. From these 13 papers with at least ten citations, four were included in the result list.

Hausknecht et al. [HRH09] reference 44 different papers from which one was already included while proceeding the paper by George. 25 papers were excluded based on their title or abstract while another paper was removed due to its age and four papers had to be excluded due not being available for the author. For all other 13 papers, it was decided to include them into the result list. For the forward snowballing, a filter criterion with at least 50 citations similar to the criteria before was used. In the end six of 29 papers which fulfilled the criteria were included, while two were already included before, two were already excluded before and the rest was excluded based on the title and abstract.

With 162 papers, the paper by Holtom et al. has by far the most references in the backward snowballing [HMLE08]. From these, eleven papers were already included either in the start set or during the processing of one of the papers before, while nine papers were excluded before and five papers were not available to the author, thus excluded too. From the remaining 137 papers, 41 were included and the rest left out as the result of the evaluation of the title and abstract. During the forward snowballing, two papers were already included before, another paper was excluded in a previous step. 14 of the remaining papers were included, 40 excluded.

The paper by Laumer has 26 references [Lau09]. 15 papers were excluded based on the title while eight were excluded after reading the abstract, two papers had to be excluded because they were not available. This led to a single reference of Laumer being included based on its content. As there were only twelve citing papers, all of them were considered as candidates, regardless of their individual number of citations. Three of them were included while the other nine were excluded based on their title or abstract.

T. Mitchell et al. referenced more than twice as many papers as Laumer [MHL+01]. From these 68 papers, six were already included before and 8 were excluded. During the rest of the backward snowballing 43 papers were excluded based on title and abstract. Again, two other papers were not available, which led to the exclusion of them. The remaining nine papers were included in the result list. The forward snowballing would have totally exceeded the capacity of this thesis, if there wouldn't have be a filter criterion as the paper was cited over 3.000 times. Therefore, only papers with 500 citations themselves were considered as candidates. From the 46 candidates, 13 were already included before and two were excluded. As a result of the analysis 24 papers were excluded and the remaining seven papers were included.

Finally, the paper by Pare was processed in the back- and forward snowballing. Of the 42 citations, one was included before while three were excluded. Due to being not available, four papers had to be excluded. Further three papers were excluded because they were written in other languages than English or German. Four of the remaining papers were included while the rest was excluded based on their title or context. During the forward snowballing, five new papers were included. The rest consists of two papers previously included, one paper not being available, 14 papers in other languages and 25 papers being excluded based on their title or abstract.

Overall, most of the papers were excluded based on their title or abstract. All tentatively included papers were then examined for relevant information regarding the retention and turnover factors as well as research projects which had similar goals or approaches. The findings of this examination are described in the next sections.

2.2 Related Work

In the past, many research projects already covered certain aspects of retention and turnover. This section briefly describes some comparable of these and their similarities and differences to the present work.

One of the first major cross domain research projects in terms of turnover research was the "Review and Conceptual Analysis of the Employee Turnover Process" by Mobley et al. in 1979 [MGHM79]. Based on a literature review of existing studies in the turnover field, they modelled the whole employee turnover process and classified factors into three big categories:

- Organizational factors are related to the current employment like salary, work climate, company size and others.
- Individual factors are both criteria like age, personality and family as well as occupational factors like skills.
- Economic or labour market factors are related to employment in general, e.g. unemployment rates.

The model by Mobley et al. distinguishes between the origins of intentions dependent on the current employment - the potential push factors - and the pull factors based on the labour market situation combined with the personal perception. For the purpose of this research, the focus should be laid on the first category of factors as they are directly influenced by the current employer. Another notable aspect of this model is the distinction between intentions to search, intentions to quit and the actual turnover behaviour. In empirical studies, it is quite complicated to measure actual turnover, as this usually means that some sample groups need to be observed over a long time. For smaller research projects like the present one this is not possible. But Angela Alexander summarized that over the last decades several researches pointed out turnover intentions to be "the strongest predictor of actual turnover" [Ale07]. Therefore, measuring turnover intentions should give a good indication regarding this aspect.

A different model of turnover antecedents was proposed by Ghapanchi et al. in 2011 [GA11]. In comparison to the multi stage turnover process model by Mobley et al., this model featured a flat tree hierarchy with several factor categories all directly having influence on turnover intentions. These different meta factors each contain several subfactors that all belong in the same context, e.g. the demographics category summarizes age, gender and marital status.

In 2015, Christeen George investigated retention factors of employed professionals. Therefore, she identified factors from existing literature and clustered them in an implicit two-level model. This model was then tested by the development of a scale with 19 elements which was deployed to 138 British workers from an international marketing company. The instrument used for the survey was a likert-scale type similar to the one used in this project. Based on the results from the survey, an 80 percent reliability of the scale was calculated [Geo15]. The approach of George is very similar to the one of this project, but concentrates on the retention side whereas this project sticks to the view of turnover factors.

A study performed by Carayon et al. in 2006 takes an approach that also is very similar to that of the present research project [CSH+06]. Based on a literature review, they identified several measurement instruments for potential turnover factors. In a pilot study, they tested the conceived questionnaire. Based on the feedback from this study the questionnaire was revised and distributed as the main survey. In contrast to the present project, the focus of Carayon et al. laid on women and minorities in IT workforce. Their work was taken into account as a template for the process of the present study. Furthermore their self-developed instrument for self-assessed turnover intentions was reused, this will be explained in chapter 4.

Another questionnaire based study to test a model of turnover intentions in the IT domain was already performed by Paré and Tremblay in 2000 [PT00]. Their sample was limited to employees from Quebec who were members of the Canadian Information Processing Society. Based on their study, especially the knowledge development opportunities stand out as an important aspect. In IT keeping up with the technology progress by learning and applying new skills seems to have a high priority for employees.

2.3 Background

The examined literature explains the importance of understanding the factors for retention and turnover and describes potential effects that are caused by turnover. This section provides some insight in the existing knowledge.

2.3.1 Retention and Turnover

The term *retention* is defined as “the ability of a company to keep its employees and stop them from going to work somewhere else [Cama]” by the Cambridge Dictionary while the term *turnover* is defined as “the rate at which employees leave a company and are replaced by new people [Camb]”. According to these two definitions, turnover and retention could be considered as opposites, but there are some smaller caveats. The turnover rate does not only contain the employees who move to another employer, but also employees who reach the age for retirement. In general it is not possible to prevent them from leaving the company. Additionally, the rates of retention and turnover cannot sum up to 100% in some cases when employees stay a shorter time than the time interval of the rates because then that employee as well as the employee in the same position that left before are both counted. Nevertheless, these differences have just minor relevance for qualitative analysis and thus can be neglected.

2.3.2 Effects of Turnover and retention

The relevance of understanding turnover from an economical viewpoint in the software engineering domain becomes quite obvious in the context of its possible effects.

The monetary effects can be divided into two parts. The direct costs are caused by the personnel and the recruiting process itself. This contains the advertisement as well as the cost for human resources personnel needed for the recruitment process [Lau09]. After successful recruitment, it is likely that the new employee needs training to get suited to the new tasks. This training may occupy other employees so it causes some costs too.

Beside the direct costs, there are indirect costs related to the work of the employees. During the absence between the old employee leaving and the new one replacing the position, some tasks will be delayed or need to be done by other employees or external service providers. A common instrument to estimate the cost and effort needed for software projects is the Constructive Cost Model (COCOMO) by Barry Boehm et al. which was revised several times to adjust to the changes in software engineering [BCH+95]. The revision II introduced a factor called *Personell Continuity* (PCON) which covers the cost driving effect of annual personnel turnover between 3% and 48%. Additionally, the experience of personnel is considered in three different factors for applications (AEXP), platforms (PEXP) as well as languages and tools (LTEX). It can be assumed that new employees need some time until they are accommodated to the working environment, so they have a lack of experience for some time.

In certain situations, the turnover of an employee might cause a chain reaction due to several reasons. On the one hand, the departure of an employee results in an at least temporary rise in workload for the remaining employees to cover up the tasks. This additional workload might result in the remaining employees to feel unhappy or stressed. Beside this negative affection of the remaining employees the actual turnover might inspire the remaining employees to leave the company, too. Frequent turnover can even lead to a changed perception of organisational commitment by employees according to Moore and Burke [MB02].

On the other hand, retention of employees might have further positive effects. In 2003, Fulmer et al. investigated if companies known as being a“great place to work” also benefit from the good relationship towards their employees in terms of the overall economic performance [FGS03]. They suggest that indeed these companies have “stable and highly positive workforce attitudes [and] also performance advantages over the broad market”.

2.3.3 Psychometric Instruments

Turnover intentions are properties which are not measurable like physical values. Rather they are theoretical concepts that describe human perceptions. Therefore, they need to be assessed by using instruments which make these concepts accessible and measurable in some way. For this purpose, psychometric instruments can be used resulting in some scores for further analysis. Graziotin et al. point out that it is important to use measurement instruments which are valid and reliable. A test is considered to be valid, if it has “relevant evidence for providing a sound scientific basis for the interpretation of the proposed scores” [GLFW20], which basically means that the numbers of the score are actually related to the phenomena they are supposed to represent. Validity can be assured on different levels, which are further described in their paper. On the other hand, the reliability is “the consistency of test scores across replications of the testing procedure” [GLFW20]. In the best of cases with highest possible reliability, a replication of the same test with the same sample under the same conditions should result in the same score results. The second meaning of reliability is the coefficient comparing different variants of a test measuring the same phenomena.

2.3.4 Causes for Retention and Turnover

The reviewed literature contains vast amounts of potential factors leading to turnover or retention. However, the literature has different approaches to categorize these. Based on the examined literature, the following main factors were retrieved.

Demographic Properties

Whether or not personal demographic characteristics have a direct influence on turnover intentions is not clearly answered by the existing literature. Some researchers like Miller and Form argue that the employees of older age tend to have less turnover intentions compared to younger employees for different reasons. These for example cover an increased job satisfaction or better prestige [MF81]. On the other side, some argue that older people have a reduced perceived job satisfaction due to the fast changing technology and need the of frequently learning new skills to keep up [GRS88]. Therefore, Joseph et al. do support that there is an effect but do not decide if the effect is positive or negative [JNKA07]. Beside age, the educational level is another relevant demographic characteristic. Igbaria and Greenhaus investigated the effect of educational level on the satisfaction and turnover intentions and found evidence for education affecting turnover intentions both directly as well as indirectly through job satisfaction [IG92].

Psychological Demand

Psychological demands range from perceived workload to stress due to short time limits and work that has to be done fast. A study by Rutner et all found support for the relationship between the workload and turnover intentions [RHM08].

Social Support

The social support in terms of employment consists of two aspects. According to Cobb, the colleague support is the assistance by team members and other fellow employees that let the perceiver "believe that he is cared for and loved, esteemed, and a member of a network of mutual obligations" [Cob76]. The supervisor support is similar but covers the relationship between the supervisors and the employees. In 2002, Lee conducted a study to test the effects of colleague and supervisor support on turnover intentions [Lee02]. He found evidence for a negative correlation between social support and turnover intention for employees who have high social affiliation needs.

Payment

Salaries are necessary to enable employees to earn a living. However, there might be some differences between the actual payment and the one that is expected by the employee to be a fair compensation for his work. Singh and Loncar describe the perceived fairness of the ratio between these two amounts of pay as the pay satisfaction [SL10]. Williams et al. compared an extensive amount of existing literature related to the pay satisfaction topic to perform a meta-analysis [WMN06]. Their results indicate that there is a moderate relation between pay satisfaction and turnover intentions.

Role Stress

Role Stress is a construct that consists of two parts. The role conflict is a discrepancy between two different perceptions of the responsibilities and tasks of a role. These two conflicting perceptions can belong to the same person or to different people and can both be bind to a specific person fulfilling a role or to the roles in general [KWQ+64]. The other part of role stress is the role ambiguity. It is the degree of ambiguity regarding expectations of a role, methods to use to fulfil some role expectations and the consequences of fulfilling the expectations [KWQ+64]. The effects of role stress on turnover intention was investigated in different domains, e.g. in the hotel business by Akgunduz and Acar [AA19] and in the social work domain by Kim and Mor Barak[KM15]. Igbaria and Greenhouse performed a study that resulted in a measurable indirect effect from role stress on turnover intentions with management information system professionals [IG92].

Feedback and Significance

Job feedback was described by Hackman and Oldham as "the degree [of getting] direct and clear information about the effectiveness of his or her performance" [HO76]. In the IT domain, direct feedback is rather hard to achieve in comparison to e.g. soccer players who get direct feedback by the choirs on the tribunes. Hackman and Oldham also describe the task significance. It measures how large the impact of the job is on the lives or work of others in the same company and elsewhere. McKnight et al. tested the relevance of these job characteristics and workplace characteristics (salary, job security, ...) regarding turnover intentions in the IT section. While the later ones are more important for programmers and analysts, the job characteristics are of higher importance for employees in technical support [MPH09].

Conflicts between Work and Family

It is a common problem in most domains that employees are confronted with conflicts between work and family responsibilities. According to Greenhaus and Beutell, these conflicts exist in three different dimensions [GB85]:

- The most obvious and common potential of conflict is time, of which both work and family require a great amount. Most problematic are situations in which both sides require the employee to be available at the same time. Causes on the work side for example are irregular shift work or overtime [PSL80] with the later being more common in IT domain. The lack of flexitime options might result in additional conflict potential. On family side, the age and number of children usually have a big influence on the conflict potential [BG80].
- Beside time, strain is another dimension of conflict between work and family. Both sides can cause stress, exhaustion and fatigue that has negative consequences for the other side. Additionally, lack of support and understanding can increase the level of stress [HG79] [JB80].
- The last dimension covers the character traits. Work might require the employee to act confident and unemotional whereas the family side prefers an empathetic family member [GB85]. This discrepancy might lead in further conflicts between work and family.

Nohe and Sonntag conducted a study that revealed an increasing effect on turnover intentions with work family conflicts. They did not find evidence for an increase in turnover intentions caused by more conflicts based on the family side [NS14].

Organisational Commitment

One of the most common definitions of organisational commitment is the one by Porter et al.: "Organsational commitment is the strength of an individual's identification and involvement with aparticular organisation, characterised by three factors"[PSMB74]. These factors cover the identification with the goals and values of the company, the readiness to invest a lot of effort into the company and the willingness to have an active organisational membership. The organisational commitment was later extended as a multidimensional aspect with the following three elements:

- *affective commitment*: This covers the traditional understand of organisational commitment following Porters definition above.
- *continuance commitment*: The potential cost of leaving a company perceived from the perspective of the employee.
- *normative commitment*: This aspect is related to the employee feeling obligated to do something for the company.

This three dimensional approach was fostered by the research of Allen and Meyer who found evidence for these different components [AM90]. Bentein et al identified a correlation between decreasing affective and normative commitment and raising turnover intentions [BVVS05]. In her research, Anderson identified a relationship between raising affective commitment and raising retention intentions [And15]. There are many further research projects focussing on organisational commitment, for example in 2010 Joo attested that organisational commitment has a decent negative effect on turnover retention [Joo10].

Job Satisfaction

As previously reported, the satisfaction plays a big role regarding turnover intentions or retention. The job satisfaction is influenced by various different properties. Price and Mueller proposed the following list of properties in their causal model of turnover from 1981 [PM81]:

- *routinisation* is the degree of repetition in the job.
- *centralisation* refers to the concentration of power in an organisation.
- *instrumental communication* relates to information sharing in the company
- *integration* covers the personal friendship like relationships to colleagues
- *pay* is the payment that the employee receives
- *distributive justice* is the degree of relation between job performance and rewards or punishments
- *promotional opportunities* cover the career development chances inside of a company
- *role overload* is related to the role stress perceived due to too many demands
- *professionalism* is the “degree of dedication to occupational standards of performance”

Agho et al. revised the model by Price and Mueller and added environmental opportunity and personal positive affectivity as further properties to the model [AMP93]. The influence of dynamic changes in job satisfaction on turnover intentions were investigated and confirmed by Chen et al. [CPT+11].

Based on these factors, a model will be conceptualised and tested in the next chapters.

3 Conceptual Model

With the information previously gathered from the snowball literature research, it is possible to form a model that represents the potential factors for turnover intentions or retention.

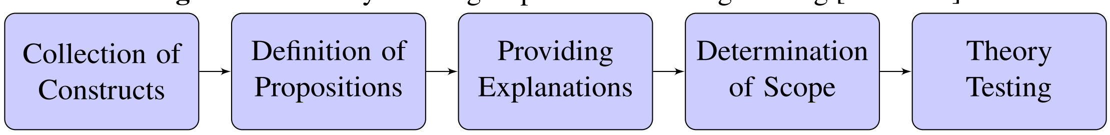
3.1 Theory Building

To construct the model, an underlaying theory has to be built. From the five types of theories in Information Systems identified by Gregor in 2006 [Gre06], the theory for this project falls in the analytic / descriptive category. Its purpose is to describe the relationship between the factors and retention or turnover intentions in a certain scope. For the domain of software engineering Sjøberg et al. proposed a theory building approach in 2008 [SDAH08]. This approach was later picked up by Wagner et al. in their report on challenges in survey research in the context of software engineering [WFF+20]. This publication served as an orientation guide for some steps of this thesis.

In Sjøbergs approach, there are several building blocks for theories which were originally described by Whetten [Whe89]. They correspond to Sjøbergs steps of theory building [SDAH08], which are visualized in figure 3.1:

- In the first step, the *constructs* of the theory are collected. These represent what the entities of theories are. In the context of software engineering, constructs could be peoples like the "employees" but also activities, organisations and other objects. It is possible to base on existing theories and reuse the constructs or to define new constructs.
- The relationship between the constructs are part of the second step. With these relations the interaction between the constructs are described and they form the *propositions* of the theory. In software engineering context, "provide feedback to" would be an exemplary relationship between the constructs "managers" and "employees".
- To justify the propositions, *explanations* are added in the third step. These explanations substantiate the propositions and constructions which have been elaborated in the previous steps. They can either be based on assumptions, which need to be tested afterwards, taken from existing similar theories or adapted from other disciplines. For software engineering this could for example be an explanation that is valid in another domain of engineering.

Figure 3.1: Theory building steps in software engineering [SDAH08]



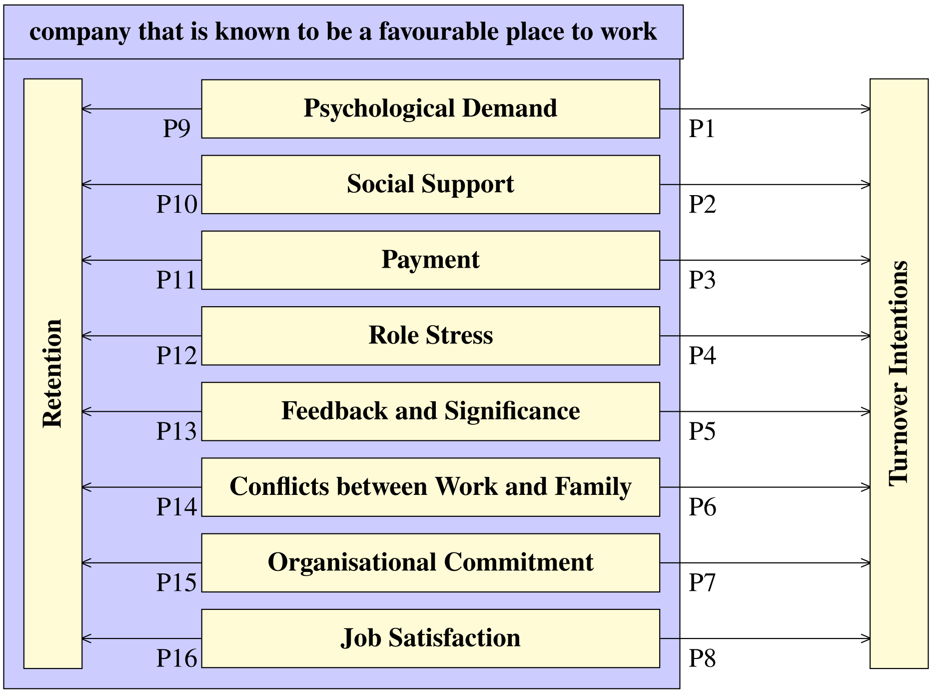
- The context in which the theory applies is limited by the scope that is defined in step four. The *scope conditions* cover the questions of where, when and for whom the theory is applicable [SDAH08]. In software engineering, such a scope condition could limit the theory to companies which are acting as consultants for other companies instead of developing own products.
- The fifth and last step is the *theory testing*. By performing empirical study research, the validity of the theory is tested in a context that suits the scope defined in the previous step.

The next sections cover step one to four. Theory testing will be the subject of the following chapters.

3.2 Model

For the present thesis, the steps are performed based on the gathered information of the literature review. The representation follows the tabular style for the building blocks recommended by Sjøberg et al. [SDAH08]. Figure 3.2 contains a graphical representation of the whole theory model in an UML-like style as proposed by Sjøberg et al. [SDAH08]. The constructs are modelled as classes, while the relating propositions are modelled as arrows connecting the constructs. The arrows are directed from the construct that is affecting to the construct that is affected. The scope is represented by the blue package box.

Figure 3.2: Model of factors for retention and turnover intentions



For this model, the constructs were derived from the turnover factors described in section 2.3. The demographic aspects are not represented as a construct as they can't be influenced by the company and are thus out of scope for the present thesis.

The relationships between the different constructs basically follow the taxonomy model by Ghapanchi and Aurum [GA11]. There is one level with all potential factors and all of them have a direct relation to the turnover intentions. This setup is mirrored to the retention construct on the other side. The explanations provide some context for the propositions and finally the scope, which was already defined in the introduction chapter is shown.

Table 3.1: Constructs of the theory of factors for retention and turnover intentions

	Constructs
C1	Turnover Intentions
C2	Retention
C3	Psychological Demand
C4	Social Support
C5	Payment
C6	Role Stress
C7	Feedback and Significance
C8	Conflicts between Work and Family
C9	Organisational Commitment
C10	Job Satisfaction

Table 3.2: Propositions of the theory of factors for retention and turnover intentions

	Propositions
P1	High psychological demand has a positive effect on turnover intentions.
P2	Low social support has a positive effect on turnover intentions.
P3	Unsatisfying payment has a positive effect on turnover intentions.
P4	Role stress has a positive effect on turnover intentions.
P5	Low feedback and significance have a positive feedback on turnover intentions.
P6	Conflicts between work and family have a positive effect on turnover intentions.
P7	Low organisational commitment has a positive effect on turnover intentions.
P8	Low job satisfaction has a positive effect on turnover intentions.
P9	Low psychological demand has a positive effect on retention.
P10	High social support has a positive effect on retention.
P11	Satisfying payment has a positive effect on retention.
P12	Less Role stress has a positive effect on retention.
P13	High feedback and significance have a positive feedback on retention.
P14	Less Conflicts between work and family have a positive effect on retention.
P15	High organisational commitment has a positive effect on retention.
P16	High job satisfaction has a positive effect on retention.

Table 3.3: Explanations of the theory of factors for retention and turnover intentions

	Explanations
E1	The more stressful and demanding a job is, the more likely employees intend to leave the job.
E2	Without a good relationship with colleagues and supervisors, employees might feel isolated.
E3	When employees perceive their payment as unfair regarding their work performance, it is likely that they want to find another employer.
E4	Ambiguities and task conflicts in the job lead to employees not feeling confident with what to do in their job.
E5	Not getting feedback and seeing the usefulness of the work might reduce the motivation to stay in the job.
E6	Additional Stress induced by conflicts between work and family may be evaded by getting another job.
E7	Not identifying with the company's goals and values is a deal breaker for motivation of employees.
E8	Not feeling happy in the job is a strong motivator for finding a different job.
E9	When the job is not too stressful, it is likely that employees are willing to stay in the job for a longer time.
E10	Good relationships to colleagues and supervisors motivate the employees to stay as they may loose these relationships otherwise.
E11	When employees feel that they receive a fair amount of money for their work performance, they have less reason to leave their job.
E12	Having clear and conflict-free tasks emphasizes confidence with the job.
E13	Directly perceiving the impact of the own work emphasizes confidence with the job, too.
E14	When duties in work and family can be fulfilled without problems, employees tend to preserve that status.
E15	Having a strong identification with a company creates a bond, which the employee does reluctantly want to give up.
E16	When feeling happy with the current job, it is unlikely that employees will have intentions to leave.

Table 3.4: Scope of the theory of factors for retention and turnover intentions

Scope
The theory is supposed to be applicable for employees in the software engineering domain who are employed by a company that is known to be a favourable place to work.

4 Empirical Study Design

To test the propositions gathered from the model in the previous chapter, an empirical study in form of a questionnaire survey based exploratory case study was conducted. This chapter describes the preparation and execution of the survey.

4.1 Type of study

In empirical research, there are two different research principle types with individual purposes. The *qualitative research* is an attempt “to make sense of, or interpret phenomena in terms of the meanings people bring to them” [DL94]. In contrast, the *quantitative research* “uses numbers and statistical methods” [KKV94] and its goal is to “produce generalizable results” [GP92].

As the purpose of this study is to test the findings of the model, the quantitative principle is the one to follow. There are several different study approaches commonly used in quantitative research, e.g. experiments, case studies, post-mortem analysis and surveys. The former two types are both dealing with observing some phenomena while they occur, either active in a controlled experiment or more passive in a case study. On the other hand, the two later types deal with things that lay in the past or are not monitored while they occur. The post-mortem analysis is used for the retrospective investigation of things that finished while the survey is a more general method that is mostly used for large populations and “could be seen as a snapshot of the situation to capture the current status” [WHH03].

For a survey, a representative sample of a larger population is selected and the results are generalized to the general population in the end. The survey may either be of descriptive, explanatory or explorative nature. For a descriptive survey, the focus is on the observation of a distribution for certain attributes, not the explanation for why said distribution occurred. The later question is the goal of explanatory surveys, which tries to find reasons for why a certain distribution could be observed. The explorative survey is a more open-ended approach that can be used to ensure that no important aspect was overseen. The results can be used to refine and improve a following larger study [WHH03]. In terms of the present study, a descriptive survey would have suited best, as its purpose is to test if the expected propositions of the model are observable in the real world. Due to the circumstances of the study in times of COVID-19 pandemic turbulences, the chances of large scale studies were rather low. This led to the reorientation to a survey based exploratory case study. The limitations of this form are discussed in chapter 6.

A survey may either be conducted in person in form of interviews that are held in meetings or by telephone calls. As an alternative, the questions can be served as a written questionnaire, either digital or printed. The participants then fill out the form in some kind of self-assessment. While the interview form has some advantages over the questionnaire like the higher response rates or possibility of more dynamic follow up questions [WHH03], the anonymity aspect is quite hard to achieve. The following section gives some insight on this and other relevant ethical aspects in studies.

4.2 Ethics

When doing research with humans, it is likely that the participants are affected in some way. Like in other research domains, the ethics are important in empirical software engineering research, too. In 2002, Singer and Vinson [SV02] identified the following four basic principles that should be taken into account.

Informed Consent

The purpose of the informed consent is the autonomous decision of the participant to voluntarily participate or decline participation. Therefore, the informed consent should contain several elements [FBK86]:

- The *disclosure* should provide the information that the participant should base his or her decision on. That contains the goal of the study, the research method, expected benefits and potential risks. Furthermore, the confidentiality aspect, the collected data and the usage of this data are explained.
- All the information and the extent of the participation should be explained in a *comprehensible* form.
- The consent needs to be acquired on a *voluntary* basis. In addition, the participants should be informed that they can abort the participation at any stage of the study.

For the present study, an informed consent was needed from both the company from which the participants should be gathered as well as the actual participants themselves. Due to the nature of the research topic, the survey focussed on the relationship between the participating employees and their employer. To get a consent by the company's representatives, the companies human resources department was contacted in an early stage of the research. It was presented with the purpose of the study and the proposed questionnaire contents. The individual employees got an invitation that was written in a more informal style as well as a structured presentation of the information right before the actual questionnaire.

Confidentiality

The confidentiality is described as "the subjects' right to expect that any information they share with researchers will remain confidential" by Vinson et al. [VS08]. This includes the identities of the participants as well as all other data that is collected.

To ensure data privacy, the gathered data needs to be stored securely and access should be given only to a limited number of people. In case of this study, the survey was realized as an online questionnaire. The questionnaire was based on a self-hosted survey system that was implemented on webspace located in a data centre in Germany. The data is protected and can only be accessed with user credentials of the survey system. Only the author and the supervisor had user accounts on the system. This meets the requirement that as few people as possible have access to the data [Pat06].

As the subject of the survey is dealing with the relationship of the employees and their employers, “[p]rotecting the subjects’ identities from managers and professors is particularly important since they can have the greatest impact on the subjects’ careers” [VS08]. To prevent the full list of participants from being known, neither the author, any employee nor the employer know which individuals actually participated.

Furthermore, the name of the employer should be omitted in the report so that it is not possible for third parties to infer the qualities of this specific employer from the statements of the employees.

The anonymity of the collected data is another important part of the confidentiality. To ensure that no conclusions can be drawn about the identities of the participants, as little personal data as possible should be collected from the beginning. This not only covers the name but other precise information like age or specific skillsets. See the sections below for more details about the details on the practical implementation of anonymisation.

Beneficence

A study should only be performed if the overall benefits are not counterbalanced by the potential risks and harms that could affect the participants [MM93].

In case of this study, the expected benefit is the support or contradiction of the established model and the propositions. This model could help both individual employees in the IT domain as well as their employers to understand which factors are relevant when it comes to the retention of the employee. Less turnover would lead to less drain of knowledge and higher efficiency due to the established teams being kept.

On the other hand, there are potential risks and harms. While there is no physical harm expected, the participants require some time to participate. Furthermore, it is possible that the participants may get awareness of a dissatisfaction with their current job by dealing with the subject matter in the questionnaire. This would potentially lead to a loss of workforce on employer side. Such effects by the self-reflection were found by Wilson et al. in 1990 [WKL90]. In case of a lack of confidentiality, there are further potential harms. Either employers may get awareness of individual participants opinions or sensitive information about employers may become public, which could lead to financial deficits due to unforeseen side effects. To minimise these risks, it is important to maintain and protect the confidentiality of the data collected. See the previous section for more details on confidentiality.

In summary, the expected benefits and risks were evaluated and a positive beneficence was anticipated.

Scientific Value

To ensure the quality of the research, it is important that the methods used are validated. According to Graziotin et al., it is recommended to reuse existing validated questionnaire elements where applicable [GWA15]. This aspect is covered by adopting already validated questionnaire elements for measurements in the present study.

Additionally, the research topic should be of interest for science, otherwise it would be obsolete and not beneficial [MM93]. Therefore, it is important to check for previous studies in the same field or the same context. If a very similar study in a matching context was already performed, it is suggested to replicate the study so the results can be compared and the procedure of the existing study can be validated.

The initial snowball research did not come up with a similar study for the context of software engineers at favourable places to work. However, as related studies with similar objectives were available, these were used as guides.

4.3 Case Study Sample

To comply to the research goals, the population that should be investigated are software engineers employed at an employer that is known as a favourable place to work for. This can be verified, for example, by national awards given to companies.

While in theory this is a well-defined population, in practice it is hard to estimate how large the population is and what its demographics are. In any way, a representative sample would need to be very large to get statistically significant results. In the context of this master thesis project, a sample of 400 participants is unachievable. Thus, certain concessions have to be done regarding population, sample and representativeness. This led to the study to be a compromise between a survey study and a smaller case study.

As a practical sample of the whole population, employees of a company which suits the criteria above were selected as potential participants of the survey. This company is an owner-operated medium-sized IT company with a small three-digit number of employees.

The author and the supervisor both were already in contact with the company prior to this master thesis project and thus had some contact persons in the chosen company. After approval of the final questionnaire by the human resources department, some introduction texts and the link to the survey were given to several contact persons in the company. They then shared the link with their colleagues and forwarded the invitation text provided by the author. In the end, this kind of distribution ensured that there were less anonymity concerns as the author did not need to retrieve identifying personnel information from the company to contact the potential participants himself. On the other hand, this procedure might have a negative influence on the representativeness of the sample, as it is likely that some clusters of employees are participating which are more integrated as a team than if the questionnaire would have been distributed to random employees of the company. This contradicts one of the four essential requirements for sampling that were provided by de Mello et al. in 2015: “A source of sampling should not intentionally represent a segregated subset from the target audience” [MST15]. However, as the invitation was provided to independent employees in the beginning, it is assumed that the participants are not originating from only one subset.

4.4 Questionnaire Creation

The questionnaire was developed in a two-phase process. At first, a draft was created based on the model and existing surveys. In their research, Graziotin et al. pointed out the importance of using validated reliable instruments to measure psychometric properties [GWA15]. In order to comply with this recommendation, existing instruments were sought that could be used for testing the various propositions. Basically, the questionnaire consists of several sections:

- Demographic questions
- A section with an instrument for each of the propositions
- A section regarding turnover intentions in general

Graziotin et al. recommended that it "is not advisable to modify validated psychological measurements or models" as that would potentially lead to a loss of validity and reliability. However, due to certain size restrictions from the human resources department, it was not possible to include all items of every instrument. Where reasonable, a certain number of items had to be left out. Most of the question items of the survey are realized by using likert scale instruments. These consist of questions or statements which are answered by choosing one of the levels of a provided scale, e.g. ranging from "Strongly Disagree" to "Strongly Agree". For the participants, this unified concept of giving answers is easier to understand than diverging answer formats. For the analysis of the responses, the scale elements can be transformed in numeric values on a numeric scale with fixed distances. This allows extended quantitative analysis techniques to be used.

For some of the demographic questions, recommendations from Breakwell et al. were used [BHF00]. The age of the respondents might be relevant to find out if they are young employees at the start of their career or if they are just before their retirement. According to Breakwell, it is likely that there are less responses if the age needs to be specified very precisely, e.g. by the birthday due to the lack of anonymity. Instead it is better to provide some age ranges which can be selected by the participants. For the survey, a set of seven age intervals was used.

Although Breakwell et al. suggest to use a binary (male/female) question to ask for the sex, the question was altered to ask for the gender and offered an open *other* option to accommodate to todays social standards.

To understand the background of the participants, several other questions were formed. The educational background might be relevant in terms of salary and career options, thus a question with options for every major educational degree was added. As typically the embeddedness of employees in a company raises over the time of their employment, another question with year intervals was added to find out how long each participant is employed at the current company. Employee's family situation might have influence as well, thus two questions were added, one for the marital status (single or married) and one for the number of children younger than ten. It is likely that children younger than ten need more assistance by their parents than children above ten, so this limit was used.

The next block of questions deals with psychological demand and social support and corresponds to the propositions P1 and P2. In 1979, Karasek developed a job demand model that covers stress at work. To support this model a questionnaire instrument was designed, the Job Content Questionnaire (JCQ) [KBKH]. Unfortunately, the instrument itself is not available in public but needs to be bought commercially. A decade later, Theorell et al. produced a shorter measurement instrument that supports the same model, the Demand Control Support Questionnaire (DCSQ). It was developed in Swedish language, but fortunately there are several translations in English available. For this study, the English translation by Aguiar et al. was used, as it had all the items consistently formulated as questions [AFV10]. The participants can answer the questions with a five item likert scale ranging from *Strongly disagree* to *Strongly agree*. The items are clustered in three different subscales. Items 1 - 5 cover psychological demands, the following six questions deal with the decision latitude and the last six questions cover the social support in the workplace [AFV10]. There were several studies that tested the psychometric properties of the DCSQ in different settings. Sanne et al. summarized that the properties "satisfactory, and the questionnaire can be used safely across different levels of skill, education, and depression" [STMD05]. While their study used a Norwegian translation of the items, a study by Mauss et al. used a German and English translation.. Their results are very similar to the ones of Sanne et al. and they confirm "a good internal consistency, construct validity, and criterion validity" [MHT+18].

For the payment aspect that is covered by proposition P3, another existing tool was used. In 1985, Heneman and Schwab designed the Pay Satisfaction Questionnaire (PSQ) to measure several dimensions of pay satisfactions [HS85]. Every item of the questionnaire instrument is answered on a likert scale with five possibilities ranging from *Very dissatisfied* to *Very satisfied*. A study that successfully tested the reliability of the instrument was performed and published by them in the same paper. Due to the large number of items – some even sounding very similar – this instrument was reduced in size for the questionnaire. During the reduction it was ensured that items representing all the four dimensions were kept. In view of the fact that the salary situation is only a partial aspect of the whole questionnaire, it is assumed that the reduction only leads to fuzziness in the partial aspects of the dimensions but does not change any tendencies in the overall result of salary satisfaction.

The fourth Proposition P4 deals with the role stress perceived at work. A Job Stress Questionnaire (JSQ) was developed by Robert D. Caplan in 1975 [Cap75]. It provides items for four different subscales covering workload, role conflict, role ambiguity and utilization of skills. For every item, a likert scale with six answers from *Never* to *Very frequently* were used. As the workload and skill aspects were already covered in the psychological demand section by using DCSQ items, those two subscales were omitted from the JSQ item list. In 1986, Hamel and Bracken tested the subscale structure of the JSQ with different samples [HB86]. They found out that there were significant differences between the physically workers – the blue-collar sample – and the professionals and white-collar workers. Anyway, the JSQ items were selected as the above critique from Hamel and Bracken focussed on the subscales and less on the overall instrument.

For the proposition P5 with the work design aspects in terms of significance and feedback, another third-party scale could be reused. The Work Design Questionnaire (WDQ) by Morgeson and Humphrey is a very large set of subscales for different aspects [MH06]. From all these subscales, the items of "Task Significance" as well as "Feedback from Others" were taken into account for this survey. Some of them were originally adapted from work by Hackman and Oldman [HHO80], Sims et al. [SSK76] and Campion and McClelland [CM91]. All items have a five item likert scale ranging from *Strongly disagree* to *Strongly agree*. The internal consistency reliability of the subscales was tested by Morgeson and Humphrey, too. Their result was 87% reliability in average.

To reflect the aspect of conflicts between work and family as in proposition P6, the Work-Family Conflict (WFC) scale by Netemeyer et al. was selected [NBM96]. It is a scale with five items, each with a five item likert scale ranging from *Strongly disagree* to *Strongly agree*, too. The research project by Netemeyer et al. proposed the inverse Family-Work Conflict scale as well, which was not used for this project. For the used WFC scale, “adequate levels of internal consistency, dimensionality, and discriminant validity across three samples” were determined in a study performed by them.

There were two possibilities for the organisational commitment in proposition P7. The Organizational Commitment Questionnaire (OCQ) developed by Mowday et al in 1979 [MSP79] is an 18-item instrument that is widely used in scientific context. A smaller instrument is the British Organizational Commitment Scale (BOCS) which was introduced by Cook and Wall in 1980 [CW80] based on the OCQ. It consists of nine statements which the participants either agree or disagree to. For the survey, the later instrument was used together with a likert scale which was reduced to five items to be consistent with the other instruments with agreement likert scales. Other researchers like Guest and Peccei as well as Mathews and Shepherd revisited this instrument to validate it [GP93][MS02]. They suggested to remove the three negative formulated items from the instrument, the items were kept unmodified though for the present questionnaire.

For the last proposition P8 regarding the job satisfaction, the Michigan Organizational Assessment Questionnaire Job Satisfaction Scale (MOAQ-JSS) by Cammann et al. was used [CFJK79]. It is a short instrument with only three items (from which one is a negation, thus reverse scored). The likert scale originally contained 7 items but other researcher like Allen reduced it to five elements [All01]. The construct validity and reliability were tested and evidence was found by Bowling and Hammond in 2008 [BH08]. An open question was added behind the MOAQ-JSS to ask the participants to “Briefly describe why [they] are particularly satisfied or not in [their] own words”.

The final section of the questionnaire covers the turnover intentions themselves. The research by Carayon et al. covered this topic as well [CSH+06]. They used three questions of which two had multiple possible answers. The first question is a general estimation of how likely it is to look for a job in the next year. It was originally provided by Seashore et al in 1982 as another element for the Michigan Organizational Assessment Questionnaire [SLMC83]. The other two items were developed by Carayon et al. three years before as a part of the pilot study. They each contain many options as possible answers from which the participant may select the appropriate ones.

4.5 Pilot Study and Questionnaire Revision

This version of the questionnaire was then sent out to a group of software engineers in different companies to perform a test run. Therefore, the questionnaire was extended by a feedback section that contained four questions. The first two questions addressed the length of the questionnaire:

1. I expected that the execution of the questionnaire would have needed
    - much less time than I needed.
    - less time than I needed.
    - approximately the time that I needed.
    - more time than I needed.
    - much more time than I needed.
    - no answer.

2. In my opinion, the questionnaire
   - should be much shorter.
   - should be a bit shorter.
   - should be about the size it is now.
   - could be a bit longer.
   - could be much longer.
   - no answer.

Of the 7 responses from the demo run, 6 answered that they expected the execution of the questionnaire would approximately need as long as they needed. One respondent even expected the questionnaire to need more time than it actually needed in the end. For the second feedback question, 6 of 7 respondents answered that the questionnaire should be about the size it was in the demo run. In contrast to the first question, the other respondent preferred it to be much shorter. To get a clue of where the questionnaire should be adjusted, the feedback section contained two open questions:

1. Did you feel uncomfortable when answering some of the questions? If so, may you say which one and why?
2. Are there any further comments, e.g. on the choice of questions?

Several participants suggested to improve the demographic section, especially in terms of the *marital status*. The marital status question was then altered to *living status* and the two answer possibilities were extended to cover more life circumstances. The question regarding the highest educational degree received the *apprenticed profession* response option.

For the main content of the questionnaire, there were two further suggestions. Some of the topics had very similar sub questions where it was unclear what the intended difference was. An example noted by a respondent were the two items in significance segment:

- The job has a large impact on people outside the organization.
- The work performed on the job has a significant impact on people outside the organization.

These two items and some similar constellations were revisited and redundant items were removed from the questionnaire. This even suited the response from above that requested a reduced length.

Another respondent suggested some of the items to be rephrased as questions. E.g. the section about the payment is not formulated as questions. A rephrasing would potentially lead to a loss in validity compared to the sources of the questionnaire items, as the exact wording that is used for the items is of importance in context of the understanding of questions by participants. Therefore, such a change was not performed and the original wording was kept.

The revised questionnaire was then sent to the human resources department to get its final permission for the execution of the survey. Even though they initially had concerns about the overall length of the questionnaire, they finally agreed to it after the overall results of the test run were positive in terms of the questionnaire length. The potential participants were then informed and the link to the online survey was distributed.

The final version of the questionnaire as used for the actual survey run can be found in appendix A. Following the suggestion of the guideline for psychometrical software engineering by Graziotin et al., all instructions for participants are included as well because the instructions may affect the answers of the participants [GWA15]. The next chapter covers the results of the survey.

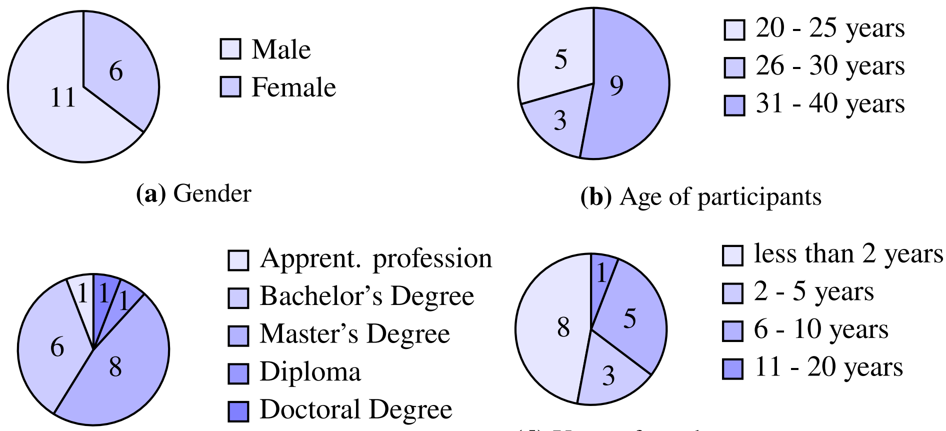
5 Results

During the time it was open for participation, 17 employees took part in the survey. The responses were mostly complete, only few responses had minor gaps.

The gathered demographic data as visualized in figure 5.1 shows that the sample of actual respondents covers most of the ranges provided in the questionnaire. Approximately two thirds of the respondents were male and a bit more than half of the participants were older than 30 years. However, no participant was older than 40 years, thus it can be assumed that none of the participants was near retirement. Figure 5.1c shows the highest educational degrees which range from apprenticed profession up to the doctoral degree. Almost half of the respondents had a master's degree. The amount of years in the company as shown in figure 5.1d is again split in half with 8 of 17 participants being employed for less than 2 years. On the other hand, there is one participant who is employed at that company for more than 10 years. There are some respondents with age 31 to 40 who are employed less than two years. It is likely that it is not their first employment.

For the main part of the questionnaire, the results are selected options in likert items. Researchers have no final decision whether likert items should be considered as ordinal scales or if they can be considered as interval scales though [1]. According to Boone and Boone, likert scales consisting of several - usually more than three - related likert type items can be considered as interval measurement scales [BB12].

Figure 5.1: Demographic information of survey participants



(a) Gender

(b) Age of participants

(c) Highest educational degree

(d) Years of employment at current company

[1]Exemplary discussion on researchgate.net:
https://www.researchgate.net/post/Is_a_Likert-type_scale_ordinal_or_interval_data

Table 5.1: Scores of factor instruments

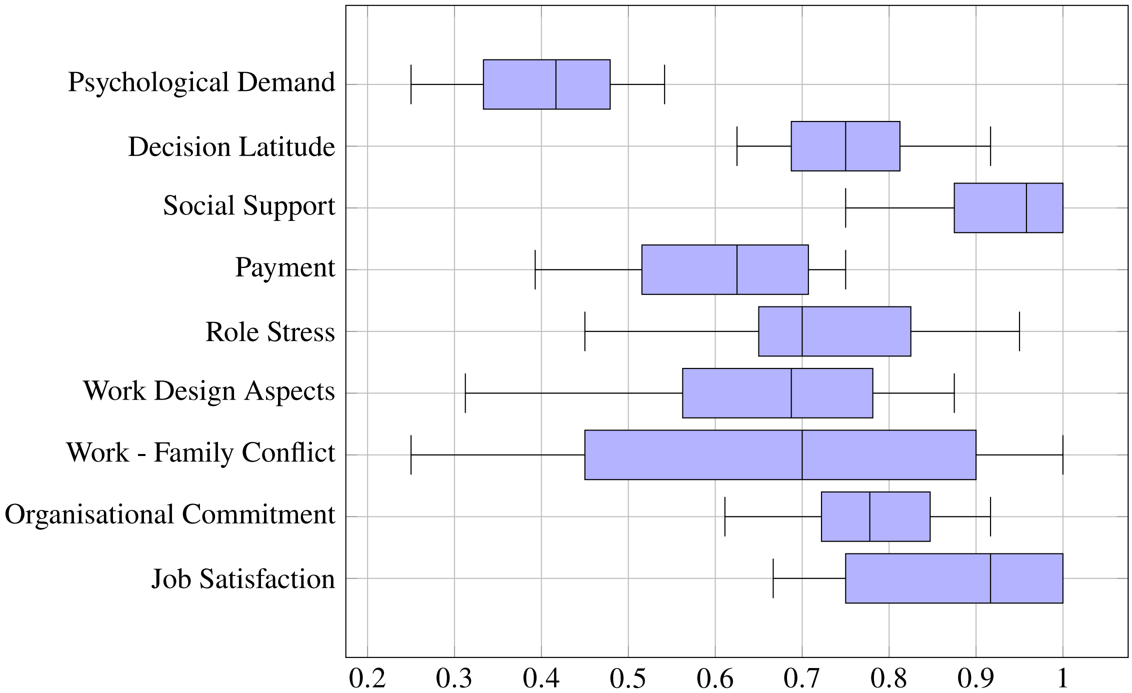
Instrument	Median	Standard-deviation	25% Quartile	75% Quartile	Minimum	Maximum
Psychological Demand	0.42	0.08	0.33	0.48	0.25	0.54
Decision Latitude	0.75	0.08	0.69	0.81	0.63	0.92
Social support	0.96	0.07	0.88	1.00	0.75	1.00
Payment	0.63	0.11	0.52	0.71	0.39	0.75
Role Stress	0.70	0.14	0.65	0.83	0.45	0.95
Work Design Aspects	0.69	0.15	0.56	0.78	0.31	0.88
Work - Family Conflict	0.70	0.22	0.45	0.90	0.25	1.00
Organis. Commitment	0.78	0.07	0.72	0.85	0.61	0.92
Job Satisfaction	0.92	0.11	0.75	1.00	0.67	1.00
Turnover Intentions	0.33	0.24	0.00	0.33	0.00	0.67

For the analysis of the instrument results, it was then necessary to convert the likert item selections to numeric values. Depending on whether the item's scale had four, five or six options, the numbers from 1 to 4, 5 or 6 are used to represent the possible answers. For example "Strongly disagree" was mapped to 1, while "Strongly agree" was mapped to 5 with the intermediate options being mapped to 2, 3 and 4. There are some items which have a wording that has negative impact on the instrument, e.g. the second statement of the job satisfaction score "In general, I don't like my job". For these items, the values had to be mapped in inverted order, so "Strongly disagree" is mapped to 5 and "Strongly agree" is mapped to 1. To get comparable numbers for all instruments, the results were normalized to the interval 0 to 1. A table with the normalized statistical information for every item is attached in appendix B. There, items where the scores had to be inverted due to a negated wording are highlighted by an asterix symbol. Following the recommendations of Boone and Boone, the statistics for every single item consider the median values as well [BB12]. In the next step, for each of the instrument scales, the scores of the participants were calculated by adding the individual item scores and dividing the result by the number of answered items. This was necessary to compensate for some gaps where participants gave no answer. These final summary scores for every instrument are listed in table 5.1.

Overall, most of the instrument scores result in values larger than 0.5, only the psychological demand has a median below that.

The Demand Control Support Questionnaire (DCSQ) for the psychological demand and social support aspects provides numbers for three different scores. All three of them have rather small standard deviations with 0.07 to 0.08. The items which were formulated as a negative statement received the largest single item deviations up to 0.26, whereas the items "Is it possible for you to learn new things through your work?" and "Do you like to work with your co-workers?" received the smallest deviations, both having a median of 1.00 and a mean of 0.97. While the median value for the psychological demand score is the lowest with 0.42, the other two scores have moderate respective high median values of 0.75 and 0.96.

Figure 5.3: Boxplots for the aggregated factor instruments



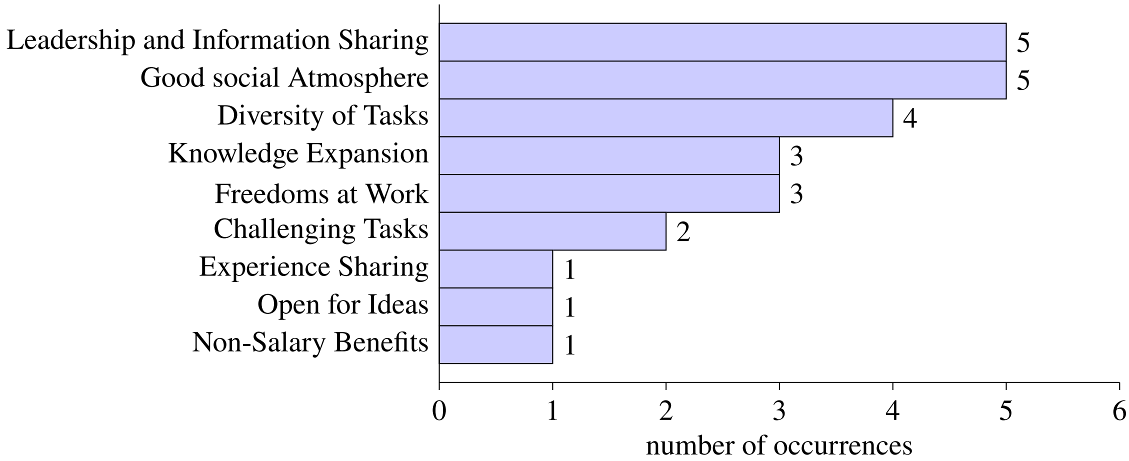
For the second instrument, the Pay Satisfaction Questionnaire (PSQ), the results are lower than for the DCSQ. The median is at 0.63 and the standard deviation is slightly larger with 0.11. There is a high contrast between the deviation of single items. While "My current salary" has a deviation of only 0.15, the deviation of "Influence my supervisor has over my pay" is more than 3 times larger with 0.39.

As the boxplot diagram in figure 5.3 shows, with 0.70 the Job Stress Questionnaire (JSQ) median lays between the two previous instruments. The overall standard deviation of 0.14 is higher than the previous instruments. The lower means of the items are related to unclear tasks, the items regarding task conflicts have higher means.

The work design aspects covered by the Work Design Questionnaire (WDQ) instrument extract have a slightly lower median value than the median of the role stress instrument. The standard deviations range from 0.20 to 0.24 for all of the four items of the instrument while the median values are all the same with 0.75. The item regarding job importance in a broader scheme of things received the lowest mean with only 0.60.

The conflict between work and family has almost the same summarized median with 0.70, but the standard deviation is larger than the deviation of all other instruments. Therefore, it is the only instrument with a 25% quartile below the 0.5 mark. With 0.62 and 0.63, the items "Due to work-related duties, I have to make changes to my plans for family activities" and "The demands of my work interfere with my home and family life" have the lowest means of this instrument. The lowest standard deviation of 0.19 is observed at the "My job produces strain that makes it difficult to fulfil family duties" item.

Figure 5.4: Coded elements of free text answers regarding personal satisfaction reasons



In contrast to the large deviations of the previous instrument, the instrument for organisational commitment, the British Organizational Commitment Scale (BOCS) together with the DCSQ described above received a standard deviation of only 0.07 and the median of 0.78. The means of the individual items range from 0.56 at "I'm not willing to put myself out just to help the organization." to 0.90 at "To know my own work had made a contribution to the good of the organization would please me".

For the Michigan Organizational Assessment Questionnaire Job Satisfaction Scale (MOAQ-JSS), the median is the highest of all instruments with 0.92. The 75% quartile is at the maximum of 1.00 and the minimum at 0.75. The item related to the workplace "In general, I like working here." received the highest mean with 0.91.

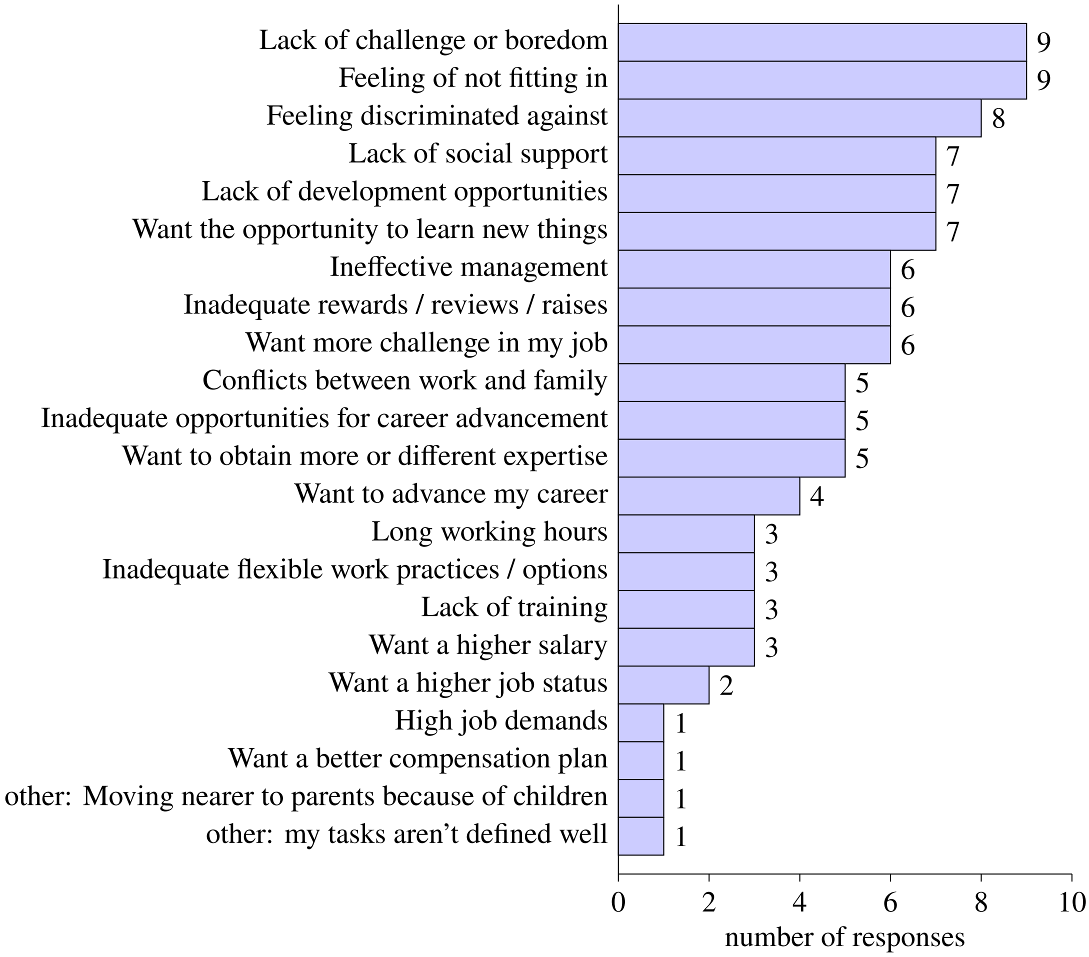
The last separate likert item score is the one asking for how likely it is that the participant will actively look for a new job in the next year. It received a mean of 0.23 with a standard deviation of 0.24. Only two participants told that it would be likely, while 5 said it would be unlikely and for 6 it is very unlikely. The remaining participants did not answer this question. This score considers 0 as having no turnover intentions and 1 as having strong turnover intentions.

The free text question regarding the personal (dis-)satisfaction reasons in the job satisfaction section received 9 answers. These answers were compared and the contents of the participants explanations were coded to common reoccurring elements. Figure 5.4 shows these elements ordered by the number of occurrences.

The prevalent elements were the management and social atmosphere aspects. Several participants pointed out that their supervisors did a good job. This covers the "very easy and open communication with the managers" as well as transparent decision making, e.g. regarding prioritization of things. The atmosphere between the employees was described as a "community, which cares for another" and a participant told that they "pursue a relationship where you can go for a drink once in a while".

Other frequently occurring elements were related to the work itself. Some participants told that they "get to know new things on an almost weekly basis" and they "have a lot of freedom and also self-responsibility". The freedoms perceived by the employees cover flexible working hours

Figure 5.5: Results for the question "If you would consider leaving your current job, what would the reasons be?"

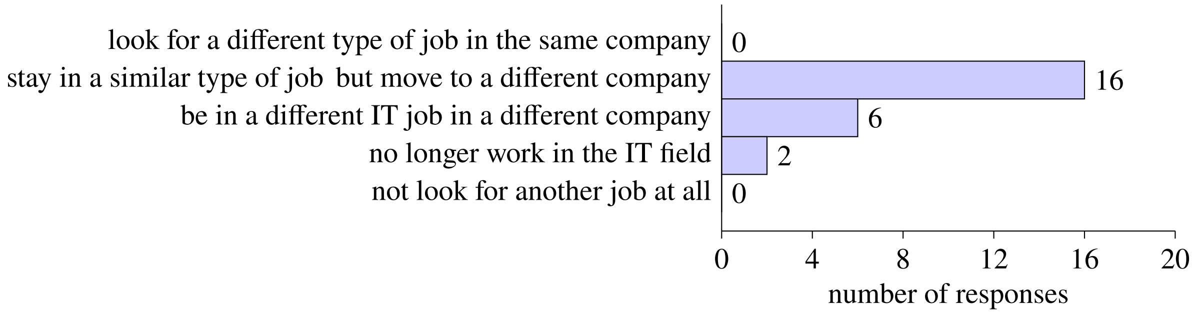


as well. To support their personal skills, the employees have a "provided timeframe for personal (knowledge) development every week" and they "support [each other] with their knowledge to keep [them] growing".

One participant pointed out that the management is open for new project ideas; instead of discarding them immediately they rather add them to backlog with appropriate priorities. Another participant emphasized that there are some benefits provided by the employing company aside the regular salary. These range from financial advantages for job tickets to the provision of bikes.

There were some additional comments of single participants. One respondent told that the job is not the best paid one but the satisfaction is more important to him than getting 20 percent less salary compared to other jobs where the conditions of work are not as good. For another participant, there are two important must haves, one is the good relationship between the colleagues and the other are the capabilities of the colleagues in terms of skills. He summarizes "One of these two statements missing would be a deal-breaker".

Figure 5.6: Results for the question "If you would decide to leave your current job, what would be your intentions?"



The last section of the questionnaire contained the self-assessment regarding turnover intentions. Two questions were provided as multiple-choice selections. The first asked the participants to select the reasons that would apply for them if considering turnover. There, the most frequently selected reasons are either related to the tasks of employees or the social atmosphere. With 9 of 17 participants, the "Lack of challenge or boredom" is the most selected personal turnover reason. Missing opportunities to learn new things are shortly after with 7 participants followed by "Want more challenge in my job" with 6 answers. Another frequently selected reason with 9 participants is the "Feeling of not fitting in" that counts to the social aspect as well as "Feeling discriminated against" with 8 and the "Lack of social support" with 7 answers. Beside these two areas, the reasons related to career development were chosen a couple of times too, e.g. "Lack of development opportunities" with 7 times and "Inadequate opportunities for career advancement" with 5 times. Two participants added two custom reasons, one being not well-defined tasks and one a family relocation to the parents because of the children, so the distance between children and their grandparents is not so large. These and all other potential reasons are listed in the bar chart in figure 5.5 and sorted by descending numbers of responses.

The last question of the questionnaire covered the intentions of employees after they would have decided to proceed with turnover and leave their current job. The results of this multiple choice question are visualized in figure 5.6. None of the respondents imagines to stay at the same company but in a different type of job. All but one participant assume that they would stay in their job but at a different company. 6 of 17 consider staying in the IT domain but doing something else in this domain as a possible option. To leave the profession in the IT domain and work in another domain was selected by two of the participants. None of the participants considers not working anymore as a personal option.

Table 5.2: Pearson correlation coefficients and p-values

Instrument	PCC Value	Correlation	p-Value	Significance
Psychological Demand	0.02	weak positive	0.9572	not significant
Decision Latitude	-0.33	weak negative	0.2690	not significant
Social Support	-0.73	strong negative	0.0046	significant
Payment	-0.78	strong negative	0.0016	significant
Role Stress	-0.43	moderate negative	0.1421	not significant
Work Design Aspects	-0.19	weak negative	0.5334	not significant
Work - Family Conflict	-0.06	weak negative	0.8643	not significant
Organis. Commitment	-0.38	moderate negative	0.2027	not significant
Job Satisfaction	-0.58	moderate negative	0.0396	significant

5.1 Analysis

Based on the results described in the previous section, it is possible to perform some analysis. To inspect the numeric scores of the instrument results for some correlation effects regarding the turnover retention score, a correlation coefficient analysis was performed.

The common correlation coefficient calculations are either for ordinal scales or interval scales. As described above, for the present research project the instrument scores are considered as interval measurements. Therefore, the Pearson correlation coefficient (PCC) is the one used for the correlation analysis. The PCC measures the linear correlation between two variables. Here, the first variable is one of the instruments representing the potential factors while the second variable is always the turnover intention score. The table 5.2 contains the calculated PCC values for every instrument. The values are almost all showing negative correlations, meaning that for example better job satisfaction results in a higher satisfaction score, while the turnover intention score gets lower - corresponding to less turnover intentions. This applies for all of the negative correlations. The meaning column is categorized by ranges provided by Taylor with values from 0 to 33% considered as weak correlations, from larger than 33 to 66% as moderate and from larger than 66 to 100% considered as strong correlations for both positive and negative correlations [Tay90].

According to the calculated PCC values, the correlation between psychological demand and turnover intentions with positive 0.02 would lead to slightly more turnover intentions when there is a better situation regarding psychological demand. But as the number is very small, it can be considered as non-existent resulting in no evidence of a correlation between the psychological demand and the turnover intentions. The PCC value for the decision latitude suggests a bit stronger but still rather weak negative correlation to turnover intentions. A way stronger correlation is suggested by the PCC value for social support with -0.73. It is almost as strong as the value of the correlation between payment and turnover intentions. The correlation coefficient of the role stress score and turnover intentions indicates a moderate negative correlation, so a less role stress might reduce the turnover intentions. Both the work design aspect score as well as the work family conflict both have small PCC values leading to weak correlations. The PCC value for the organisational commitment score suggests a moderate negative correlation. A slightly larger correlation coefficient was calculated for the job satisfaction score.

It is important to keep in mind that the correlations that were identified based on the Pearson correlation coefficient are no definitive evidence for the factor variable affecting the turnover intentions. To ensure the significance of the correlations, t-tests can be performed. For this t-test two hypotheses are proposed where ρ is the correlation coefficient of the whole population:

$$H_0 : \rho = 0$$

$$H_1 : \rho \neq 0$$

The null hypothesis H_0 tells that there is no correlation coefficient for the population that is significantly different from 0. The alternative hypothesis H_1 tells that there is a correlation coefficient for the population that is significantly different from 0. To decide which of the two hypotheses apply, a p-value test with a significance level α of 5% is performed for each correlation. Where these p-values are below the α criteria of 0.05, the hypothesis H_0 is rejected and the results can be considered as significant, otherwise the results are considered as not being significant.

The calculated p-values are listed in table 5.2. Based on the t-tests, only three of the correlations can be considered as significant, namely:

- Social support
- Payment
- Job satisfaction

Indicated by the Pearson correlation coefficients, it is not possible to support or discard the remaining correlations.

In general, the sample of participants is rather low. Due to some participants not answering the question regarding turnover retentions, there were only 13 usable data sets for the correlation calculations. Furthermore, the various degrees of freedom in the survey and possible noise due to the various involved factors lead to a loss of statistical power. Under these circumstances, it is unlikely that the correlations can be considered as giving significant evidence for effects of the factors regarding turnover intentions. While this leads to not being able to scientifically support the propositions, it is possible to get some hints for further research as well as a summary of the state in the company that was involved in the case study. The next chapter will cover the discussion of the analysis and results provided in this chapter.

6 Discussion

This chapter covers the implications of the case study that was performed in the previous chapters. The limitations of this research project are treated and the results are compared with findings from the related work.

6.1 Proposition Testing

The model proposed in chapter 3 contains 16 propositions, which are describing the relationships between potential factors and turnover as well as retention. Propositions P1 to P8 covered the negative effect on turnover intentions, meaning that positive manifestations of the factors would lead to less turnover intentions. The evaluation of instrument score and turnover intention score correlations should provide statistical evidence for these propositions, though in this case, the results are not significant enough, mainly due to the small sample sizes. In contrast, previous studies in other domains had substantial larger numbers of participants, e.g. the mentioned study of Christeen George [Geo15] was deployed to 138 workers which is a ten times larger sample than the number of answers retrieved for the correlation calculations in the present study.

Therefore, no well-founded statement can be made as to whether the propositions can be confirmed or must be rejected. An a priori power analysis based on the observed effects is recommended to estimate the needed sample size for a repetition of the study.

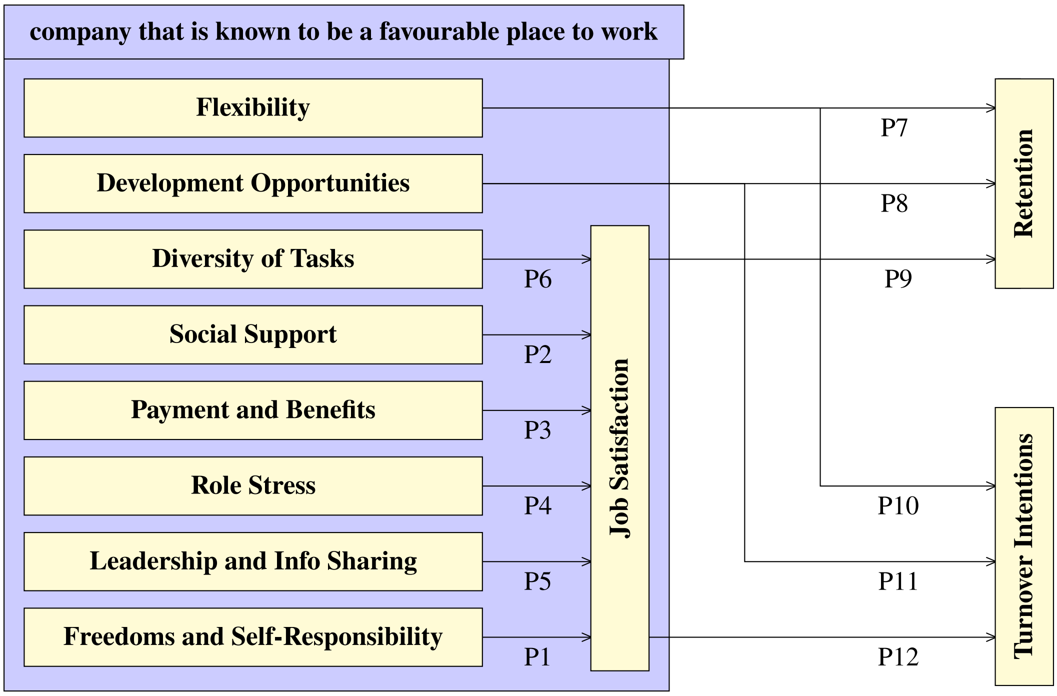
6.2 Implications

From a scientific point of view, as described above, unfortunately no substantiated implications can be made regarding the conceptual model. However, as intended in an exploratory study, new approaches can be identified which can serve as a basis for future research projects.

Based on the responses, a revised version of the conceptual model can be formed that reflects the situation in the investigated company. The model is visible in figure 6.1 below. The major difference between the two versions of the models is the addition of the job satisfaction as an intermediate driver of turnover or retention instead of the job satisfaction being a factor like the others.

In their free text answers, many participants pointed out that their job satisfaction is mainly based on the other factors. The original model in chapter 3 did not feature such an intermediate step and followed the flat structure that was proposed by the turnover antecedents model of Ghapanchi et al. 2011 [GA11]. In contrast, the original model by Mobley et al. from 1979 features a similar structure where the satisfaction is the intermediate step between the job-related perceptions and the intentions to turnover [MGHM79].

Figure 6.1: Revised model of factors for retention and turnover intentions conceptualizing the situation at the company of the case study.



The actual factors in the models were changed as well to better suit the findings from participant answers. Some of the previously included factors were dropped:

- *Psychological Demand*: Although the results of the instrument score were rather low, there were no traits of correlations found and no participant stated that a big workload plays a significant role. Only the frequently selected boredom as potential turnover reason could support that factor partly.
- *Feedback and Significance* These aspects were covered by the work design aspects instrument. Again, no significant correlation between the moderate scores and the turnover intentions could be found.
- *Organisational Commitment* The organisational commitment score results were better than the ones of the two previous ones. However, the information contributed by the participants does not show that this factor plays an active role in the intentions.

The revised model contains some new factors instead of the previously removed ones:

- *Diversity of Tasks*: Especially in the free text answers to the open question, the diversity of tasks was pointed out to be one of the most important things in everyday work. Further support is provided by the lack of challenge or boredom being the most selected potential reason for turnover. As boredom can be taken into account as a psychological constraint, this new factor may be considered as a follow up factor for the *psychological demand*.

- *Leadership and Info Sharing*: This is the top ranked satisfaction reason according to the free text answers. Several participants pointed out that the way their managers are doing the work is important for them, as they not only inform the employees but also hear them and are open for new ideas, thus allowing some participation regarding decisions and future work of the team. Like the previous factor, ineffective management is one of the higher ranked potential turnover reasons.
- *Freedoms and Self-Responsibility*: Another factor that is driven by the text answers is mainly focussing on the ability of the employees to decide how and what they want to do at work. The decision latitude scores that were provided by the Demand Control Support Questionnaire (DCSQ) as a side effect identified a slight correlation to the turnover intentions too.
- *Flexibility*: This new factor relates both to the flexitime policy of the company as a positive reason and the potential *conflicts between work and family* that would be a negative driver. The flexitime policy was mentioned by some of the participants in the free text answers. The conflict potential between work and family was already in the original model and is selected as a potential reason for turnover in the multiple-choice question block by several participants, too.
- *Development Opportunities*: Despite not initially covered by the instruments in the questionnaire, the development opportunities or a lack thereof play a role regarding turnover reasons. This aspect covers both the career development as well as the development of knowledge and skills.

  The items "Lack of development opportunities" and "Inadequate opportunities for career advancement" were both frequently selected in the multiple-choice question regarding turnover reasons. As they were not actively mentioned in the open question regarding satisfaction, it seems that they are not related to the intermediate satisfaction driver though but stand in a direct relationship towards turnover intentions and retention.

  Responses showed that the possibility of improving personal skills and knowledge is an important aspect for many participants. In the free text answers as well as in the multiple-choice selections, the expansion of knowledge and opportunity to learn new things was frequently mentioned. This matches the observations of Paré and Tremblay in their turnover intention study where they came to the same conclusion regarding the importance of knowledge development[PT00].

The remaining three factors are adopted almost unchanged from the original model:

- *Social Support*: According to the results of the questionnaire study, this is the most important factor. It has a strong correlation towards the turnover intentions that even passed the significance t-test. Furthermore the most frequently reported satisfaction reasons were related to the good social atmosphere in the company. On the other hand, the feeling of not fitting in, discrimination and the lack of social support would be critical reasons for turnover according to the selections in the multiple-choice question.
- *Payment and Benefits*: This factor was already present in the initial conceptual model and it gained support by having the strongest correlation while passing the significance test. While not being mentioned as an important driver for satisfaction, inadequate rewards / reviews

/ raises still got selected as potential turnover reason. The addition to this factor are the benefits, which were mentioned in the free text answers. These range from e.g. job ticket subvention to provision of bikes for employees.

- *Role Stress*: As previously mentioned, the employees have certain degrees of freedom for performing their work. However, a participant explicitly pointed out that not well defined tasks are the most important turnover reason for him. He also was one of the two participants who likely consider actual turnover in the near future. This emphasizes the importance of having at least some guidelines what the employees should do to prevent them from having uncertainty on what they actually should do in the company.

For the company itself, it seems that their qualification as a good place to work is supported by the answers of the participants. In average, most of the scores had higher positive values, especially the ones which can be directly influenced by the company. Nevertheless, there is some potential to improve related to the work itself. On the one hand, as just described above, it should be ensured that no employee feels frustrated due to not having clear tasks. On the other hand, the overall workload might be investigated as the psychological demand scale received the worst score.

6.3 Limitations

As told above, the main limitation is not being able to support or decline the propositions based on the numeric results with a certain significance due to the small sample size. The numerous degrees of freedom require a larger sample to get reliable results. This leads to a restriction of the meaningfulness of the implications to an exploratory context. To gain scientific support for either of the proposed models, at least one other study under better conditions is required. However, the results obtained might be valuable for the participating company as it may gather some hints on where there is further potential for improvement of their already good employment conditions.

In addition to the main sample size problem, some approaches to improve the questionnaire were identified during further literature research accompanying the analysis of the responses. To counteract the possible negative implications of the scientifically controversial evaluation of likert scales as interval scales, Wu and Leung suggest to increase the number of likert scale points to eleven [WL17]. This fine-grained approach would improve the results by getting closer to the real distribution of values, thus reducing the deviations when interpreting them as interval data.

The used instruments contained several negative worded items. According to Suárez-Alvarez et al. the usage of both positive and reversed items in the same questionnaire have some negative consequences [SPL+18]. Due to the changes in wording, the verbal skills have higher influence on the answers and in general, there is another source of variance added. A study by Qasem et al. brought up evidence that the direction of items has some influence on the construct validity of likert scales [NA14]. Though the criterion validity does not seem to be affected by the direction of items. Especially for the British Organizational Commitment Scale (BOCS) used in the present project, different researchers investigated a shorter six item variant that omits the negatively worded items. Both Mathews and Shepherd [MS02] as well as Guest and Peccei conclude that the version without these reversed items is “psychometrically superior to the nine-item version” [GP93]. Therefore, a revised questionnaire should use instruments with less or better none reversed items to additionally improve the validity.

7 Conclusion

This thesis covers the creation of a conceptual model of factors for turnover and retention based on existing literature as well as an empirical case study based on this model in the setting of a company that is known as a good place to work.

The motivation for this thesis was expressed in the introductory chapter 1 which also contains the research question and scope of the thesis. It was followed by the literature review in chapter 2 that based on a snowball literature research. The literature review brought up several previous attempts to inspect turnover or retention reasons in the IT domain, however the scopes were slightly different. Additionally, the potential factors for turnover intentions and retention were identified during the literature review. Other background information was later used to improve the quality of the further thesis, e.g. by using existing validated instruments as a base for the questionnaire instead of creating questionnaire items from scratch. Based on the potential factors identified in the previous chapter, a conceptual model was formed in chapter 3. 16 propositions were retrieved from it covering the relationships between factors and turnover on the one hand and the factors and retention on the other hand. To test these propositions, in chapter 4 a questionnaire driven case study was developed. For this purpose, existing likert scale instruments were used to represent the factors of the conceptual model, e.g. the Demand Control Support Questionnaire (DCSQ) covering psychological demand, decision latitude and social support. A first pilot study was used to improve the questionnaire which was subsequently deployed to participants of the actual survey. Their responses were described and analysed in chapter 5. The calculated Pearson correlation coefficients showed some connections between the different factors, but the results have no statistical significance mainly due to the too small sample size. This problem and other limitations were discussed in chapter 6 as well as other findings and implications from the survey results were collected there. The remaining final chapter 7 provides a summary of the thesis, a tentative answer to the research question as well as an outlook onto potential future research projects which could pick up the findings of this thesis.

The initial research question "Which factors foster retention and hinder turnover from the perspective of employees in IT domain?" proposed in section 1.2 was splitted into two subquestions:

1. Which factors foster retention from the perspective of employees in IT domain?
2. Which factors hinder turnover from the perspective of employees in IT domain?

Both subquestions could not be answered with scientifically significant evidence due to the implications of the small sample size in the study and additional blur caused by deficits in the validity of the used instruments. However, based on the available numeric results in combination with the subjective answers of the participants it is possible to identify some tendencies which could serve as hints for further research. The most noticeable trait is the social support factor which many of the participants identified as very important reason for their personal satisfaction as well as one of the most important reasons for turnover if it would be missing. The aspect of career development opportunities was not included in the initial conceptual model. Based on the responses, it is likely that a lack of career development opportunities would have an increasing effect regarding turnover intentions.

7.1 Outlook

As the study could not answer the research question with scientific certainty, a repetition of the study with improved conditions is strongly recommended. This covers the quality of the questionnaire to improve validity as well as the setting with a larger sample to reach a better level of significance. The revised questionnaire could either be based on the original conceptual model or on the revised version that was proposed in the previous chapter based on the findings of the study. It would be interesting to test if other companies have similar structures.

Alternatively, it is imaginable to drop the questionnaire in favour of the questionnaire used by Carayon et al. as it shares some of the instruments and was designed for a similar scope [CSH+06]. The questionnaire by Carayon et al. has the advantage of being already validated and having data to compare from other studies. Though the questionnaire by Carayon would require the acceptance of a larger survey by the involved company due to the increased number of items.

Following the rather small amount of responses in the main survey, the idea of conducting the survey in another company with a slightly different background and scope came up. The second company is not explicit known as a good employer like the first company but is active in consulting and with commissioned development for third party companies too. It would have provided an interesting scenario as the company was bought up by a larger international corporation several months ago resulting in various changes for the everyday life of employees. Unfortunately, responses were even lower with only two participants. Therefore, it was dropped for the present thesis. This idea could be picked up again to recreate the study of the thesis in a similar scenario. The author of this thesis expects to gain valuable insights into the dynamic development of retention and turnover under the influence of such changes caused by company acquisition. In consulting situations, the characteristics of social support and organisational commitment may have a different significance, since employees may spend a large part of their time not with their employer, but directly with the customer.

The third and final proposal for further research bases on the variety of tasks that was pointed out by the participants to be one of their most important satisfaction aspects of work. An IT company that focuses on the in-house development of one single product would provide a contrasting setting where these factors could be investigated too. All these different case studies could shine a light on the manifestations of the factors in various settings.

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A Full Questionnaire

This is the transcript of the questionnaire in its revised version as it was used for the actual survey run.

Turnover and Retention Questionnaire

Introduction

This questionnaire is part of a master thesis by Matthias Gürtler at the University of Stuttgart. The goal of the thesis is to gain knowledge about factors leading to retention or turnover. For this purpose, the following questionnaire provides various questions about employee's intentions to stay at their current employer (retention) or to leave (turnover). Moreover, the reasons and factors leading to these intentions shall be investigated.

The study takes maximum 15 minutes of your time (depending on how fast you answer the questions). Most questions are closed questions that require you to select one of the predefined answers.

Confidentiality

The answers are stored in a protected database hosted on a webserver in Germany. Only me - the master student - and my supervisors get access to the data. Third parties (e.g. employers) will not be able to view the response data records at any time.

The response data records do not contain any identifying data (e.g. IP or e-mail addresses) and cannot be traced back to individual participants. Furthermore, the thesis will not contain any complete answer data records that allow conclusions to be drawn about individual persons. Only summarised evaluations of aggregated data records or excerpts of open question responses will be included.

After complete evaluation of the answers, the data records will be removed from the web server and local data storage.

Contact

If you have any further questions, you may contact me by mail at *information redacted* or by phone at *information redacted*.

Informed Consent

Consent to take part in research study:

- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous.
- I understand that extracts from my answers to open questions may be quoted in the corresponding master thesis documentation/presentation and research publications.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

By participating I agree that I have read and understand the previously mentioned remarks about the study.

Demographic Questions

To get some context about your current employment situation, here are some basic demographic questions regarding your job and education. As the family situation may influence some decisions regarding retention and turnover, there are some more private than usual questions, too.

In which range is your age? Please choose only one of the following:

- less than 20 years
- 20 - 25 years
- 26 - 30 years
- 31 - 40 years
- 41 - 50 years
- 51 - 60 years
- more than 60 years

What is your highest educational degree? Please choose only one of the following:

- Doctoral Degree
- Master's Degree
- Diploma
- Bachelor's Degree
- Apprenticed profession
- Other

How many years are you already working for your current employer? Please choose only one of the following:

- less than 2 years
- 2 - 5 years
- 6 - 10 years
- 11 - 20 years
- more than 20 years

What is your living status? Please choose only one of the following:

- Single or living alone
- Married or living in a partnership

What is your gender? Please choose only one of the following:

- Female
- Male
- Other

How many children younger than 10 do you have? Please choose only one of the following:

- 0
- 1
- 2
- more than 2

Psychological demand and social support

The statements below describe various aspects of your tasks and the work with co-workers.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Do you have to perform your work tasks quickly?	◦	◦	◦	◦	◦
Do you have to work intensely? (in other words, produce a lot in little time)	◦	◦	◦	◦	◦
Does your work require too much from you?	◦	◦	◦	◦	◦
Do you have enough time to perform all the tasks of your job?	◦	◦	◦	◦	◦
Does your work usually involve contradictory or discordant requirements?	◦	◦	◦	◦	◦
Is it possible for you to learn new things through your work?	◦	◦	◦	◦	◦
Does your work require much ability or specialized knowledge?	◦	◦	◦	◦	◦
Does your work require you to show initiative?	◦	◦	◦	◦	◦
In your job, do you have to repeat the same tasks many times?	◦	◦	◦	◦	◦
Can you choose HOW to do your job?	◦	◦	◦	◦	◦
Can you choose WHAT to do in your job?	◦	◦	◦	◦	◦
Is there a calm and pleasant environment where you work?	◦	◦	◦	◦	◦
At work, do you have a good relationship with each other?	◦	◦	◦	◦	◦
Can you rely on the support of your co-workers?	◦	◦	◦	◦	◦
If you are not having a good day, do your co-workers understand you?	◦	◦	◦	◦	◦
At work, do you have a good relationship with your superiors?	◦	◦	◦	◦	◦
Do you like to work with your co-workers?	◦	◦	◦	◦	◦

Payment

The statements below describe various aspects of your pay. For each statement, decide how satisfied or dissatisfied you feel about your pay.

	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
My current salary	∘	∘	∘	∘	∘
Possible bonus payments	∘	∘	∘	∘	∘
The value of my non-salary benefits	∘	∘	∘	∘	∘
The number of benefits I receive	∘	∘	∘	∘	∘
The most recent raise	∘	∘	∘	∘	∘
Influence my supervisor has over my pay	∘	∘	∘	∘	∘
The company's pay structure	∘	∘	∘	∘	∘
Differences in pay among jobs in the company	∘	∘	∘	∘	∘

Role Stress

The questions below describe various aspects of role conflicts and role ambiguity. For each question, decide how often these situations occur.

	Never	Very rarely	Rarely	Occasionally	Frequently	Very frequently
How often do people equal in rank and authority over you ask you to do things which conflict?	∘	∘	∘	∘	∘	∘
How often do people whose requests should be met give you things to do which conflict with other work you have to do?	∘	∘	∘	∘	∘	∘
How often are you unclear on what your responsibilities are?	∘	∘	∘	∘	∘	∘
How often can't you predict what others will expect of you on the job?	∘	∘	∘	∘	∘	∘

Work Design Aspects

The following statements deal with the significance of your work and the feedback you receive. For each statement, decide how strong you agree or disagree.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
The results of my work are likely to significantly affect the lives of other people.	◦	◦	◦	◦	◦
The job itself is very significant and important in the broader scheme of things.	◦	◦	◦	◦	◦
The work performed on the job has a significant impact on people outside the organization.	◦	◦	◦	◦	◦
Other people in the organization, such as managers and co-workers, provide information about the effectiveness (e.g., quality and quantity) of my job performance.	◦	◦	◦	◦	◦

Work - Family Conflict

The following statements deal with the conflicts of work and family. For each statement, decide how strong you agree or disagree.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
The demands of my work interfere with my home and family life.	◦	◦	◦	◦	◦
The amount of time my job takes up makes it difficult to fulfill family responsibilities.	◦	◦	◦	◦	◦
Things I want to do at home do not get done because of the demands my job puts on me.	◦	◦	◦	◦	◦
My job produces strain that makes it difficult to fulfill family duties.	◦	◦	◦	◦	◦
Due to work-related duties, I have to make changes to my plans for family activities.	◦	◦	◦	◦	◦

Organisational Commitment

The following statements deal with the commitment to your company. For each statement, decide how strong you agree or disagree.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I am quite proud to be able to tell people who it is I work for.	∘	∘	∘	∘	∘
I sometimes feel like leaving this employment for good.	∘	∘	∘	∘	∘
I'm not willing to put myself out just to help the organization.	∘	∘	∘	∘	∘
Even if the firm were not doing too well financially, I would be reluctant to change to another employer.	∘	∘	∘	∘	∘
I feel myself to be part of the organization.	∘	∘	∘	∘	∘
In my work I like to feel I am making some effort, not just for myself, but for the organization as well.	∘	∘	∘	∘	∘
The offer of a bit more money with another employer would not seriously make me think of changing my job.	∘	∘	∘	∘	∘
I would not recommend a close friend to join our staff.	∘	∘	∘	∘	∘
To know my own work had made a contribution to the good of the organization would please me.	∘	∘	∘	∘	∘

Job Satisfaction

The statements below describe various aspects of your overall job satisfaction. For each statement, decide how strong you agree or disagree.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
All in all, I am satisfied with my job.	∘	∘	∘	∘	∘
In general, I don't like my job.	∘	∘	∘	∘	∘
In general, I like working here.	∘	∘	∘	∘	∘

Briefly describe why you are particularly satisfied or not in your own words.

Turnover

The statements below describe various aspects of your overall job satisfaction. For each statement, decide how strong you agree or disagree.

	Very unlikely	Unlikely	Likely	Very likely
How likely is it that you will actively look for a new job in the next year?	◦	◦	◦	◦

If you would consider leaving your current job, what would the reasons be?

- High job demands
- Long working hours
- Lack of challenge or boredom
- Lack of social support
- Inadequate flexible work practices / options
- Conflicts between work and family
- Ineffective management
- Feeling discriminated against
- Feeling of not fitting in
- Lack of training
- Lack of development opportunities
- Inadequate rewards / reviews / raises
- Inadequate opportunities for career advancement
- Want a higher job status
- Want to advance my career
- Want a higher salary
- Want a better compensation plan
- Want to obtain more or different expertise
- Want the opportunity to learn new things
- Want more challenge in my job
- Other:

If you would decide to leave your current job, what would be your intentions?

- I would intend to look for a different type of job in my same company.
- I would intend to stay in a similar type of job, but move to a different company.
- I would intend to be in a different IT job in a different company.
- I would intend to no longer work in the IT field.
- I would intend not to look for another job at all.
- Other:

Submission

Thank you for participating in the survey. Your answers contribute to the successful completition of my master thesis :)

If you are interested in getting the results, once the thesis is completed, please notify the person from who you got the invitation to participate in this survey.

B Study Result Data

The table below contains statistical information for every individual likert scale item. All scales are normalized to the range between 0.0 and 1.0. Item scales with formulated negations in the statements are already inverted. They are highlighted with an asterix symbol.

Item	Mean	Median	Standard-deviation
Psychological Demand & Social Support			
Do you have to perform your work tasks quickly?*	0.46	0.25	0.26
Do you have to work intensely? (in other words, produce a lot in little time)*	0.50	0.50	0.19
Does your work require too much from you?*	0.71	0.75	0.25
Do you have enough time to perform all the tasks of your job?	0.76	0.75	0.18
Does your work usually involve contradictory or discordant requirements?*	0.66	0.75	0.21
Is it possible for you to learn new things through your work?	0.97	1.00	0.08
Does your work require much ability or specialized knowledge?	0.85	0.75	0.15
Does your work require you to show initiative?	0.88	1.00	0.15
In your job, do you have to repeat the same tasks many times?*	0.63	0.50	0.19
Can you choose HOW to do your job?	0.84	0.75	0.12
Can you choose WHAT to do in your job?	0.59	0.75	0.19
Is there a calm and pleasant environment where you work?	0.87	1.00	0.19
At work, do you have a good relationship with each other?	0.94	1.00	0.11
Can you rely on the support of your co-workers?	0.94	1.00	0.11
If you are not having a good day, do your co-workers understand you?	0.90	1.00	0.15
At work, do you have a good relationship with your superiors?	0.93	1.00	0.14
Do you like to work with your co-workers?	0.97	1.00	0.08
Payment			
My current salary	0.63	0.75	0.15
Possible bonus payments	0.31	0.50	0.34
The value of my non-salary benefits	0.81	0.75	0.20
The number of benefits I receive	0.69	0.75	0.20
The most recent raise	0.40	0.50	0.27
Influence my supervisor has over my pay	0.44	0.50	0.39
The company’s pay structure	0.60	0.75	0.21
Differences in pay among jobs in the company	0.29	0.50	0.33

Item	Mean	Median	Standard-deviation
Role Stress			
How often do people equal in rank and authority over you ask you to do things which conflict?*	0.87	0.80	0.14
How often do people whose requests should be met give you things to do which conflict with other work you have to do?*	0.78	0.80	0.20
How often are you unclear on what your responsibilities are?*	0.61	0.60	0.23
How often can't you predict what others will expect of you on the job?*	0.60	0.60	0.22
Work Design Aspects			
The results of my work are likely to significantly affect the lives of other people.	0.68	0.75	0.24
The job itself is very significant and important in the broader scheme of things.	0.60	0.75	0.21
The work performed on the job has a significant impact on people outside the organization.	0.71	0.75	0.20
Other people in the organization, such as managers and co-workers, provide information about the effectiveness (e.g., quality and quantity) of my job performance.	0.63	0.75	0.24
Work - Family Conflict			
The demands of my work interfere with my home and family life.*	0.63	0.75	0.27
The amount of time my job takes up makes it difficult to fulfill family responsibilities.*	0.78	0.75	0.24
Things I want to do at home do not get done because of the demands my job puts on me.*	0.70	0.75	0.29
My job produces strain that makes it difficult to fulfill family duties.*	0.82	0.75	0.19
Due to work-related duties, I have to make changes to my plans for family activities.*	0.62	0.75	0.29
Organisational Commitment			
I am quite proud to be able to tell people who it is I work for.	0.84	0.75	0.17
I sometimes feel like leaving this employment for good.	0.76	0.75	0.25
I'm not willing to put myself out just to help the organization.	0.56	0.75	0.22
Even if the firm were not doing too well financially, I would be reluctant to change to another employer.	0.75	0.75	0.17
I feel myself to be part of the organization.	0.84	0.75	0.12
In my work I like to feel I am making some effort, not just for myself, but for the organization as well.	0.76	0.75	0.13
The offer of a bit more money with another employer would not seriously make me think of changing my job.	0.75	0.75	0.28
I would not recommend a close friend to join our staff.	0.87	1.00	0.15
To know my own work had made a contribution to the good of the organization would please me.	0.90	1.00	0.12

Item	Mean	Median	Standard-deviation
Job Satisfaction			
All in all, I am satisfied with my job.	0.82	0.75	0.14
In general, I don’t like my job.*	0.88	1.00	0.12
In general, I like working here.	0.91	1.00	0.12
Turnover			
How likely is it that you will actively look for a new job in the next year?*	0.23	0.33	0.24

Declaration

I hereby declare that the work presented in this thesis is entirely my own and that I did not use any other sources and references than the listed ones. I have marked all direct or indirect statements from other sources contained therein as quotations. Neither this work nor significant parts of it were part of another examination procedure. I have not published this work in whole or in part before. The electronic copy is consistent with all submitted copies.

place, date, signature