From Candidate To Employee

IEM Bachelor Thesis

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23-8-2022

UNIVERSITY OF TWENTE.

This report is submitted to the University of Twente in partial fulfilment of the requirements of the degree of BSc Industrial Engineering and Management.

From candidate to employee, IEM Bachelor Thesis

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First edition, 47 pages, 3 appendices

Summary

Ecare experiences difficulties in filling vacancies. For some vacancies, a qualified candidate is hired, but the time between opening and closing this vacancy is longer than desired. Other vacancies remain unfilled for a long time since they received no suited applications or no applications at all. The unfilled vacancies are influenced by internal- and external factors. The internal factor that influences the unfilled vacancies is influenced by the way of working in the job application process. External factors which also have an influence are a job shortage on the labor market and the competitive sector Ecare is in. Ecare is a software company that is mostly looking for employees in the research and development (R&D) field. Since the software sector is growing exponentially, the demand for software engineers is also increasing. Unfortunately, Ecare cannot influence these external factors. However, Ecare can influence the internal factor that influences the unfilled vacancies.

Therefore, this bachelor thesis researches the job application process at Ecare. The job application process entails the recruitment, selection and hiring of applicants that applied for a position at the company. The company wants to improve the process' effectiveness. The company has the opinion that the current process is ineffective. An underlying problem is determined to be the fact that the roles and responsibilities of the process are not clear. Therefore, the goals of this research are to find a solution to improve the process' effectiveness by assigning responsibilities and roles to the process' internal stakeholders and to give the company insight into the current situation.

To accomplish research goals, the following research strategy is applied. The current process is mapped. To gain information about the process, interviews were conducted with internal stakeholders. First, the steps of the process are identified. Secondly, the stakeholders of the process are identified. In addition, the in- and outflow of applicants through the job application process of 19 vacancies are analyzed. Thereafter, the roles and responsibilities of the process for the different steps of the process are identified. Finally, improvement points that are mentioned by the internal stakeholders are listed. Thereafter, KPIs are selected to measure the process effectiveness. These KPIs are measured for the 19 previously mentioned vacancies. To find a solution to formulate the roles and responsibilities in the process, a systematic literature review (SLR) is performed. This SLR resulted in four methods to formulate roles and responsibilities of a process. All these options were evaluated and one option is considered to be best suited for Ecare: the RA(S)CI matrix.

From mapping the current situation and performing a literature study the following results can be drawn:

- No candidates of the researched 19 vacancies withdrew from the process due to a long process time. Employees were afraid that candidates would leave the process due to the long process time.
- The RA(S)CI matrix is best suited for Ecare to formulate the roles and responsibilities for the job application process.
- Of the previously mentioned 19 vacancies all applicants that have received a job offer from Ecare accepted this offer. From this it can be concluded that Ecare was able to find a consensus with the applicants about their terms of employment.
- Most of the participant's outflow occurred at the first assessment moment.
- Most of the open vacancies are looking for employees in the research and development (R&D) sector. The R&D sector is very competitive and there is a job

shortage on the labour market. This could explain the difficulty that Ecare is experiencing in finding R&D employees.

Due to the time span of this research, it was not possible to implement the RA(S)CI matrix. Therefore, an implementation plan is created so the company can implement the RA(S)CI matrix themselves. The implementation plan entails who should implement the matrix, what are the steps to implement the matrix and how to evaluate the matrix after implementing. Since the RA(S)CI matrix is not implemented, it cannot be concluded that the RA(S)CI matrix will increase the process' effectiveness.

Preface

This research is conducted at the software company Ecare. This research is performed to obtain the bachelor's degree in Industrial Engineering and Management at the University of Twente.

Firstly, I would like to thank my first supervisor L. van der Wegen for his guidance and feedback during the research. I would like to thank my second supervisor A. Asadi as well for this feedback at the end of my research.

Secondly, I would like to thank Ecare for the opportunity to graduate at their company. I received a warm welcome from the company and its employees. I especially would like to thank my company supervisor S. Ivens who provided me support with company data and answering questions that appeared during my research.

Hopefully you enjoy reading my bachelor thesis.

Babette de Brouwer

Enschede, July 2022

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Chapter 1 – Problem identification

This chapter introduces the problem that this thesis researches. Section 1.1 introduces the graduation company. The problem setting is discussed in Section 1.2. Section 1.3 discusses the theoretical framework. Thereafter, the research design is discussed in Section 1.4. Section 1.5 discusses the intended deliverables. Section 1.6 includes a reading guide for the report.

1.1 Company

This bachelor thesis will be conducted at Ecare. Ecare is a company that develops software applications for the public health care sector. These software applications are developed according to the following procedure:

1. Product strategy: conversation with stakeholders what to develop.
2. Development: making user stories and list stakeholder requirements.
3. Developing and testing: make minimal viable product, testing by user and implement user feedback.
4. Documentation: technical documentation concerning what is made and reasoning of development choices.
5. Implementation, support and education: assisting customers in implementing and using the product [1](Ecare, 2022).

Ecare has vacancies regularly. The job application process at Ecare is divided in three stages:

1. *Recruitment stage*: Request from department in company to hire new employee, vacancy text is created, requirements for function are listed, vacancy is published on platform, candidate applies for the vacancy.
2. *Selection stage*: Company receives application, review of application, sending invitation or rejection to applicants, conduct interviews, evaluate candidate, reject or offer candidate position, negotiations.
3. *Hiring stage*: Candidate is hired, candidate is incorporated in HR system, filled vacancy is deleted from platforms.

Figure 1.1 Job application process at Ecare

1.2 Problem setting

Ecare has rapidly grown over the last few years. Nowadays the company counts 100+ employees. Due to the growth, the company has regularly open vacancies. In the early years of Ecare, the managing director (founder/owner) was managing the total job application process himself. He was solely responsible for finding and hiring new employees. Due to the growth of the company and the increasing number of vacancies this is no longer possible. Ecare has taken steps to professionalise the job application process and today different departments are involved. The company has tried to professionalise the process by setting up a Human Resources (HR) department with the idea that the HR department would handle all incoming job applications.

[1] Ecare (2022). "Over ons." from https://ecare.nl/over-ecare/.

The goal of the job application process is to fill open positions with qualified candidates within a certain timeframe. However, the HR department is not delivering sufficient candidates for the unfilled vacancies. The company has given priority to improve the job application process, as the current situation is no longer manageable. The workload of employees is increasing if open positions are not filled. Employees are not able to handle the increasing workload and even some employees have resigned.

To get a first overview of the problems concerning the job application process, I have conducted interviews with employees who are directly involved in the process: the managing director, department managers and the HR department. Appendix A lists an initial overview of problems that were mentioned during these interviews. Figure 1.2 shows relations between problems that concern Ecare's job application process.

The biggest concern is that the current process does not deliver sufficient candidates to fill open vacancies. At the moment, Ecare has 10 open vacancies. Some have not received any applications, others have received applications but these did not contain qualified candidates. In the current way of working, the time between application and hiring is longer than desired. During this time, an applicant can be recruited by other companies and withdraw from the process. There are two factors that could explain the long process time. One factor is an inefficient way of working. Employees do not know the status of an application, therefore they have to communicate with other employees to get this status information. Another factor is that applicants receive duplicate responses or are left without a response, which also results in a long process time. The underlying cause of these problems is that there are no clear roles and responsibilities defined for the employees involved in the job application process.

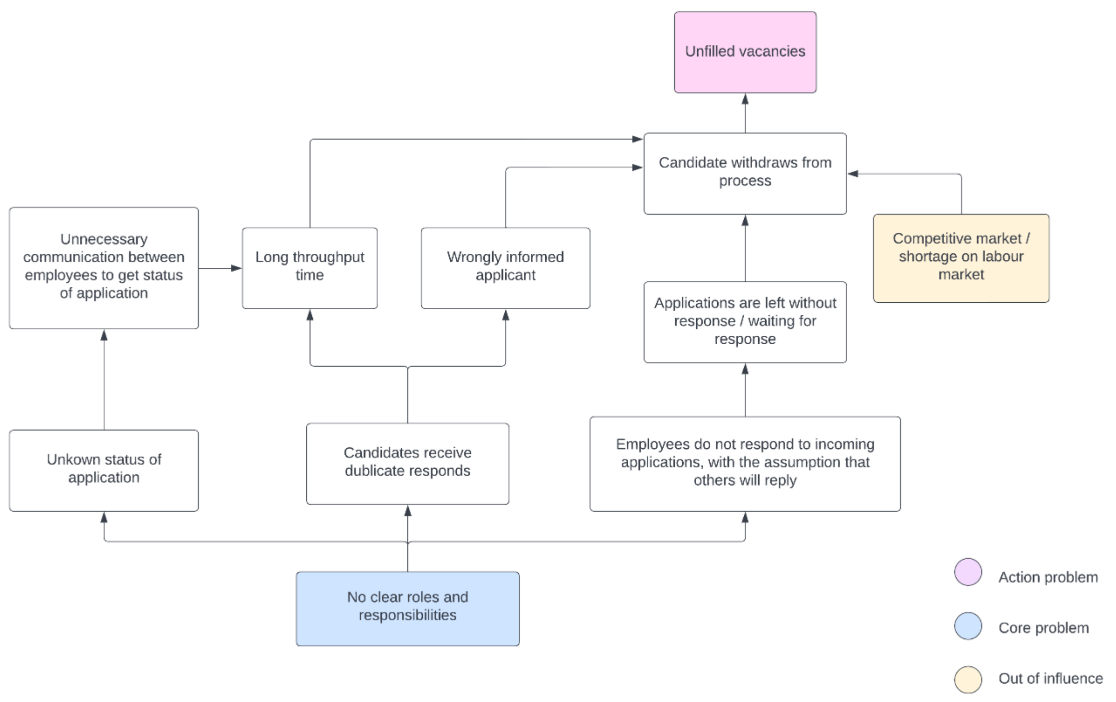

Figure 1.2 Problem cluster Ecare

A core problem should be selected from the problem cluster. This problem should have no direct cause itself, should be influenceable and solvable/improvable within the graduation period. The problem cluster shows one potential core problem "No clear roles and responsibilities". The company has the norm to have clear roles and responsibilities in the process, but in reality, this appears not to be the case.

1.3 Theoretical framework

During interviews with employees of Ecare that were scheduled to get a first impression of the situation, the employees mentioned the recent growth of the company. In a short period of time, the number of employees increased to over one hundred. Some employees have the hypothesis that the recent increase of vacancies revealed problems in the current job application process.

Five dimensions have influence on organizational development [2](Greiner, 1998). These are organization's age, organization's size, stages of evolution, stages of revolution and the growth rate of its industry. Because management problems and principles are rooted in time, the age of an organization has impact on the organizational development. The size of an organization influences its development because an increase in the number of employees and sales volume, company's problems and solutions tend to change. When an organization is in an evolutionary period, the company is in prolonged growth and therefore makes modest adjustment to maintain growth with the same overall management pattern. On the other hand, when an organization is in a revolution period, it is common that the organization has a change in management practices. The rate at which an organization grows is influenced by the market environment of its industry.

According to Greiner (1998), there are five phases of growth that companies go through. Each evolutionary period has a dominant management style to achieve growth. Each revolutionary period has a management problem that must be solved before growth can continue. The first three phases are explained, as these are relevant considering the age of Ecare.

-*Phase 1 Creativity:* This can be called the birth stage of an organization. The emphasis in this phase is on creating a product and a market. As the company growths, the organization is going to experience problems. Increase in production requires knowledge about efficient manufacturing, for the increase in employees the management style cannot be exclusively informal and new employees may not be motivated to the product or organization. At this stage, the first revolution, a crisis of leadership occurs. Someone needs to lead to company and solve the managerial problems.

-*Phase 2 Direction:* The organization survived the first revolution by installing a qualified business manager. The new directive techniques channel employee's energy more efficiently into growth. However, at a certain point these techniques become inappropriate for controlling a more complex and diverse organization. In addition, lower-level employees possess more knowledge about market and machinery than leaders at the top and therefore taking initiative on their own. At this stage, a new revolution, a crisis of autonomy occurs. A solution for the revolution is to move toward more delegation. It is difficult for leaders that were successful at being responsible to give up responsibility to lower-level managers. These lower-level managers are not used to making decisions for themselves. As results, many companies stick to centralized methods, while lower-level employees become discouraged and leave the organization.

-*Phase 3 Delegation:* The organization survived the revolution of the second phase from successful application of a decentralized organization structure. Due to the delegation of responsibilities to

[2] Greiner, L. E. (1998). "Evolution and Revolution as Organizations Grow." Harvard Business Review.

lower-level managers, they are more motivated. Eventually, a problem occurs: top-level managers feel that they are losing control over a highly diversified field operation. Therefore, the organization falls into a crisis of control. Top-level managers try to gain control over the company.

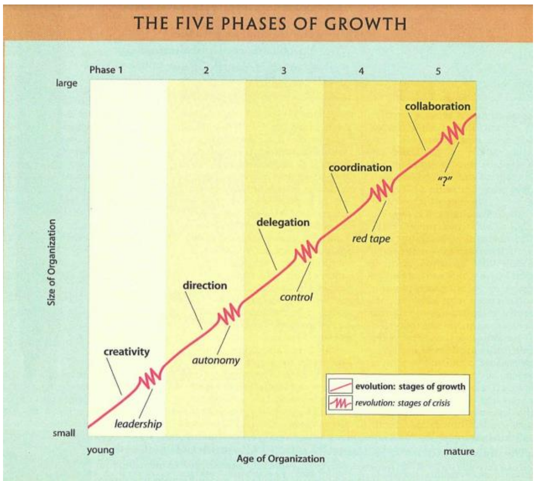

Figure 1.3 The five phases of growth, L. E. Greiner (1998)

Current phase Ecare

Based on the characteristics of the different growth phases, Ecare is probably situated in the revolution of the second phase. The management director has difficulties in delegating tasks to other employees. The job application process was managed by the management director, but she is trying to delegate the process to the HR department. The management director still tries to be involved in the decision-making in the job application process. Due to the current revolution, the roles and responsibilities in process have no clear structure.

Summarizing, Ecare experiences difficulties with the roles and responsibilities in the job application process, resulting in an ineffective process. The terms effectiveness and process will be explained using literature and are afterwards linked to the company.

-Process

"Processes whether commercial, industrial, service or institutional can all be modelled by the simple input, process, and output activity sequence." [3](Nina Thornhill, Michael Grimble, & Marcus Nohr, 2007). Figure 1.4 shows the key techniques in performance improvement.

In the context of Ecare, the job application process can be modeled as an in- and output process. The process has two types of inputs. The first input are applicants. The second input is the profile of the open vacancy. This profile contains the requirements that an applicant should meet. In the process, employees select applicants. The process has a qualified candidate as output that fills an open position.

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[3] Nina Thornhill, A. H., Dale Seborg, David Laing,, et al. (2007). Process Control Performance Assessment. London, Springer.

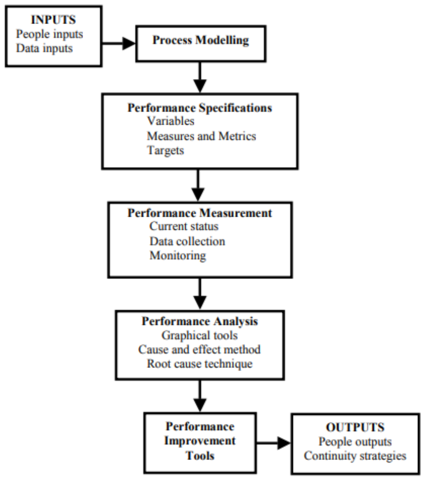

Figure 1.4 Steps and tool groups in performance assessment, Nina Thornhill, A. H., Dale Seborg, David Laing,, et al. (2007)

-Effectiveness

Process effectiveness measures the process performance to specified customer requirements [4](BEM, 2020). A process should have a value proposition for the customer: the process should add value. Therefore the customer of the process, the customer's problem that will be solved by the process, and the way how the process solves the customers problem should be defined.

There are multiple parameters to analyze the process' effectiveness. These are feasibility of solution, reliability of solution, timeliness of delivery, presentation of outputs and accuracy of outputs [5](Management, 2022).

The customer of the job application process is the department that has an open vacancy. This department has the wish to fill the open position with a qualified candidate within a determined period. The specified customer requirements can be interpreted as the characteristics that a qualified candidate should have and the period within the position should be filled.

[4] BEM (2020). "9 Ways To Measure A Business Process." 2022, from https://www.businessmapping.com/blog/9-ways-to-measure-a-business-process/

[5] Management, P. B. P. (2022). "Process Excellence – Efficiency VS Effectiveness." from https://www.primebpm.com/process-excellence-efficiency-vs-effectiveness.

1.4 Research design

The main research question of this thesis is: How to formalize the roles and responsibilities in the application process? Subsection 1.4.1 describes the current situation of the process. The effectiveness of the current situation is assessed in Subsection 1.4.2. Subsection 1.4.3 discusses the literature study on options to formulate roles and responsibilities. An implementation plan is made in Subsection 1.4.4. Subsection 1.4.5 discusses the limitations of the research design.

1.4.1 Map current situation: "As is" situation

In order to solve the action problem, unfilled vacancies, the current process must be mapped in order to improve it. This knowledge problem will be addressed in the first research question. The first research question describes the "As is" situation.

1. What does the current application process look like?
   1.1 What are the steps in the current process?
   1.2 Who are the stakeholders of the current process?
   1.3 What is the in- and outflow of applicants per step in the current process?
   1.4 What are the roles and responsibilities in the current process?
   1.5 What are improvement points for the process according to stakeholders?

Method of data collection

The first research question will be answered by conducting descriptive research. This entails interviews with involved employees of the process and gathering secondary data from the HR department. These involved employees are the managing director, department managers and HR department.

For every involved employee a 30-minute interview is scheduled. Interviews with involved employees give insight in who is involved in the process, what are someone's responsibilities and what are the steps of the process. The interview is semi-structured: the interview has fixed questions that are prepared in advance and room for additional questions that may arise during the interview. Interviewee's responses are written down during the interview.

Secondary data is gathered to get insight into in- and outflow of applicants in the process. The HR department possesses this data. The data of the 10 most recently filled vacancies and 10 open vacancies will be gathered to get insight in filled vacancies and open vacancies. Open vacancies are positions that are not filled yet, this is the case if the selection process is still running or no applicants applied for a position. I choose to research this number of open vacancies because the company has at this moment 10 open vacancies. I want to research the same number of filled vacancies, therefore 10 filled vacancies will be researched. For each vacancy, the inflow and outflow per step in the process is analysed. This analysis entails the number of inflow and outflow and reasons for inflow and outflow.

Method of data analysis

The interviews give qualitive results. All interviewee's responses will be combined and converted into different models to visualize the responses. Information of the steps, stakeholders and roles of the process will be converted into a Business Process Model (BPM). Quantitative data results from gathering the in- and outflow of applicants of the process. Per vacancy, the in- and outflow of applicants per step will be analysed.

Intended deliverable/result

The "As is" situation will be mapped in a Business Process Model (BPM). The BPM displays the steps of the process and involved roles and responsibilities of stakeholders. An additional flowchart displays the in- and outflow of previous and open vacancies.

1.4.2 Assess the effectiveness the current situation

After mapping the current process, the performance of the process' effectiveness is assessed. The goal of the job application process is to fill vacancies within a predetermined time frame with qualified applicants.

2. What is the effectiveness of the current process?
   2.1 What aspects should KPIs contain to measure the effectiveness?
   2.2 What KPIs to select?
   2.3 What are the values of the selected KPIs?

Method of data collection

To determine what aspects KPIs should contain to measure effectiveness, I will use the theoretical framework as input.

With the aspects that are determined in the previous sub research question, I will in collaboration with the company compose and select KPIs.

The third sub research question will be answered by conducting evaluative research. All KPIs will be measured of the data of the 10 most recently filled vacancies and 10 open vacancies. The HR department possesses this data. This data is stored at multiple locations: in the mailbox and in a shared drive of the HR department. My plan to gather the data is to schedule an appointment with the HR manager and browse through all data.

Method of data analysis

All data that is gathered is quantitative data. Measurements of KPIs will be gathered and displayed.

Intended deliverable/result

The "As is" situation is assessed and visualized.

1.4.3 Options to formulate roles and responsibilities

To solve the core problem "No clear roles and responsibilities", a literature study researches options to formulate roles and responsibilities.

3. What option to formulate roles and responsibilities of the job application process is best suited for Ecare?
   3.1 What are options to formulate roles and responsibilities of a process?
   3.2 What are the advantages and disadvantages of each option?
   3.3 What option fits Ecare best?

Method of data collection

Chapter 4 discusses the approach for the systematic literature review.

Method of data analysis

From the systematic literature review options to formulate roles and responsibilities are investigated. All options that result from this systematic literature review will be listed. Of all options, the advantages and disadvantages are identified. Taken the advantages and disadvantages of each option and the company in mind, one option is chosen for Ecare.

Intended deliverable/result

Advice which option to use to formulate the roles and responsibilities of the job application process.

1.4.4 Implementation plan

From the systematic literature review, possibilities to formulate roles and responsibilities are investigated. One of these options is chosen and for this option an implementation strategy is created.

4. How to implement the chosen option in Ecare?
   4.1 Who should promote the option?
   4.2 How should the option be implemented?
   4.3 How to evaluate the option after implementation?

1.4.5 Limitations of research design

This research design has certain limitations. The available time for performing this bachelor thesis is ten weeks. Unfortunately, this is not enough time to research all aspects of the problem. Therefore, the research design contains the most essential parts to understand and solve the problem. For example, in the second research questions certain KPIs are listed to measure effectiveness. However, there are more KPIs that could measure effectiveness. Not all KPIs can be included considering the timeframe of the research.

1.5 Intended deliverables

I am intended to deliver the following deliverables:

-Map of the current process
-Analysis of the current process
-Recommendations to formulate roles and responsibilities of the process.
-Report and presentation

1.6 Reading guide

This report is structured in different chapters. Chapter 2 describes the ‘As is’ situation of the job application process. Chapter 3 measures the effectiveness of the process. Chapter 4 identifies options to formulate roles and responsibilities. One of these options is advised to Ecare. Chapter 5 discusses an implementation plan for this option. Chapter 6 concludes with answers to the research questions, discusses recommendations for the company and future research, and a discussion.

Chapter 2 "As is" situation

This chapter answers the first research question: What does the current application process look like? This research question is divided in five sub research questions. Each section discusses a sub research question. Section 2.1 discusses the steps in the job application process. The stakeholders of the process are discussed in Section 2.2. Section 2.3 visualizes the in- and outflow of applicants per step in the process. The roles and responsibilities of the process are discussed in Section 2.4. Section 2.5 discusses improvement points for the process according to stakeholders. Section 2.6 answers the first research question.

2.1 The steps of the process

As mentioned in Section 1.1, the job application process at Ecare is divided in three stages: the recruitment stage, the selection stage and the hiring stage. Per stage the different steps are discussed.

2.1.1 Recruitment stage

The process starts with a *request to hire a colleague*. This request could be caused by the departure of a colleague or increasing workload of a department that requires assistance. First, the *profile of the colleague is determined*. This profile entails the salary of the new colleague, the working experience that a candidate should have, the number of working hours, the skills and competencies that a candidate should possess, should the colleague be hired for long- or short term and when does the department want to let the candidate start with the open position.

Thereafter, *the vacancy text is written*. This text describes the open position and the company. The inputs for this text are the previously created profile and earlier vacancy texts. The finished *vacancy text is published*. Depending on the vacancy, this could be on different platforms. Ecare publishes their vacancies on their own website, LinkedIn, Indeed and ZorgSelect.

Depending on the vacancy, the *vacancy is promoted*. There are multiple decisions regarding promoting a vacancy. These decisions are when to start promoting the vacancy, on which platform to promote a vacancy and what the budget for promotion is?

If the vacancy is published, it is a matter of time before an applicant finds the vacancy and decides to *apply for the position*.

2.1.2 Selection stage

The selection stage starts with *receiving applications* for an open position. *The application is assessed*. This assessment entails the overall impression of the curriculum vitae, the working experience of the candidate and relevant experience with the health care sector. This assessment has three outcomes. The first is a positive assessment, the application is sent to the department of the vacancy. If the assessor is not certain to invite or reject the applicant, the application is also sent to the department of the vacancy. The third possibility is that the assessor has a negative assessment and therefore sends a rejection mail to the applicant.

The department of the open position receives the application. They read the application. If they decide to invite the applicant, they *send an invitation for a first interview*.

The *first interview takes place*. This interview consists of two employees of Ecare and the applicant. Most of the time these employees are a department manager and department employee who has the same position as the position of the vacancy. During this interview, the applicant is questioned about his/her persona and competencies. During this interview, the applicant is informed about his/her potential future working activities and Ecare. After the interview, *the interviewers evaluate the applicant*. The applicant is informed about this evaluation. If this evaluation is negative, the applicant receives a call with an explanation why the applicant is rejected. If this evaluation is positive, the applicant is invited for a second interview. The employees that will conduct the second interview are informed about the applicant.

The *second interview takes place*. The interview consists of one or two employees of Ecare and the applicant. During this interview, the interviewers assess if the applicant is a match with the organization. If the interviewers feel during the interview that there is a match between the applicant and the organisation, they discuss the terms of employment of the open position. After the interview, *the interviewers evaluate the applicant*. If their evaluation is negative, they call the applicant to reject. If the evaluation is positive, *they create and send an employee agreement*.

The applicant receives the employee agreement, they can *accept or reject the proposal*. If the applicant accepts the proposal, he/she is ready to sign the contract. If the applicant rejects the proposal, *negotiations start*. If the negotiations result in a consensus, the applicant can sign a new contract. If both Ecare and the applicant cannot find a consensus, the applicant is rejected.

2.1.3 Hiring stage

If the applicant has accepted the contract, *the contract can be signed*. When the vacancy is officially filled, *the vacancy should be deleted from platforms*. If the vacancy is promoted, *the promotion should be terminated*. The last step is *to inform all incoming applicants or applicants* that are in the process that the vacancy is filled.

2.2 The stakeholders of the process

"Stakeholders are the people and groups who have a legitimate interest in the operation's activities." [6](Nigel Slack, 2016). The job application process at Ecare has multiple stakeholders. These stakeholders are divided into internal and external stakeholders.
The internal stakeholders of the job application process are employees that play a role in the process. These are employees of the marketing and HR department, department managers and board of directors.
The external stakeholders of the job application process are applicants.

[6] Nigel Slack, A. B.-J., Robert Johnston 1953- (2016). Operations Management. Harlow, Pearson Education.

2.3 The in- and outflow of applicants

As mentioned in Section 1.4, the in- and outflow of applicants will be analysed of the current ten open vacancies and ten most recently filled vacancies. However, during data collection (27-5-2022), the company had nine open vacancies and therefore the number of open vacancies that will be analysed is nine.

Open vacancy	Date of publication	Filled vacancy	Data of publication	Data of closing
Data scientist (R&D)	3/6/2022	Executive Assistant	14/1/2022	7/3/2022
Quality Engineer (R&D)	30/5/2022	Product Owner GGZ	27/1/2022	24/2/2022
Product Owner (R&D)	30/5/2022	Product Owner GHZ	Unknown	Unknown
Senior back-end software engineer (R&D)	17/6/2022	Software engineer	1/2/2022	15/3/2022
Sales adviser (Organizational advisor)	2/6/2022	Product Specialist	4/2/2022	22/3/2022
Back-end software engineer (R&D)	13/5/2022	Support specialist CloudIT	10/3/2022	19/4/2022
Frond-end software engineer (R&D)	13/5/2022	Specialist Client administration	11/3/2022	1/5/2022
Full-stack software engineer (R&D)	13/5/2022	Product specialist	25/3/2022	9/6/2022
Product Adviser sales team (Sales & marketing)	14/6/2022	Specialist Client administration	11/3/2022	1/6/2022
		Salaris verzuim	11/3/2022	1/6/2022

Table 2.3 Open and closed vacancies

Of all the vacancies that are listed in Table 2.3, the in- and outflow of applicants is measured per step in the job application process. The process is divided in six steps. These steps are first inflow, first assessment, first interview, second interview, job offering and hiring.

2.3.1 Open vacancies

- Data scientist (R&D)

The department of data scientist is looking for multiple candidates for this position. Therefore, vacancy is not closed but there is already one person hired.

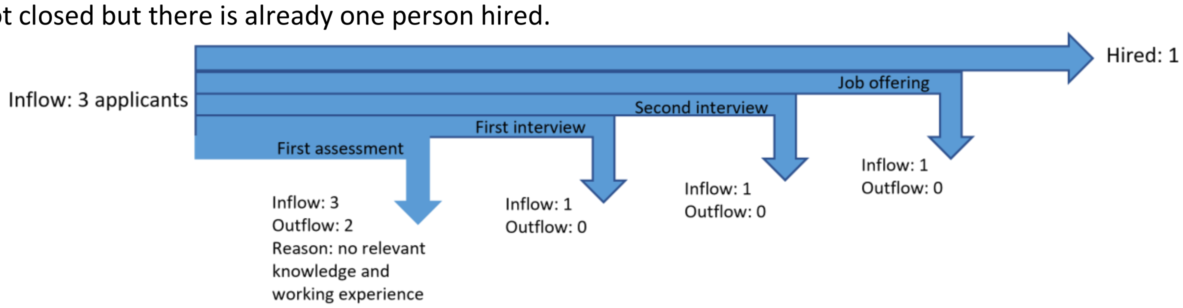

Figure 2.3.1 In- and outflow vacancy data scientist

- Quality Engineer (R&D), Product Owner (R&D), Senior back-end software engineer (R&D), Back-end software engineer (R&D), Product Adviser sales team (Sales and marketing)

These vacancies have not received any applications.

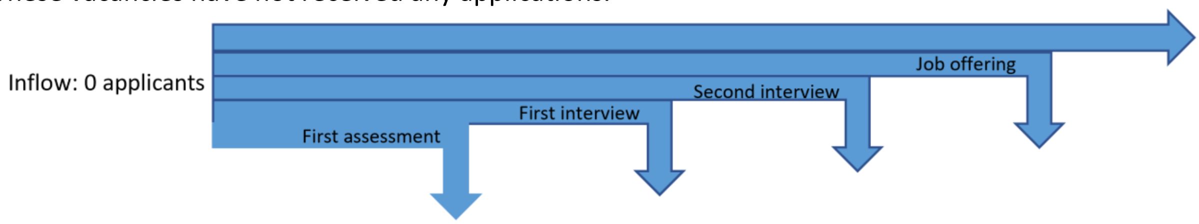

Figure 2.3.2 In- and outflow vacancies without responses

- Frond-end software engineer (R&D)

Two applicants have not received first response, therefore the inflow of the first assessment is for the moment two.

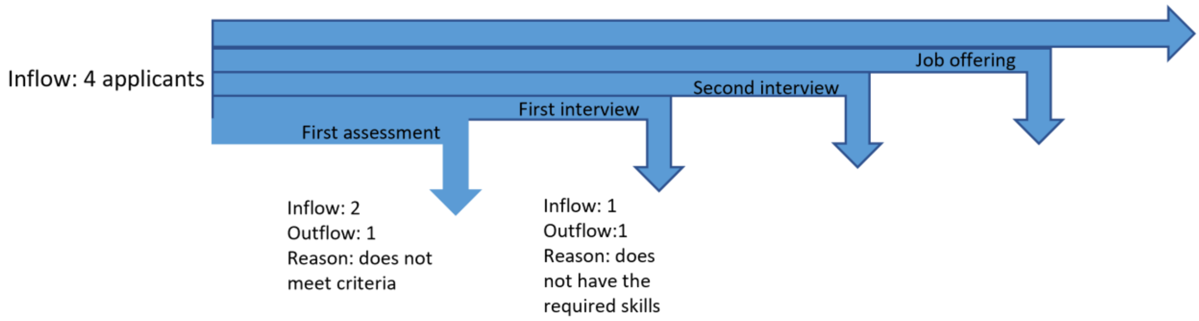

Figure 2.3.3 In- and outflow vacancy front-end software engineer

- Full-stack software engineer (R&D)

One applicant sent an application for this vacancy, but this application has not been assessed.

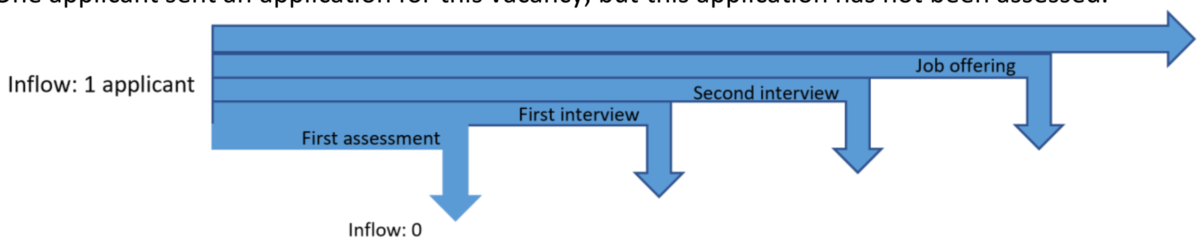

Figure 2.3.4 In- and outflow vacancy full-stack software engineer

- Sales adviser (organizational advice)

One applicant sent an application for this vacancy and is invited for a first interview. However, the outcome of this first interview is unknown since the interview is scheduled after the moment of data collection.

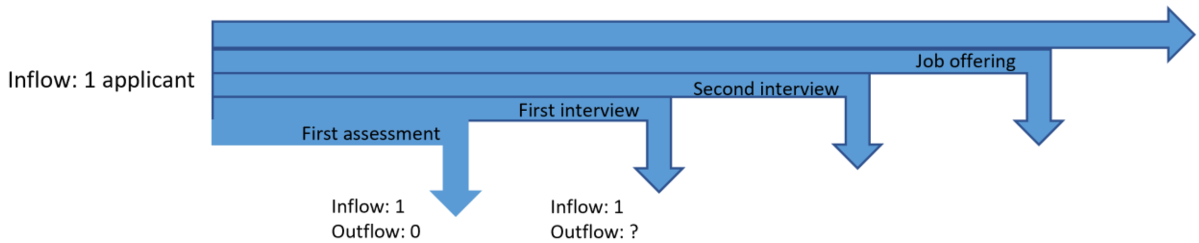

Figure 2.3.5 In- and outflow vacancy sales advisor

2.3.2 Closed vacancies

- Executive Assistant

During the process of this vacancy one applicant stepped out of the process, however this was due to personal circumstances.

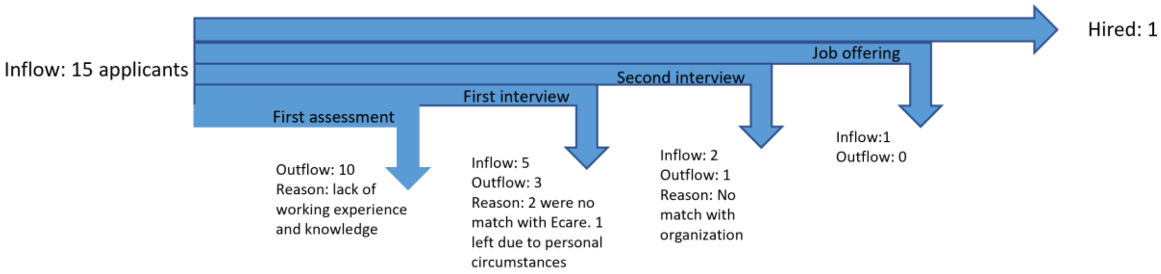

Figure 2.3.6 In- and outflow vacancy executive assistant

- Product Owner GGZ

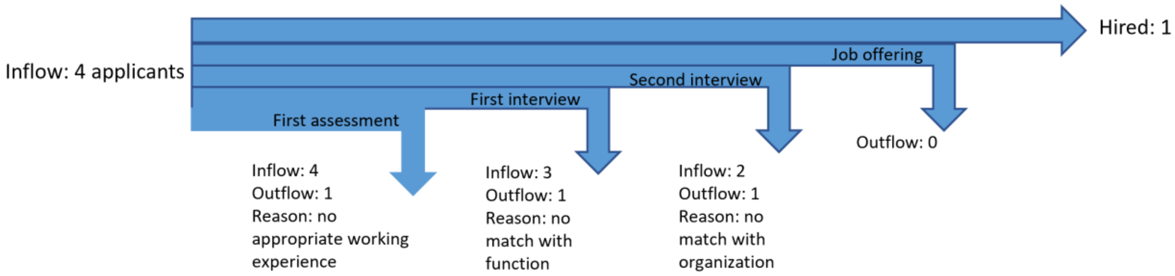

Figure 2.3.7 In- and outflow vacancy product owner GGZ

- Product Owner GHZ

Data for this vacancy is missing to make a complete in- and outflow model. The department that is responsible for this vacancy was unable to retrieve data which persons applied.

- Software engineer

For this vacancy two candidates are brought up by an employee. Before this moment, the company did not receive any applications. Both candidates were suited for the position.

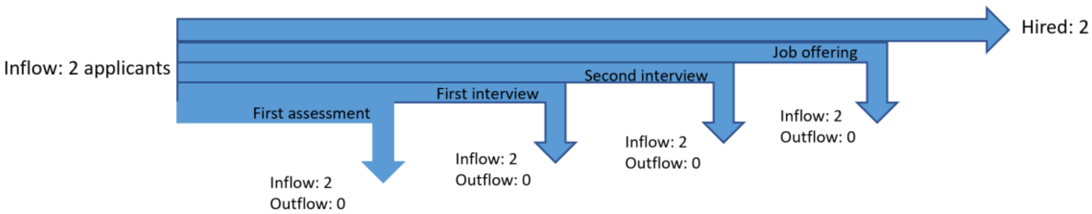

Figure 2.3.8 In- and outflow vacancy software engineers

- Product specialist

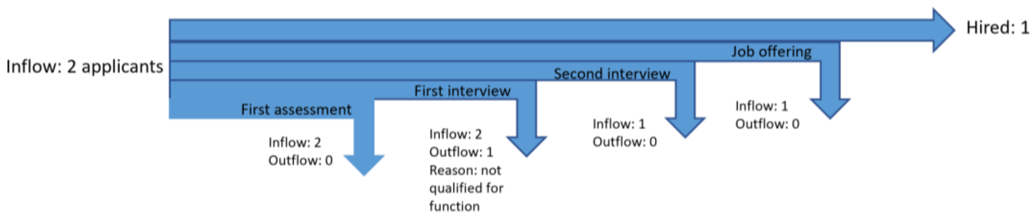

Figure 2.3.9 In- and outflow vacancy product specialist

- Support specialist

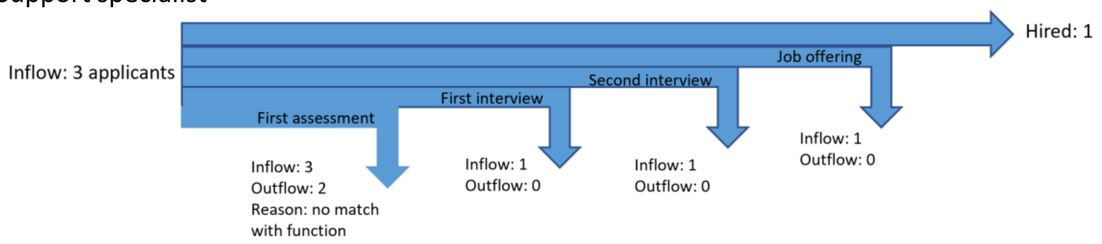

Figure 2.3.10 In- and outflow vacancy support specialist

- Specialist Client administration

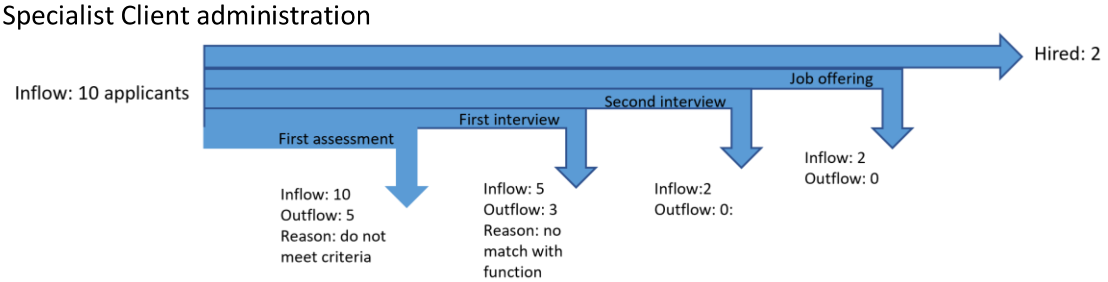

Figure 2.3.11 In- and outflow vacancy specialist client administration

- Product specialist

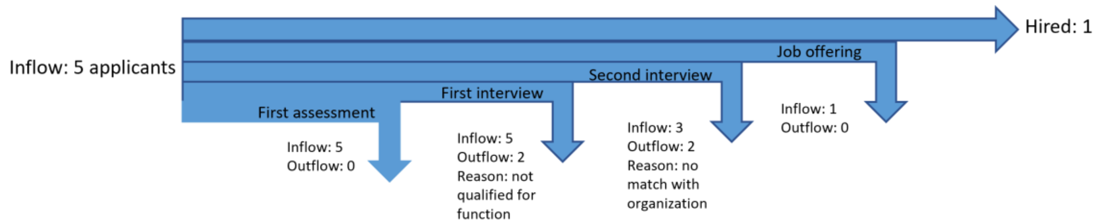

Figure 2.3.12 In- and outflow vacancy product specialist

- Salaris verzuim

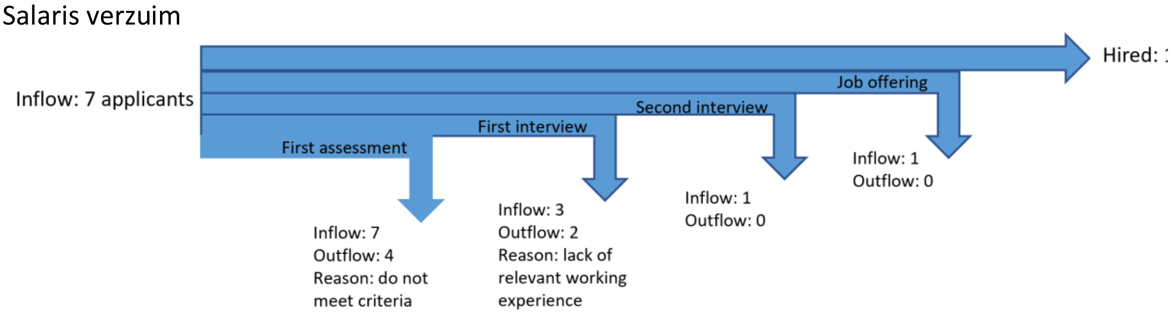

Figure 2.3.13 In- and outflow vacancy salaris verzuim

2.3.3 Conclusion

From the in- and outflow models the following conclusions can be drawn:

-No candidates withdrew from the process. There is one exception due to personal circumstances. During interviews that were conducted to get a first impression of the process, colleagues mentioned that they were afraid that candidates would leave the process due to long process time. For the vacancies that were analysed this was not the case.

-Most of the outflow occurred at the first assessment moment. The most candidates left the process since they did not meet the first assessment criteria.

-All applications that are offered the position of the open vacancy accepted the offer.

-The open vacancies that are in the research and development (R&D) field have difficulties to find applicants. Most vacancies in the R&D field have received no applications or applications did not meet the first assessment criteria.

2.4 Roles and responsibilities in the process

The job application process has different roles and responsibilities. To clarify, I use the definition of roles and responsibilities of Indeed. “A role refers to one’s position in a team. A responsibility refers to the tasks of a particular role.” [7](Indeed, (2022, 1 June 2022)).

2.4.1 Recruitment stage

The recruitment stage has different roles: The department manager, marketing department, HR department and the Managing director. Table 2.4.1 shows the responsibilities that are assigned to a specific role. Figure 2.4.1 visualizes all roles and responsibilities in a sequential flow.

Department manager	Marketing department	HR department	Managing director
Determine profile	Write vacancy text	Assist with profile	Determine promotion budget
Send profile	Publish vacancy	Assist with vacancy text	
	Promote vacancy		

Table 2.4.1 Roles and responsibilities in recruitment stage

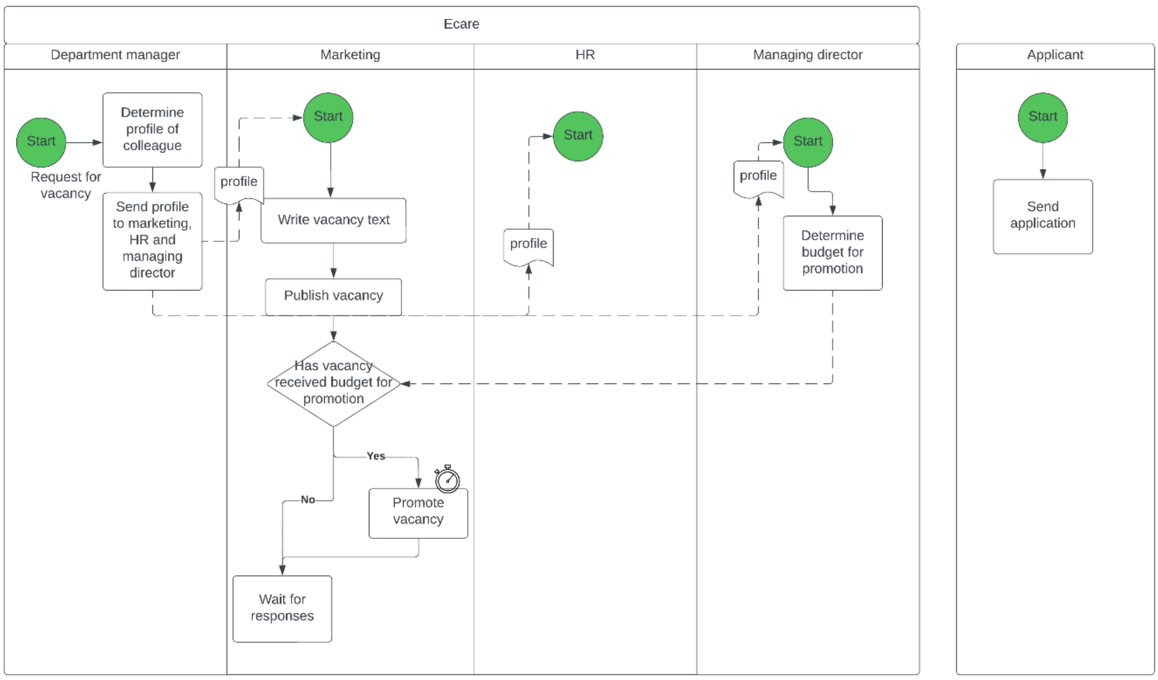

Figure 2.4.1 Recruitment stage

[7] Indeed (2022, 1 June 2022). "How To Define Team Roles and Responsibilities in 4 Steps." Retrieved 11 July 2022, from (https://www.indeed.com/career-advice/career-development/team-roles-and-responsibilities#:~:text=Roles%20refer%20to%20one's%20position,several%20tasks%20in%20the%20workplace.).

2.4.2 Selection stage

The selection stage has different roles: The department manager, HR department and the Managing director and one of the board members (CMO/CTO). Table 2.4.1 shows the responsibilities that are assigned to a specific role. Figure 2.4.1 visualizes all roles and responsibilities in a sequential flow.

Department manager	Managing director	HR	CMO/CTO
Assess application	Attend second interview	Collect all applications	Attend second interview
Invite applicant for first interview	Evaluate second interview	Assess application	Evaluate second interview
Invite extra interviewer for first interview	Inform HR to compose contract	Send application to department manager	
Attend first interview	Send contract	Attend first interview	
Evaluate first interview	Negotiation session	Evaluate first interview	
Inform colleagues for second interview		Compose contract	
Send invitation for second interview			

Table 2.4.2 Roles and responsibilities in recruitment stage

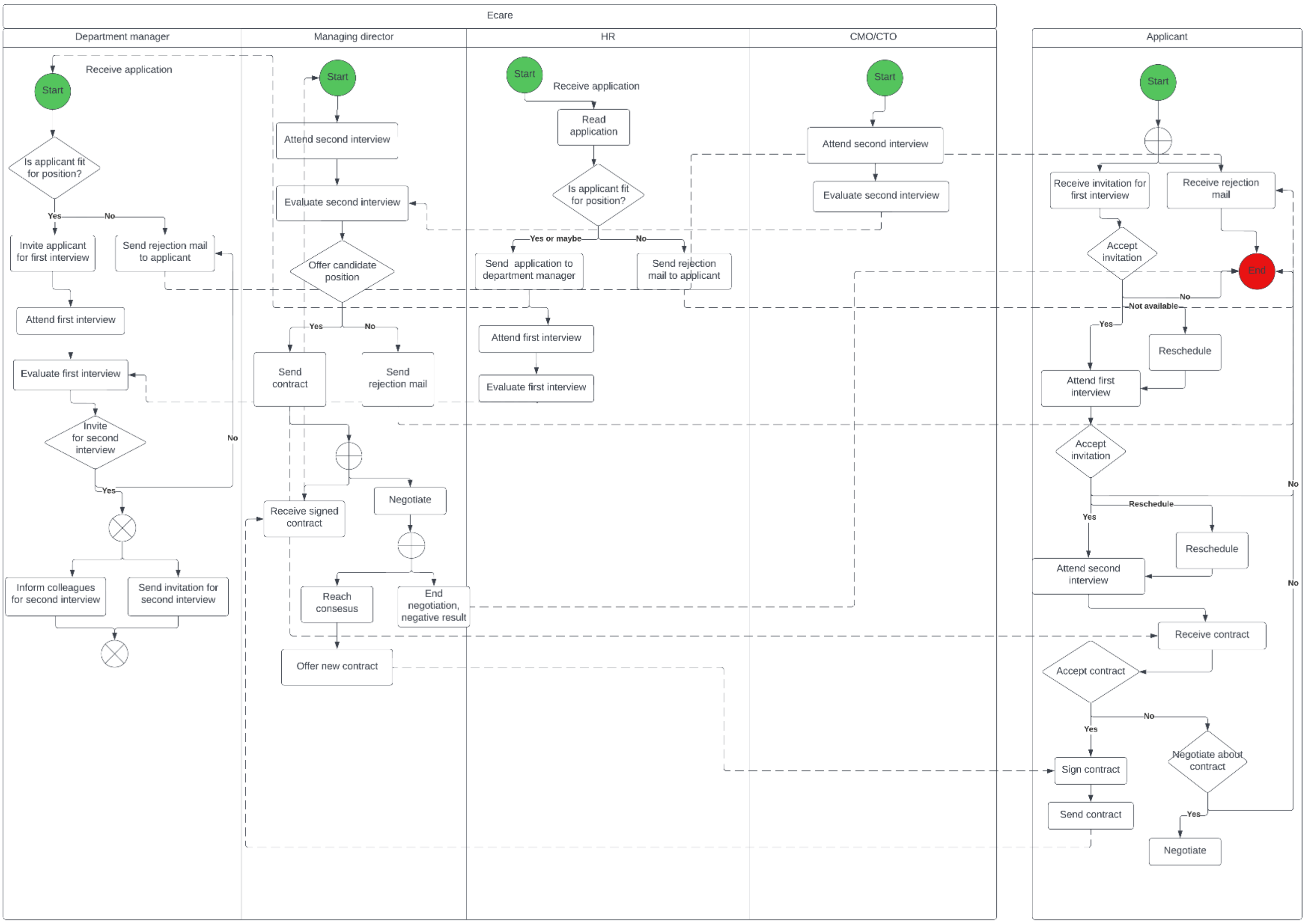

Figure 2.4.2 Selection stage

2.4.3 Hiring stage

The selection stage has different roles: The department manager, HR department and the Managing director and one of the board members (CMO/CTO). Table 2.4.1 shows the responsibilities that are assigned to a specific role. Figure 2.4.1 visualizes all roles and responsibilities in a sequential flow.

Marketing department	HR	Managing director
Remove filled vacancy from platforms	Incorporate candidate in system	Sign final contract
Stop promoting vacancy	Send applicants that are still in process a rejection mail	Inform marketing and HR about hiring

Table 2.4.3 Roles and responsibilities in hiring stage

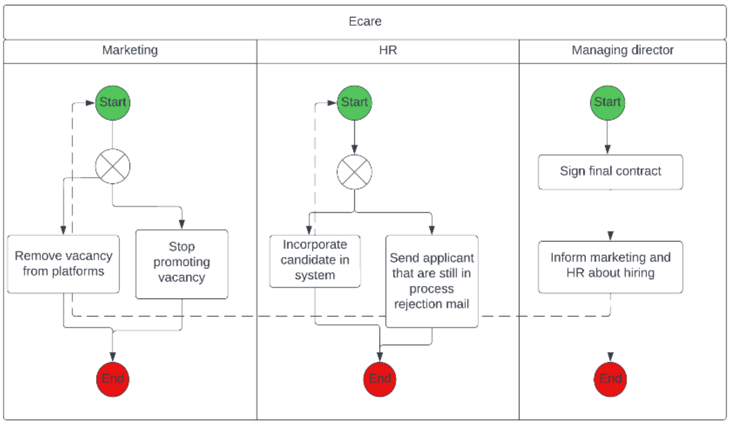

Figure 2.4.3 Hiring stage

2.5 Improvement points

During interviews with the internal stakeholders of the process, interviewees mentioned the following improvement points for the current process.

-The HR manager mentioned that when a vacancy is published, it is not clear which colleagues are involved in the process. After publishing a vacancy, it is necessary to re-align which colleagues are involved.

-Internal stakeholders do not update each other about the status of an application.

-Multiple interviewees mentioned that there is no documentation of the status of an applicant.

2.6 Conclusion

The job application process is divided in three stages. Each stage consists of different steps. These steps are executed by different stakeholders. The internal stakeholders of the process are employees. These are department managers, general management, HR department and department colleagues of the function. The external stakeholders of the process are applicants that apply for a vacancy at Ecare. The internal stakeholders have different roles and responsibilities in the process. Each internal stakeholder has one or more roles with different responsibilities. The in- and outflow of these applicants is visualized for the current nine open and 10 most recently filled vacancies in models. These models showed that the biggest outflow of applicants occurred at the first assessment moment. All applicants that are offered the position were hired.

Chapter 3 Effectiveness of current situation

Ecare has the opinion that their job application process is not effective. Ecare would like to improve the process' effectiveness. This chapter answers the second research question: What is the effectiveness of the current process? This research question is divided in three sub research questions. Each section discusses a sub research question. Section 3.1 discusses what aspect KPIs should contain to measure the effectiveness of a process. Section 3.2 discusses what KPIs will be selected to measure the process' effectiveness. Section 3.3 measures the values of the previous selected KPIs. Section 3.4 answers the second research question.

3.1 Aspects of effectiveness

Before KPIs can be selected to measure effectiveness, effectiveness should be defined. Therefore, I refer to the definition of effectiveness that is mentioned in Section 1.3.

"Process effectiveness measures the process performance to specified customer requirements. A process should have a value proposition for the customer: the process should add value. Therefore, the customer, customer's problem that will be solved by the process, the way how the process solves the customers problem should be defined." [4]*(BEM, 2020).*

"There are multiple parameters to analyze the process' effectiveness. These are feasibility of solution, reliability of solution, timeliness of delivery, presentation of outputs and accuracy of outputs." [5]*(Management, 2022)*

Combining the two definitions of effectiveness, the following aspects should be measured by KPIs:

-Specified customer requirements:

- -Candidate should meet requirements.
- -Time between hiring and application should be as short as possible. Vacancy should be filled as soon as possible.

-Goal of process should be accomplished:

- -Right candidate should be placed on the right position.

3.2 Select KPIs

Given the aspects that are mentioned in Section 3.1, the following KPIs are selected to measure the process' effectiveness:

1. What is the average overall time before a vacancy is filled?
2. What is the average time between application and first response to applicant?
3. What is the time between application and hiring?
4. What is the time between application and first interview?
5. What is the percentage of inflow of applicants who meet first assessment criteria in the process?
6. What is the percentage of the number of applicants who are offered the open position?
7. What is the percentage of applicants who accepts an offer?

[4] BEM (2020). "9 Ways To Measure A Business Process." 2022, from https://www.businessmapping.com/blog/9-ways-to-measure-a-business-process/.

[5] Management, P. B. P. (2022). "Process Excellence – Efficiency VS Effectiveness." from https://www.primebpm.com/process-excellence-efficiency-vs-effectiveness.

3.3 Values of KPIs

All values of the KPIs are displayed per open and closed vacancy.

KPI 1	The average overall time before a vacancy is filled
KPI 2	The average time between application and first response to applicant
KPI 3	The time between application and hiring
KPI 4	The time between application and first interview
KPI 5	The percentage of inflow of applicants who meet first assessment criteria in the process
KPI 6	The percentage of the number of applicants who are offered the open position
KPI 7	The percentage of applicants who accepts an offer

Table 3.3.1 KPIs to measure effectiveness

3.3.1 Closed vacancies

-Executive assistant

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	52 days	3.7 days	46 days	12.3 days	33.33%	6.67%	100%
Min	n/a	1 day	n/a	3 days	n/a	n/a	n/a
Max	n/a	7 days	n/a	20 days	n/a	n/a	n/a
St.dev	n/a	2.0045 days	n/a	8.0989 days	n/a	n/a	n/a

Table 3.3.2 KPIs Executive assistant

The vacancy “Executive assistant” received 15 applications. For one application the date of application is missing. For three applications the data for first response is missing. Therefore KPI 2 is based on 11 applications.

-Product owner GGZ

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	28 days	1.5 days	18 days	16.7 days	66.7%	33.33%	100%
Min	n/a	1 day	n/a	8 days	n/a	n/a	n/a
Max	n/a	3 days	n/a	30 days	n/a	n/a	n/a
St.dev	n/a	1 day	n/a	11.72 days	n/a	n/a	n/a

Table 3.3.3 KPIs Product owner

The vacancy “Product owner GGZ” received four applications.

-Product Owner GHZ

Data of the vacancy “Product owner GHZ” is not available. The department that is responsible for this vacancy is not able to retrieve data of applicants that applied for this vacancy.

-Software engineers

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	42 days	Missing	18.5 days	5 days	100%	100%	100%
Min	n/a	Missing	15 days	3 days	n/a	n/a	n/a
Max	n/a	Missing	22 days	7 days	n/a	n/a	n/a
St.dev	n/a	Missing	4.95 days	2.83 days	n/a	n/a	n/a

Table 3.3.4 KPIs Software engineers

For this vacancy two candidates are brought up by an Ecare employee. Ecare did not receive any applications via its regular process. Both candidates were suited for the position. The first response data are not recorded for both candidates.

-Support specialist

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	40 days	5.67 days	30 days	17 days	33.33%	33.33%	100%
Min	n/a	3 days	n/a	n/a	n/a	n/a	n/a
Max	n/a	10 days	n/a	n/a	n/a	n/a	n/a
St.dev	n/a	3.79 days	n/a	n/a	n/a	n/a	n/a

Table 3.3.5 KPIs Support specialist

Three persons applied for this vacancy. One person was invited for a first interview.

-Specialist client administration

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	40 days	3.4 days	28.5 days	10 days	50%	20%	100%
Min	n/a	1 day	22 days	7 days	n/a	n/a	n/a
Max	n/a	12 days	35 days	19 days	n/a	n/a	n/a
St.dev	n/a	3.66 days	9.19 days	5.1 days	n/a	n/a	n/a

Table 3.3.6 KPIs Specialist client administration

10 applicants applied for this vacancy. Two applicants were suited for the position, both accepted Ecare's job offer and were hired.

-Product specialist

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	46 days	2.5 days	21 days	5 days	100%	50%	100%
Min	n/a	0 days	n/a	2 days	n/a	n/a	n/a
Max	n/a	5 days	n/a	8 days	n/a	n/a	n/a
St.dev	n/a	3.5 days	n/a	4.24 days	n/a	n/a	n/a

Table 3.3.7 KPIs Product specialist

Two applicants applied for this vacancy. One applicant was suited for the position and is hired.

-Product specialist

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	76 days	2 days	69 days	15.2 days	100%	20%	100%
Min	n/a	1 day	n/a	7 days	n/a	n/a	n/a
Max	n/a	2 days	n/a	25 days	n/a	n/a	n/a
St.dev	n/a	0.71 days	n/a	7.05 days	n/a	n/a	n/a

Table 3.3.8 KPIs Product specialist

Five applicants applied for this vacancy. The data of two first response data is missing.

-Salaris verzuim

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	82 days	3.3 days	72 days	13.7 days	42.9%	14.3%	100%
Min	n/a	0 days	n/a	5 days	n/a	n/a	n/a
Max	n/a	12 days	n/a	20 days	n/a	n/a	n/a
St.dev	n/a	4.19 days	n/a	7.77 days	n/a	n/a	n/a

Table 3.3.9 KPIs Salaris verzuim

Seven applicants applied for this vacancy.

3.3.2 Open vacancies

-Data scientist

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7

Average	n/a	Missing	44 days	11 days	33%	33%	100%

Table 3.3.10 KPIs data scientist

Three persons applied for the vacancy. All three applicants were invited for a first interview. However, some of the data of application and first response and first interview are missing. Therefore, some KPIs are not calculated. One person is hired for the position, but the company is looking for more applicants to fill the position, therefore the vacancy is not closed.

-Sales advisor

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	n/a	Missing	n/a	12 days	100%	n/a	n/a

Table 3.3.11 KPIs sales advisor

One person applied for the vacancy. This candidate is invited for a first interview, however the date for this invite in unknown.

-Frond-end software engineer

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7
Average	n/a	2 days	n/a	14 days	50%	n/a	n/a

Table 3.3.12 KPIs Front-end software engineer

Four applications applied for the position. Only one person was invited for an interview. One person is rejected and of the other two applications data is missing.

-Full stack software engineer

	KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI6	KPI 7
Average	n/a	Missing	n/a	n/a	n/a	n/a	n/a

Table 3.3.13 KPIs Full stack software engineer

One applicant applied for the vacancy. However, no response is given to his application.

-Quality Engineer (R&D), Product Owner (R&D), Senior back-end software engineer (R&D), Back-end software engineer (R&D), Product Adviser sales team (Sales and marketing)

All these vacancies have received zero applications, therefore the KPIs cannot be calculated. Most of these vacancies are looking for employees in the research and development (R&D) sector. The R&D sector is very competitive and there is a job shortage on the labour market. This could have influenced the zero applications for the open vacancies.

3.4 Conclusion

The KPIs of the closed vacancies resulted in the following averages.

	Definition	Average	Minimum	Maximum	St. dev
KPI 1	The average overall time before a vacancy is filled	50.75 days	28 days	82 days	18.76 days
KPI 2	The average time between application and first response to applicant	3.15 days	0 days	12 days	1.37 days
KPI 3	The time between application and hiring	37.88 days	15 days	72 days	22.05 days
KPI 4	The time between application and first interview	11.86 days	2 days	30 days	4.81 days
KPI 5	The percentage of inflow of applicants who meet first assessment criteria in the process	65.78%	33%	100%	30.22%
KPI 6	The percentage of the number of applicants who are offered the open position	34.70%	6.67%	100%	29.61%
KPI 7	The percentage of applicants who accepts an offer	100%	100%	100%	0

Table 3.3.14 Average values KPIs closed vacancies

The first KPI measures the time between opening and closing a vacancy. The average time that a vacancy is closed is 51 days. The maximum value for this KPI that is measured is 82 days. The reason for this high value is that the person who is hired had to finish her current job before she was allowed to sign the new job offer which resulted in a one-month delay before she could start with the new position. The second KPI measure the time between application and first response. On average this first response time is 3.15 days. The first response time fluctuates between 0 (the same day) and 12 days. The third KPI measures the time that a hired person has spent in the process. On average this is 38 days. The fourth KPI measures the time between application and first interview. This value fluctuates between 2 and 30 days. The fifth KPI measures the percentage of applicants that meet the first assessment criteria. On average, 66% of the applicants meets the first assessment criteria. The sixth KPI measures the percentage of applicants that are offered the open position. It is interesting to mention that all applicants that were offered a position accepted this offer. Therefore KPI 7, offer acceptance rate is 100%.

Chapter 4 – Systematic literature review

A systematic literature review (SLR) is performed to answer the third research question. The full SLR can be found in Appendix B. The third research question is "What are options to formulate roles and responsibilities of a business process?". This research question is divided in three sub research questions. Each section discusses a sub research question. Section 4.1 discusses all options that result from the SLR. Section 4.2 discusses the advantages and disadvantages of the earlier investigated options. Section 4.3 discusses what option fits Ecare best.

4.1 Systematic literature review

The literature review resulted in four articles. Each article presents a different way to formulate roles and responsibilities of a business process.

4.1.1 UML metamodel

The first article, Modeling Support for Delegating Roles, Task and Duties in a Process-Related RBAC Context, discusses an approach for the integrated modelling of business processes and the delegation of roles, tasks and duties [8](S. Schefer, M. Strembeck (2011). RBAC stands for Role-Based Access Control. RBAC is about managing access. There is a capability (something that you can have access to) and someone has access to them (permission). This permission is granted to a role. A role is assigned to a user. User -> Role -> Permission -> Capability

A UML metamodel extensions is used to model the delegation of roles, task and duties which is extended via UML2 Activity diagrams. Figure 4.1 displays an extended UML2 Activity model with all components. UML2 Activity models visualizes the control and object flows between different actions. The UML2 model consist of different components, some are explained below:

-Business Action: a task and all permissions that are necessary to perform a task
-Duty: identifies that an action must be performed by a specific user

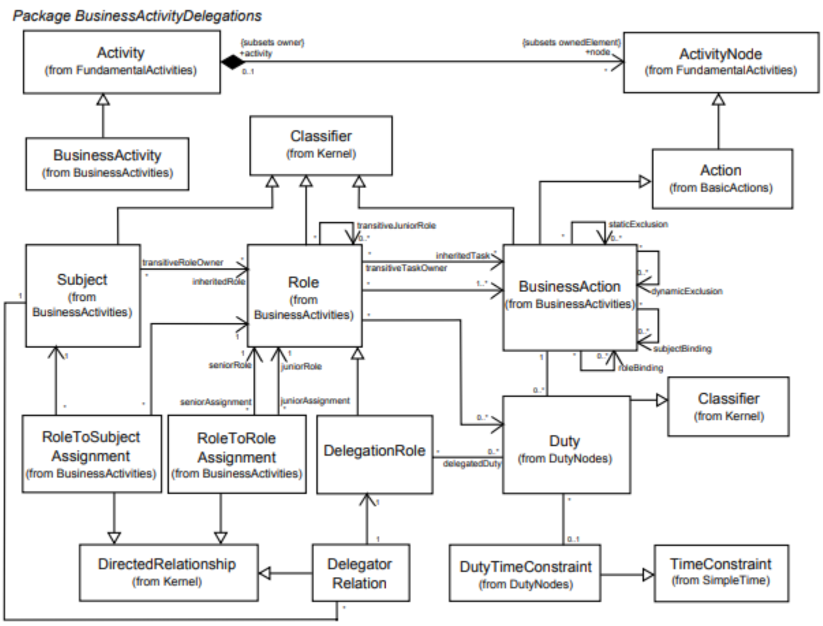

Figure 4.1 extended UML2 Activity Model, S. Schefer and M. Stermbeck (2011)

[8] Strembeck, S. S. M. (2011). Modeling support for delegating roles, tasks, and duties in a process-related RBAC context, Springer Verlag.

4.1.2 RACI Matrix

The second article, Automated Resource Assignment in BPMN Models Using RACI Matrices, discusses a different approach to formulate roles and tasks [9] (C. Cabanillas et. Al, 2012). Organizations have to manage the assignment of responsibilities to their employees about what activities they have to perform. To assign and manage the responsibilities and activities, the organization needs a way to organize and display these. This can be done by a Responsibility Assignment Matrix (RAM), also known as Responsible Accountable Consult Inform (RACI) matrix. A RACI matrix represents the assignment of responsibility of the members of an organization.

The rows in the RACI matrix represent the activities that have to be performed. The columns represent the resources (employees) that have a certain responsibility. Each cell contains zero or more RACI initials indicating the type of responsibility that a resource has per activity. The initials that are listed in cells have different functions, called roles:

-R, Responsible: the person who must perform the work. This person is responsible for the activity until the work is completed and approved by an accountable.

-A, Accountable: the person who must approve the work from the person that is responsible for a certain activity.

-C, Consulted: this person's opinion may be asked while performing the work.

-I, Informed: this person is kept up to date about the progress of an activity and/or the results of the work.

For each activity, only one person should be accountable. Typically, one person is responsible for an activity.

A variant of a RACI matrix is a RASCI matrix. One extra initial is added.

-S, Support: This person may assist in completing an activity. The person who is responsible may delegate work to them.

	Project's PhD Student	**PhD Thesis Supervisor**	**Project Coordinator**	**Project's Administrative Assistant**	**Research Group's Clerk**
Submit Paper	R/A				
Fill Travel Authorization	R		A/C		
Sign Travel Authorization	I		R/A		
Send Travel Authorization	I				R/A
Register at Conference	R/A	I	C/I	I	
Make Reservations	R/A	C	C	C/I	S

Figure 4.2 RASCI matrix, C. Cabanillas et al. (2012)

[9] Cristina Cabanillas. Manuel Resinas, A. R.-C. (2012). Automated resource assignment in BPMN models using RACI matrices. **7565 LNCS:** 56-73.

4.1.3 Template-based approach

Article 3, A template-based approach for responsibility management in executable business process discusses a different approach [10](C. Cabanillas et. Al, 2018). Business Process Models (BPM) provide support for modelling activities that involve several people with different responsibilities. However, the BPM can be improved by adding information about responsibilities. This article describes a template-based technique to add information about responsibilities in BPM by transforming the information in BPMN elements. The article discusses different templates to implement the principles of the RACI matrix into a BPM.

-Static template: this is a process model defined in BPMN that details the interaction between different people with different responsibilities within an activity.

-Fragment-based template: this is process model that is divided in fragments according to the different responsibilities of RACI.

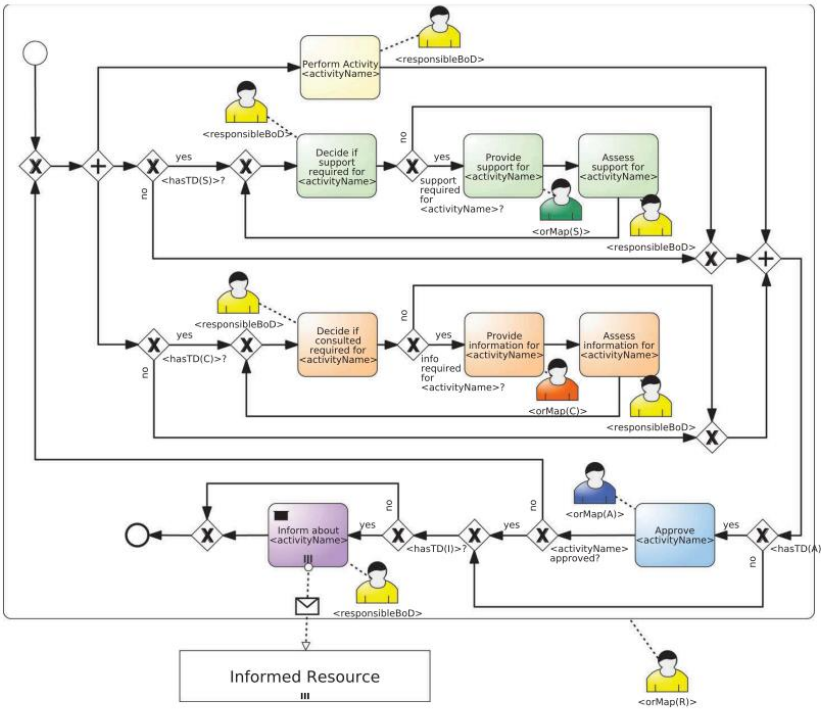

Figure 4.3.1, static template C. Cabanillas et. Al (2018)

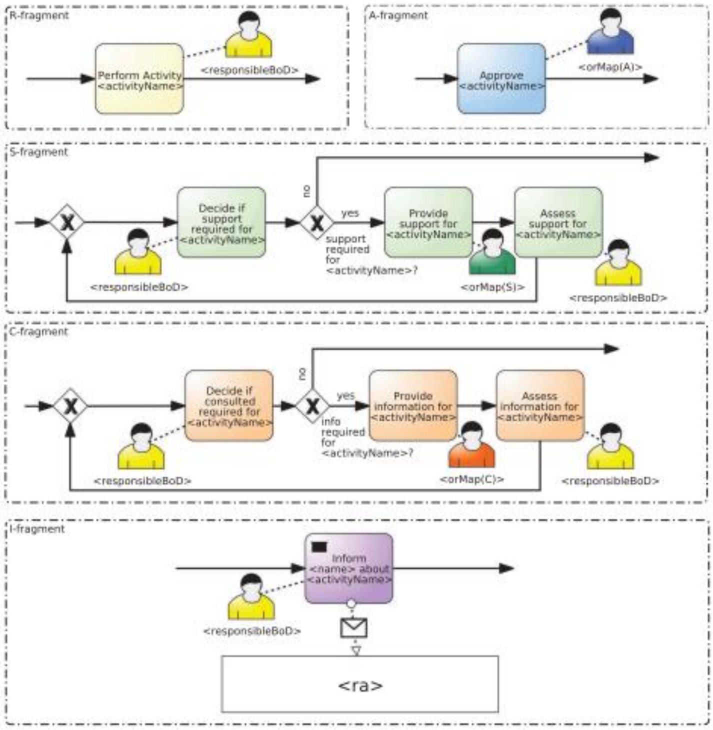

Figure 4.3.2, fragment-based template C. Cabanillas et. Al (2018)

[10] Cristina Cabanillas. Manuel Resinas, A. R.-C. (2018). "A template-based approach for responsibility management in executable business processes." **12**(5): 550-586.

4.1.4 Social tagging

The fourth article, A framework to capture and reuse process knowledge in business process design and execution using social tagging, discusses social tagging [11](M.E. Rangiha et. Al, 2016).

Social tagging is used to capture process knowledge emerging during the design an enactment of a business process. Process knowledge entails the activities that have to be performed to fulfil a goal and the skills/experience that are required to fulfil a goal. Tasks are activities that have to executed to reach a goal. In the social tagging model are two types of process members

-Community members: participate in the design and execution of the process. They decide which tasks should be part of a process and assign community members
-Active members: similar to process owners, they are responsible for the overall design and execution of the process.

Tags contain information about objects. There are two types of tags: system-defined and user-defined tags. System-defined tags are used for tasks. User-defined tags are added by the active members to tasks to specify the skills that are require for the execution of that task. In this way, tags represent the tasks and roles.

Social tagging occurs when tags are shared among users and different users are allowed to tag. Social tagging consists of three elements: users who perform tagging, resources which are items that users tag and tags which are keywords added by users.

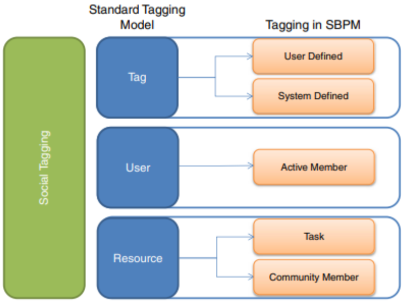

Figure 4.3 Social tagging, M. E. Rangiha et al. (2016)

[11] Mohammad Ehson Rangiha, M. C., Bill Karakostas (2016). "A framework to capture and reuse process knowledge in business process design and execution using social tagging." Business Process Management Journal **22**(4): 835-859.

4.2 Evaluation of options

All articles have proposed different approaches to formulate roles and responsibilities in a process. Table 4.1 lists all the advantages and disadvantages per approach.

Article 1: UML		Article 2: RACI Matrices		Article 3: Template		Article 4: Social tagging	
Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Supporting a proper mapping of models to software systems	UML notation may not be clear	Visualizes responsibilities per activity of a task		Templates improve current support for responsibility management	Have to make a BPM	-User-defined tags indicate the skills that are required to perform a task	-Risk of not tagging due to difficulty
Facilitates communication between different stakeholders	No clear overview of the whole process in one view	Clear visual representation		Templates could be combined with existing BPM			-Too many tags could result in chaos
Makes responsibility for tasks and duties explicit		RACI matrix could be easily combined with a BP model					The applicability of framework is limited to ad hoc business process
Detects task- or duty related conflicts							

Table 4.1 overview benefits of different approaches

4.3 Advice for Ecare

The company experiences the problem that the job application process has no clear roles and responsibilities. Ecare wants a tool to increase the awareness among internal stakeholders of what task is assigned to what colleague. All articles describe a different approach to document roles and tasks. Weighing all the advantages and disadvantages that are mentioned Section 4.2, one article presented an approach that is best suited for Ecare. This approach is mentioned in Article 2: RA(S)CI matrix. The RA(S)CI matrix is best suited for Ecare since it solves the problem: no clear roles and tasks. The RA(S)CI matrix visualizes per step of a process what the responsibilities are per stakeholder. In addition, a RA(S)CI matrix gives a clear visual presentation.

Chapter 5 Implementation plan

This chapter discusses the implementation stage of the previously advised approach to document roles and responsibilities in the job application process. The final research question "How to implement the chosen option in Ecare?". The option that is advised to implement at Ecare is RA(S)CI matrix. Therefore the research question is "How to implement the RA(S)CI matrix for the job application process of Ecare?". This question is divided in sub research questions. Section 5.1 describes who should promote the RA(S)CI matrix. Section 5.2 discusses how the RA(S)CI matrix should be implemented. Section 5.3 describes how the evaluate the RA(S)CI matrix after implementing. Section 5.4 proposes a timeline for the implementation plan.

5.1 Promote RA(S)CI

The introduction of the RA(S)CI matrix results in a change of the way of working. There are factors that influence employee perception and commitment during organizational change [12] (S. Maheshwari, V. Vohra): culture, leadership, cross functional integration, training, communication and technology. Some of these factors are explained further:

-Leadership: Leadership influences employee's perceptions during organizational change. The success or failure of an implementation depends on leader's ability to gain support for change from employees.

-Training: Training for employees on the use of tools and processes effects the acceptability for organizational change.

-Communication: Communication is essential for achieving organisational change. Insufficient communication may result into rumours and resistance to change.

Taking these factors into account, someone has to be appointed to promote the change to RA(S)CI matrix. This person needs to have leadership. Preferably the promotor should be a senior stakeholder who has a leadership status. The promotor should be able to influence employee's perceptions. The promotor should communicate about the organizational change to employees. The promotor should explain why there is a need for this change and mention the value that this change could give. I would advise the promotor to be the managing director since she is a senior stakeholder and she has a leadership status. These characteristics are essential to promote the implementation of the RA(S)CI matrix.

[12] Shweta Maheshwari, V. V. (2015). "Identifying critical HR practices impacting employee perception and commitment during organizational change." Journal of Organizational Change Management **28**(5): 872-894.

5.2 Implement RA(S)CI

After the RA(S)CI matrix is promoted by a promoter, the RA(S)CI matrix should be implemented. The implementation of the RA(S)CI matrix can be seen as a project, which needs a project leader. An employee should be made responsible for implementing the matrix. The implementation of the RA(S)CI matrix consist of different steps. These steps are discussed per subsection.

5.2.1 Identify roles

The first step of implementing the matrix is identifying roles. A role refers to a position of an employee. From the 'As is' situation, it can be concluded that the process has different roles: department manager, department colleague, HR department, marketing department, managing director, CFO/CTO.

5.2.2 Identify tasks

The job application process at Ecare is divided in three stages: recruitment stage, selection stage and hiring stage. From the current situation the different steps in the stages of process are identified. These steps are incorporated into Table 5.3.1, Table 5.3.2 and Table 5.3.3.

5.2.3 Assign the RA(S)CI to each role and task

After listing all the tasks of the process, the different responsibilities should be assigned to roles. The definitions of the different responsibilities are explained in subsection 4.1.2. After observing the job application process and its internal stakeholders, I recommend using the following assignment of roles.

The recruitment stage

For the recruitment stage, Table 5.3.1 visualizes the proposed responsibility assignment. The department manager is responsible for determining the profile. A department colleague can give support with completing the activity. The opinion of the HR department may be asked during the determination of the profile. The managing director should approve if the profile is complete. When this is the case, the marketing department should be informed about the profile.

The marketing department is responsible for writing and publishing the vacancy text. The HR department can offer support with writing the vacancy text. The managing director determines the promotion budget for a vacancy. The marketing department should be informed by the managing director about this budget. The marketing department is responsible and accountable for promoting the vacancy. While promoting, the managing director should be informed about the progress.

TASK	Department manager	Department colleague	Marketing department	HR department	Managing director
Determine profile of colleague	R	S	I	C/I	A
Write vacancy text			R/A	S	
Publish vacancy			R/A		
Determine promotion budget			I		R/A
Promote vacancy			R/A		I

Table 5.3.1 Recruitment stage

The selection stage

For the selection stage, Table 5.3.2 visualizes the proposed responsibility assignment. The HR department is responsible for collecting and assessing the applications. The department manager should be informed about the incoming applications. The HR department may ask support from the department manager with assessing the applications. The HR department is responsible for rejecting or inviting the application for the first interview. The HR department should inform the department of the open vacancy with details for the first interview.

The department's manager and colleague are responsible for attending and evaluating the interview. They should inform the HR department, managing director and CTO/CMO about their assessment. Thereafter the HR department can reject or invite the applicant for a second interview. The HR department should inform the managing director and CTO/CMO when the second interview takes place. The managing director and CTO/CMO are responsible for attending and assessing the second interview. They should inform the department manager and the HR department about their assessment. If the assessment is negative, the managing director is responsible for rejecting the applicant. If the assessment is positive, the HR department is responsible for creating a contract. The managing director can give support. When the contract is finished, the HR department sends the contract to the applicant. The managing director is responsible for negotiations about the contract with the applicant.

TASK	Department manager	Department colleague	HR department	Managing director	CTO/CMO
Collect applications	I		R/A		
Assess applications	S		R/A		
Invite/reject applicant for first interview	I	I	R/A		
Attend first interview	R/A	R/A			
Evaluate first interview	R/A	R/A	I	I	I
Invite/reject applicant for second interview			R/A	I	I
Attend second interview				R/A	R/A
Evaluate second interview	I		I	R/A	R/A
Reject applicant after second interview				R/A	
Create contract			R/A	S	
Send contract			R/A		
Negotiations				R/A	

Table 5.3.2 Selection stage

The hiring stage

For the hiring stage, Table 5.3.3 visualizes the proposed responsibility assignment. The managing director is responsible for signing the final contract. The managing director should inform the marketing department and HR department about signing the final contract. The marketing department is responsible for removing the filled vacancy from platforms and stopping the promotion of the filled vacancy. The HR department is responsible for incorporating the new colleague in their system. The HR department should inform (incoming) applicants that applied for the position that the position is filled.

TASK	Marketing department	HR department	Managing director
Sign final contract	I	I	R/A
Remove vacancy from platforms	R/A		
Stop the promotion of the vacancy	R/A		
Incorporate candidate in system		R/A	
Inform (incoming) applicants of vacancy that position is filled		R/A	

Table 5.3.3 Hiring stage

5.3 Evaluation

The RA(S)CI matrix is introduced to improve the current awareness of roles and responsibilities of the job application process. The company has the problem that the current job application process is not effective. The underlying problem is that the roles and responsibilities of the process are not clear. After implementing and working with the RA(S)CI matrix, the matrix should be evaluated to see if the matrix has the desired result. The evaluation could be quantitative and qualitative.

-Quantitative: quantitative evaluation measures the effects of the RA(S)CI matrix. In Chapter 3 KPIs are introduced to measure the effectiveness of the job application process. When the RA(S)CI matrix is implemented, after some time, the KPIs can be measured. To see if the effectiveness increased, the values of the current situation can be compared with the values of the previous situation before using the RA(S)CI matrix.

-Qualitative: qualitative evaluation could be used to evaluate the effects of the RA(S)CI matrix. Internal stakeholders could be questioned about how they experience working with the RA(S)CI matrix.

5.4 Timeline

The following timeline is proposed to implement and evaluate the RA(S)CI matrix:

Week 0: First a promotor should be appointed. The competencies of the promotor are described in Section 5.1. The HR department could be made responsible to appoint the promotor since they know all the staff with their competencies.

Week 1: The promotor should schedule a meeting with the employees who have a role in the process. The promotor should explain the need for the RA(S)CI matrix.

Week 1: Implementing and using the RA(S)CI matrix.

Week 2-3: After working with the RA(S)CI matrix, employees may want to adjust the matrix. They could add tasks or change responsibilities. If adjustments are made, this should be shared with all the employees that have a role in the RA(S)CI matrix.

Week 12-16: The RA(S)CI matrix should be evaluated. The KPIs of the new situation (when Ecare uses the RA(S)CI matrix) should be compared with the old situation (when Ecare does not use the RA(S)CI matrix) to see if the process' effectiveness improved.

Chapter 6 Conclusions, recommendations and discussion

This chapter finishes this bachelor thesis. Section 6.1 discusses the conclusions. Section 6.2 discusses the recommendations for the company and future research. Finally, Section 6.3 discusses the research.

6.1 Conclusions

This bachelor thesis had two goals. The first goal was to give the company insight into the current job application process. The second goal was to improve the effectiveness of the job application process.

To achieve the first goal, the process is mapped and the current effectiveness is measured. First, all the steps of the process are visualized. The process' stakeholders are identified. An overview of the roles and responsibilities is made. The current effectiveness of the process is measured by measuring KPIs that indicate the process' effectiveness. Therefore, it can be concluded that the first goal is achieved.

The second goal of the process has not been achieved during the research. In the research a method to document the roles and responsibilities is identified, but due to the time span of the research it was not possible to implement this method. However, the company could evaluate the method after implementation if the effectiveness increased by using the evaluation method that is described in Section 5.3.

6.2 Recommendations

After observing the job application process at Ecare, I have multiple recommendations. These recommendations are categorized in future research, way of working at Ecare, using the RA(S)CI matrix and evaluating the RA(S)CI matrix.

6.2.1 Future research

-The applications that apply for a vacancy at Ecare find the company via different platforms. The company does not make an overview via which platforms the applicants found Ecare. Making an overview could help to decide on which platforms Ecare could promote their vacancies.

-This thesis researches the job application process. Future research could investigate the onboarding process at the company. The onboarding process refers to introducing and incorporating a newly hired employee into the organization. Researching the onboarding could measure if the hired colleague is the right fit for the position or if the way of working in the onboarding could be improved.

-The internal stakeholders of the process mentioned that to find the status of where an applicant is positioned in the job application process. Future research could develop a tool to give an overview of the status of an applicant.

6.2.2 Way of working at Ecare

-The company does not evaluate the way of working in the job application process. Evaluating the way of working in the process could help to improve the process. This could be done by questioning the process' internal and external stakeholders.

6.2.3 Using the RA(S)CI matrix

Section 5.2 proposes a way to fill in the RA(S)CI matrix. For the different steps, roles and responsibilities of this RA(S)CI matrix, observations of the current process are used as input. After implementing and using the proposal, users should evaluate if they want to change roles, tasks and responsibilities.

6.2.4 Evaluating the RA(S)CI matrix

The goal of the RA(S)CI matrix is giving a clear overview of the roles and responsibilities of the job application process. Using the RA(S)CI matrix should increase the effectiveness of the job application process. To see if using the RA(S)CI matrix has the desired effect, Ecare should evaluate the results of using the RA(S)CI matrix. Chapter 3 lists KPIs to measure effectiveness. To see if the RA(S)CI matrix increases the effectiveness, Ecare could measure these KPIs for vacancies that are opened after implementing the RA(S)CI matrix. When the values of the new situation are better compared to the situation without using the RA(S)CI matrix, it could be concluded that the RA(S)CI matrix helps to increase the process' effectiveness.

6.3 Discussion

The research methods of this thesis entailed mapping the current job application process, measuring KPIs that indicate the process' effectiveness and performing a systematic literature review (SLR).

To map the current process, interviews were conducted with internal stakeholders and the in- and outflow of applicants through the process is analyzed. The answers of the interviewees and data of the in- and outflow of applicants are transformed into Chapter 2 'As is' situation. This chapter matters to accomplish one of the research goals: give the company insight into the current job application process. Some data of the in- and outflow of vacancies is missing since this data could not been retrieved. For which vacancies the data is missing is mentioned in the report. Therefore, the in- and outflow models are not complete but they almost give an full impression of the current situation. This has also influenced the values of the KPIs in Chapter 3.

The action problem that has been tried to tackle during this research is that the current process is not effective. The underlying problem is that the roles and responsibilities of the process are not clear. By performing a SLR, a RA(S)CI matrix to formulate roles and responsibilities of the process is proposed. The hypothesis of implementing this RA(S)CI matrix is that the process' effectiveness would increase. However, due to the timespan of the research it was not possible to implement and evaluate the effects of the RA(S)CI matrix. It is likely that implementing the RA(S)CI matrix would improve the process' effectiveness, but this has not been proven.

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12. Shweta Maheshwari, V. V. (2015). "Identifying critical HR practices impacting employee perception and commitment during organizational change." Journal of Organizational Change Management **28**(5): 872-894.

Appendix A Cleaned up list of problems

-Risk on brand image damage

-No application procedure

-Unknown status of application

-Unnecessary communication between employees

-Less time for regular working activities

-Different employees respond to same applicant

-Wrongly informed applicant

-Uninformed/waiting applicants

-Applicants feel less committed

-Missing out on potential employees

-Different communication methods

-Unfilled vacancies

-No system with status of application

-No clear division of tasks: who needs to respond

Appendix B Systematic Literature Review

A systematic literature review (SLR) is performed in order to answer the third research question of my bachelor thesis. The systematic literature review entails following steps that are presented in the following figure. The full SLR can be found in Appendix B

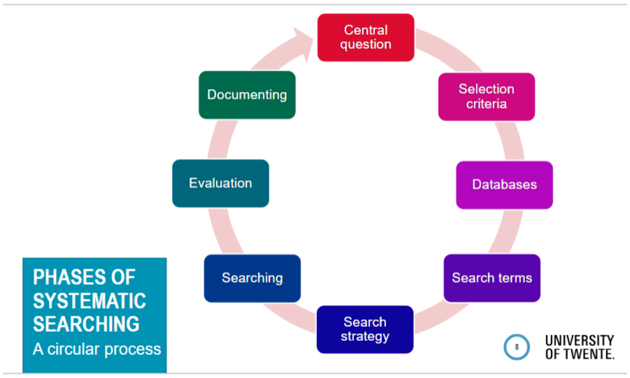

Figure B.1 systematic literature review cycle

1. The knowledge problem/research question

The first step entails defining the knowledge problem and/or research question. The knowledge problem that I want to answer is "What are options to formulate roles and responsibilities of a business process?".

2. The inclusion and exclusion criteria

Certain inclusion and exclusion criteria are formulated in order to select the most suitable literature for my SLR.

Inclusion criteria	**Reason**
Literature should be written in English or Dutch.	I am only fluent in English and Dutch.
Literature should be written from 1995.	Due to the time frame of my research, literature from 1995 can be considered as up to date.
Literature should be accessible by UT access or open access.	To get access to literature, the literature should be accessible by UT or open access.
Literature abstract should contain one of the key concepts or synonyms that are listed in Table 3.2.	The literature that will be reviewed should discuss one of the key concepts in order to answer the knowledge problem.
Abstract	(Roles OR Responsibilities) and (tasks OR activities) and (process)
Exclusion criteria	**Reason**
Literature that is written in another language than English or Dutch	I am only fluent in English and Dutch.
Literature that is written before 1995	Literature before 1995 can be considered as outdated.

Table B.1, inclusion and exclusion criteria for SLR

3. The databases used

In the micro lectures series about systematic literature review, it was recommended to use 2 to 4 databases for input. In addition, the subject guide for IEM highlighted Scopus and Web of Science as most important databases. Therefore, I selected the following two databases:

-Web of Science: this is a multi-disciplinary database. Web of Science is a large data base for articles and citations.

-Scopus: this is a multi-disciplinary database. Scopus is a large database for research literature, citations, patents and web resources.

4. The search terms and the used strategy

My knowledge problem “What are options to formulate roles and responsibilities in a business process?” contains key concepts. To find search terms, the key concepts of the knowledge problem and synonyms of these key concepts are used.

Key concepts	**Synonyms**
Formulate	Model, document, map, specify systematically, visualize
Roles and responsibilities	Functions, tasks, accountability, jobs, duties, activities
Business process	Business method, business function

Table B.2 Search matrix

A combination of the key concepts and synonyms are used for the input of the search strings. Due to time limits, for every search string the first 50 hits are reviewed by reading the abstract bases on relevance sorting.

5. Listing the number of search results found, the number of duplicates, to the final set of articles

   The search log is based on chronological sequence. Therefore, potential duplicates are removed from the column “Relevant articles”.

Date	Database	Search string	Additional filter	Number of hits	Relevant articles
18-5-2022	Scopus	(TITLE-ABS-KEY (model OR map OR formulate OR visualize) AND (functions OR tasks OR accountability OR jobs OR duties))	Subject Area: Business Management and Accounting	158	1
18-5-2022	Scopus	(TITLE-ABS-KEY (map OR model OR document) AND (roles OR activities OR tasks OR jobs) AND (business process OR process)	Subject Area: Business Management and Accounting	956	0
18-5-2022	Scopus	(TITLE-ABS-KEY ((BPM) AND (roles OR task OR activities))		77	2
18-5-2022	Scopus	(TITLE-ABS-KEY ((BPM) AND (roles OR task OR activities) AND (model OR map OR visualize OR formulate))		68	1 (2 duplicates)
18-5-2022	Web of science	((roles OR responsibilities) AND (tasks OR activities OR jobs) AND (process or BPM))		25	0 (2 duplicates)
18-5-2022	Web of science	(model OR map OR formulate OR visualize) AND (functions OR tasks OR accountability OR jobs OR duties)		102	0 (2 duplicates)

Table B.3 Search log

6. A conceptual matrix

Article/Concept	RBAC	RACI	Template-based approach	Social tagging
Modeling support for delegating roles, tasks, and duties in a process related RBAC context	X			
Automated resource assignment in BPMN models using RACI matrices		X		
A template-based approach for responsibility management in executable business processes			X	
A framework to capture and reuse process knowledge in business process design and execution using social tagging				X

Table B.4 Conceptual matrix

7. *Integration of the theory*
   The integration of theory is written out in Chapter 3 Systematic Literature Review. I refer to this chapter to prevent double reading.

Appendix C Approval of BMS ethics committee

UNIVERSITY OF TWENTE.

APPROVED BMS EC RESEARCH PROJECT REQUEST

Dear researcher,

This is a notification from the BMS Ethics Committee concerning the web application form for the ethical review of research projects.

Requestnr. :	220622
Title :	From candidate to employee
Date of application :	2022-04-19
Researcher :	Brouwer, B.A. de
Supervisor :	Wegen, L.L.M. van der
Commission :	Bruinsma, G.W.J.
Usage of SONA :	N

Your research has been approved by the Ethics Committee.

The BMS ethical committee / Domain Humanities & Social Sciences has assessed the ethical aspects of your research project. On the basis of the information you provided, the committee does not have any ethical concerns regarding this research project.

It is your responsibility to ensure that the research is carried out in line with the information provided in the application you submitted for ethical review. If you make changes to the proposal that affect the approach to research on humans, you must resubmit the changed project or grant agreement to the ethical committee with these changes highlighted.

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you re-consider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research is subject to regulations such as the EU General Data Protection Regulation (GDPR), the Code of Conduct for the use of personal data in Scientific Research by VSNU (the Association of Universities in the Netherlands), further codes of conduct that are applicable in your field, and the obligation to report a security incident (data breach or otherwise) at the UT.