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A Conceptual Design of an Integration Module for existing HR Systems based on Historical Recruiting Data of an Organization

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Abstract:

Both applicants and organizations have high stakes in the outcome of the recruitment process. Stakes are economical and psychological satisfaction needs, especially for applicants. In today's recruitment process the organizations hold power, and the needs of the applicants are ignored because of required resources among other factors. This thesis project describes in the report an in-depth analysis of the recruitment process, its stakeholders' perspectives, and the design of "SmartProfile". The project idea also attracted the interest of Organization X. The historical recruiting data investigation is conducted with real data and technology support from a consultancy company, NTT, who are specialized in SAP SuccessFactors(SF). Besides, the analysis showed the applicants' concerns about not receiving information during the recruitment process. The outcome of the thesis, a conceptual design of SmartProfile, shows the high potential and the possibility of enhancing transparency between the stakeholders by leveraging historical data, and with no need for the extra resources from the organizations. SmartProfile is an SF service module that can be integrated into the existing SAP SF HR Systems.

Keywords: Process Mining, Recruitment, SAP

The content of this report is freely available, but publication (with reference) may only be pursued by agreement with the authors.

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Abbreviations

Abbreviation	Definition
NTT	The Organization: NTT Data Business Solutions A/S
Organization X	The Organization who supported this project thesis by walking through their recruitment process and provided recruiting data for case study
ERP	The Software: Enterprise Resource Planning
SAP	The ERP System: Systems Applications and Products
SF	The SAP Module: SuccessFactors
HR	Human Resource
API	Application Programming Interface
BPM	Business Process Management
KPI	Key Performance Indicators
DPCS	Data Privacy Consent Statement
OData	Open Data Protocol
REST	Representational State Transfer
ADF	Azure Data Factory

Table 1: Abbreviations and Explanations

1 Introduction

Chapter 1 is introducing the problem background, formulated question(s), and the organizations supporting the thesis work. Further, motivation for the thesis, expected outcome, and delimitation of thesis are explained in this section.

1.1 Background

The employee recruitment process started back in world war II. It came from the gaps in the workplace that resulted from the call for men to join the war efforts. However, this was only to fulfil the need from the workplace. Additionally, [Perelsen and Associated, 2022] mentions that during the following decades up till now qualifications and requirements from the workplace emerged. Applicants create resumes to show qualifications in various ways trying to meet the requirements provided by the organizations. The qualifications and requirements are added from the organization's side to the recruitment process creating a number of limitations. The employee recruitment process has evolved to show more importance to the needs of the organizations and evolving the standard recruiting process as per their own needs. With this, not considering the applicants' side of expectations. In other words, the organization has managed to create its own process of receiving applications, screening, interviewing, and selecting the right candidate within its own favorable timeline and desire. This includes preferring internal candidates over external candidates, delays in the process and even using two months or more to get back to candidates regarding their applications, 6.4. Besides this, In 2017, a research from the Danish National Healthcare Institute showed that 47% of unemployed people experience stress associated with being unemployed, [Frost, 2017]. Having the responsibility of budgeting own finances, maintaining a stable family lifestyle, and managing time effectively but also choosing a satisfying job that fills the needs, can be some of the reasons for the stress. Another research [Admin, 2022] conducted, shows 70% of the candidates experience the recruitment process to be one of the most stressful periods experienced in life. With the recruitment process and minding the involved aspects both from organization and applicant, we discovered a problem in the employee recruitment market. Which is organizations seeking to fulfilling own needs and not considering applicants aspect of the process.

With the support from NTT Data Business Solutions A/S the thesis project area became focused to enhance applicants' user experience in the recruitment process. Based on an interview with NTT, the interviewee, highlights the no considerations existing towards the applicant, and organizations only looking for what they are interested in. The only communication that appears to exist towards the applicants who are not considered in the recruitment process, is a standard template email, roughly concluding *"Thank you for applying"*. Such emails may be received after months and in the very last stage of the recruitment process, A.1. When presenting the problem, NTT became curious about the expected outcome of the project and supported the thesis with the needed infrastructure. Most importantly NTT provided a client case study involving process workshops and raw recruiting data from the client's HR recruitment system.

Overall the interview summed up, confirmed the exclusion of the applicants' needs from both the organization and the current HR systems. Therefore, the aim of the thesis project is to build a service module based on existing historical recruiting data. The module is intended to be integrated with the current HR system to increase the communication transparency between the applicant and the organization also displaying statistics gathered from recruiting data. In other words, the service module is an extension software to developed HR systems existing on the market today. The purpose of the module integration is to provide the applicants an interface with the organization's recruitment process KPIs, statistics of what to expect from the organization. The service will on the other hand also benefit the organization to optimize the internal recruitment process. Certainly, the goal is to implement a generic service design that relies on organizational historical recruiting data and supports larger HR systems to enhance the recruitment process from both applicant and organizational points of view.

1.2 Thesis Support

NTT Data Business Solutions is as mentioned in the background chapter, section 1.1, supporting the thesis project by providing one of the client's recruiting data. Additionally, provisioning a fully equipped platform to ingest, transform and analyze the extracted recruiting data from the clients in relation to the study conducted.

NTT Data Business Solution A/S is an organization operating with ERP IT systems more specifi-

cally SAP solutions including the Success Factors HR recruitment system. It is a consultancy house, which helps companies reach their full potential in digital transformation. This is both within SAP and also new IT business solutions categorically split into data-driven services, Artificial Intelligence, and Machine Learning solutions. NTT DATA Business Solutions designs, implements, manages and provides support to enhance SAP and IT solutions for their customers. NTT is a Japanese-owned organization born with a DNA of expressing to explore new technologies and staying ahead of competitors. The organization has a mission: “We create new markets for digital business, provide services with superior quality by leveraging the aggregated strengths of NTT DATA worldwide, and proactively pursue the technical excellence that our clients expect from us.”, Yo Honma, Representative Director, President, and Chief Executive Officer, [NTT, 2021].

The client, mentioned in this project and above paragraph is referred to as Organization X. Organization X has been operating in the retail market since 1971 and is headquartered in Denmark. It has its production in Denmark, Sweden, and Poland while having retail stores in Denmark, Poland, Iceland, Norway, and Sweden. With this, the organization is having revenue of DKK 2.25 billion and 2470 employees. Organization X, today has SAP SF HR system, which is used for recruitment. Therefore, the recruitment data provided for the thesis work context will be from SAP SF.

1.3 Problem Formulation

Above described sections lead to framing the following problem formulation:

- **To what extent is it possible, with a new service module integration to the Human Resource system, to enhance the communication transparency between the applicants and organizations in the recruitment process?**
 - Through recruiting system history data is it possible to add value and enhance the communication transparency between the applicants and organizations?
 - What data is required to provide insights into the ongoing recruitment process from applicants’ point of view?
 - What are the architectural approaches and requirements to design and integrate a new service module into an existing Human Resource system?

- To what degree is it possible to create a generalized service module that can be integrated into any Human Resource system and enhance the communication transparency in the recruitment process?

1.4 Motivation

The motivation for conducting this project stems from the desire and interest in both investigating and providing a potential solution to the job-seeking applicants' health and stress problems that exist on the market today. Also, the proposed solution for organizations creates value to optimize the recruitment process and supports them in creating value by decreasing health and stress problems for their future potential candidates/employees. Areas of interest for reaching this goal will also require strengthening knowledge in the field of data engineering, data modeling, service architecture, conducting well-established interviews, enhancing user experience, and creating value for both applicants and organizations.

Furthermore, the encouragement from NTT increased the belief in the expected outcome of the thesis work that could potentially contribute to decreasing the applicants' job-seeking stress. And ultimately developing the motivation for pursuing the thesis.

1.5 Expected Outcome

The thesis work plan includes diving into the current recruitment situation from both the applicants' and organizations' perspectives, and also the recruitment process literature. Furthermore, it includes studying the current HR systems with the purpose of optimizing the system and the recruitment process for stakeholders. To summarize, the expected outcome involves discovering the most suitable service design to fulfill the stakeholders' needs and, solving the problem of HR systems that tends to address only the needs of the employer and ignore the interests of the applicants.

In other words, the expected outcome of the thesis is to create a conceptual service design, a software module, for organizations' existing HR recruitment systems. Thereby creating mutual value for both the applicants and organizations by leveraging historical recruiting data. The service will be integrated into organizations' current HR recruiting systems.

1.6 Delimitations

The thesis is concerned with designing the service for improving communication transparency between the organizations and applicants and thereby, enhancing applicants' user experience. The thesis is creating a conceptual design and does not carry out an implementation of the service because of time limit.

Another delimitation of the thesis project is acceptance of the proposed idea itself and service module solution integration in organizations. As already highlighted the optimal solution for the thesis is mainly to target improving the applicants' user experience through enhanced communication between the organizations and applicants. However, the solution itself gets activated and applicants start to see benefits once it is integrated into the organization's HR recruitment system. A well-managed and strongly established practice of the recruitment process in an organization could constrain the acceptance of the proposed conceptual design. Further, if the current practice is followed for a significantly longer period of time could also influence the acceptance. Additionally, the political beliefs of recruitment process owners could impact the acceptance of the solution. All resulting to continue having weak and dilute communication between organizations and applicants.

On the other hand, if the solution is accepted by the organizations. Identifying the common grounds within the organization's policies and regulations to enable the functioning of the solution would be a challenge. Managing conflict of interests in relation to what data to show and not to show, between the organizations and applicants are considered to be a vital area of delimitation for this thesis project. Due to the fact that we are only students and have no access to organizational policies and regulations, further discussion about conflicts of interest, organizational policies, and regulations are excluded from this report.

As mentioned in the expected outcome section 1.5 and beginning of this section, it is only the conceptual design that is developed. The conceptual design is an enriched view of statistical shown on a interface. The narrowed scope of the thesis project is recruitment process mining and process optimization. Hence the report excludes in-depth discussion of interface design principles and concepts. However, the principles of converting the process actions data into meaningful information is

considered when designing the conceptual design interface [**Dourish, P.**, 2001].

Furthermore, the thesis is supported by data from Organization X. Organization X is as mentioned a large retail organization, which includes a high hierarchy from skilled IT professionals to management positions, store assistants, and others. This thesis is not considering the positions; of store assistants, cleaning staff, and other positions with low expectations of qualifications. The reason is that the recruitment process for the positions is mostly hired-on-the-stand with a contract being signed on the location, found in section 6.2. The thesis scope is hence limited to learning the process activities and creating an optimized process approach through a conceptual design. The design is believed to enhance communication transparency in the recruitment process of hiring skilled IT professionals and management positions. Therefore, Organization X and its specific recruitment processes are chosen in the scope of the thesis.

1.7 Structure of the Thesis

Section	Description
Section 1: Introduction	An introduction to the thesis project topic area based on which the problem is formulated, and is presented in this chapter.
Section 2: Methodology	This chapter provides the methods used in the below sections.
Section 3: Methodology Theory	This chapter describes the theory of the methods and concepts explored in the thesis.
Section 4: Recruitment Process Theory	This chapter provides the reader an understanding of traditional recruitment process .
Section 5: State of the Art	This chapter provides an understanding of the SAP SF system and the used data tables to create a solution for the problem formulation.
Section 6: Analysis	This chapter provides a deep analysis of the stakeholders interviews, value proposition and system data.
Section 7: Design	This chapter provides the use cases of the design, the architecture and ends with the requirements of the design.
Section 8: Case Study - Organization X	Based on the previous sections, this chapter provides a discussion of the tools and technologies used in the case study.
Section 9: Shortcomings of the Thesis	Based on the previous sections, this chapter provides known shortcomings of the thesis.
Section 10: Discussion	Based on the previous sections, this chapter provides a discussion of the findings.
Section 11: Conclusion	This section seeks to answer the problem formulation created in section 1.3.
Section 12: Future Work	This section seeks to highlight the next step of the thesis work.

Table 2: Thesis Structure Overview

2 Methodology

Chapter 2 focus on describing the methodological choices of theories and approaches that are made to present and formulate state of the art, analysis and design chapters in relation to problem formulation and expected outcome. The design approach is iterative and incremental with respect to optimizing the expected outcome.

The choice of thesis project area, recruitment process to optimize, a case study support in collaboration with Organization X and NTT DATA business solutions A/S and a software application are explicitly made for investigation. Furthermore, the choices are influenced by an assumption that the current recruitment process needs quality enhancement and improved stakeholder experience. The investigation is embedded with semi-structured interviews and a recruitment process walk-through of a case study that gets inspected through qualitative methods [Duignan, J., 2016]. Adjacent to interpretation of the stakeholder experience, an analysis of process phenomena is performed through quantitative research methods. The stakeholder affected in this context are job applicants. Job applicants are primary stakeholders of the thesis work while secondary stakeholders are organizations recruiting applicants. The information collected and observations made convey that a quality of process, stakeholder prominence and essential value is missing in the recruitment process. The solution created and judged is prominently focused to enhance applicants psychological satisfaction in the recruitment process, however the solution as a consequence is targeted to optimize the recruitment process for organizations.

The problem formulation is introduced in the context of psychological dissatisfaction of applicants' experience in the recruitment process towards the organizations'. It was fast identified that the current recruitment system SAP SF lacks an interface that provides expected information to applicants by the organizations. Therefore, a supplementary service module is beneficial in this context that could be integrated with the main SF HR recruitment system to enhance the applicants experience and satisfaction in the recruiting process.

A combination of theories exist from experts on how to interpret the recruitment process phenomena, recruitment system and user behaviors involved in the process. The first category of theories

reviewed are centered around methodology concepts such as Interpretivism, Phenomenology, Inductive Inference and Interpretive Case Study [KLEIN H, MYERS M, 1999], [BOLAND R J, 1985], [Geoff Walsham, 2006] and [Geoff Walsham, 1995], and process mining concepts. While the second category of theories reviewed helps in understanding the traditional recruitment process. Literature review on recruitment process management and process mining techniques has influence on learning the standard process methods and key measures to discuss and optimize for in the project.

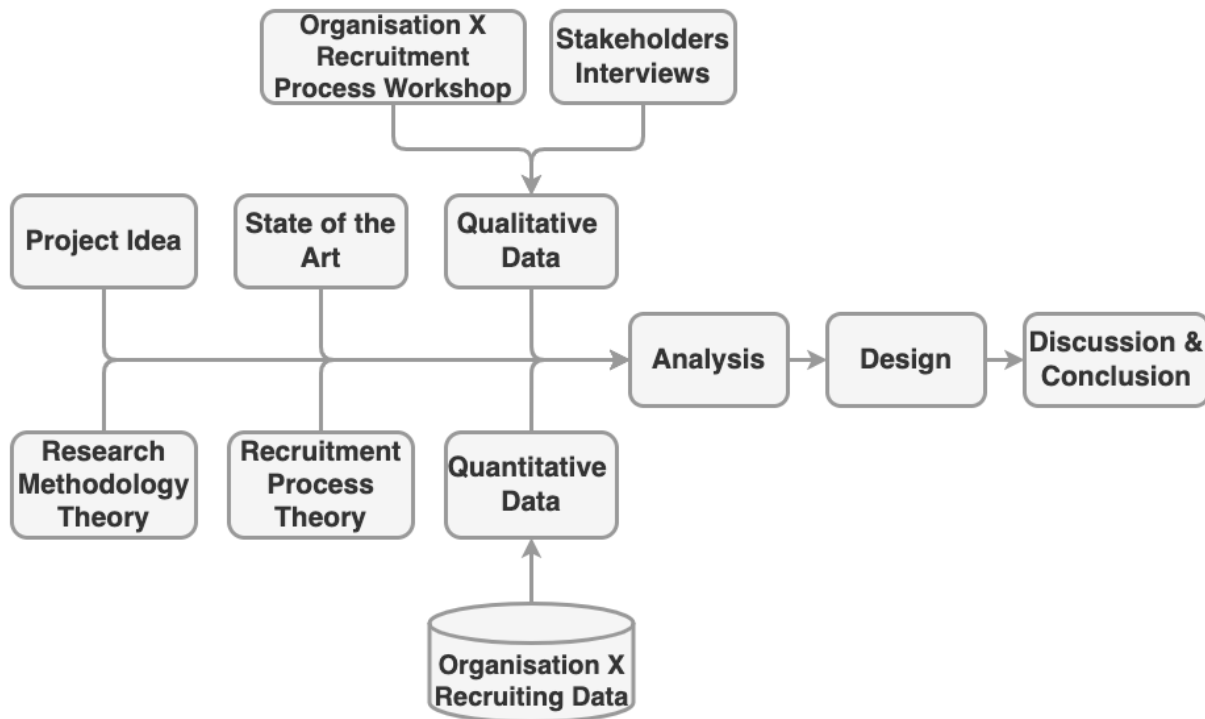


Figure 1: Methodology Diagram

To solve the problem defined in 1.3, we considered interviewing stakeholders - applicants and organizations in the recruitment process. This is to mainly discover current practices behind the process and between the stakeholders. Organization in this context is represented by hiring managers and recruitment partners who perform recruitment tasks in the process. Furthermore, a specific case study of Organization X is investigated through a workshop to visualize how a recruitment process and HR SF system works, from there basing to our thesis work context and further to map our understanding of missing value(s) in the overall recruitment process.

The State of the Art section serves to describe the SF recruitment system functionalities, recruiting data that the system collects and certainly can serve the purpose of understanding the relationship between the stakeholders in terms of what data or communication are exchanged through the system.

In the Analysis section, stakeholders interviews, Organization X recruiting data and workshop is studied thoroughly to analyze the recruitment process and the system used. This is done based on the concepts introduced in Theory sections and the HR system functionality described for carrying out the recruiting process as briefed in the State of the Art section. The empirical evidence and statistics collected in this context, will be deeply analyzed to discover the communication pattern between the stakeholders, stakeholders' pain areas and challenges, and finally to investigate the reasons for missing value(s). All resulting in deciding the optimal solution and a conceptual design draft of a service module. Furthermore, in the Analysis section stakeholders analysis and the design's value proposition is done to define who is highly interested and benefited from the service module.

The service module is designed conceptually in the project 1.6. In a practical scenario, the proposed design would be a supplemental service module that primarily serves the requirements of the applicants in the project context. However the overall architecture of the service module is fully functional upon its integration with the main SF HR recruitment system. The module design choices are made based on how the service platform can add value to applicants' experience in the recruitment process. Alongside how the data-driven statistical results can be integrated to the service platform to enhance the experience. Ultimately how the communication between the stakeholders are enhanced through integration of the service module with the SF HR recruitment system. As described, the decisions are supported by empirical evidence and data-driven statistics.

Although the design solution is mainly focused on solving the applicants' experience as the main problem, an added value to the organizations' are embedded in the solution. Further in future implementation, choices from a technical standpoint would consider to build a solution focusing on building a generalized design architecture to widen the integration capabilities with any HR recruitment system.

The report finally discusses what could be the potential shortcomings impacting the deployment

of thesis project solution in an organization. Likewise the discussion is continued describing the benefits of deployment from applicants perspective, the reliability of empirical evidence, historical recruiting data collected and analyzed for designing the solution. A summary of conclusion is made and presented based on findings, designed solution and its potential values to stakeholders as an answer to the problem formulated. Certainly the future work plan is elaborated on how the designed conceptual solution can be implemented, integrated and optimized after testing with a real use case.

3 Methodology Theory

In chapter 3, some of the theories that are referred to and are relevant in the context of analyzing the thesis work area and recruitment process is described.

3.1 Interpretivism and Phenomenology

Beginning to study the thesis project area as students, it was necessary to qualitatively understand the traditional grounds of phenomena in the recruitment process. Further, this approach is often combined with observing and describing human social behavior and experience from psychological standpoint of view, political and sociological beliefs of a cultural group. In summary, to emphasize and interpret the system phenomena, stakeholders experience and needs, a lens of interpretivism [BOLAND R J, 1985], [Göran Goldkuhl, interpretivism], [Geoff Walsham, 2006] is adopted while involving the stakeholders in interviews. This is a primary approach. The project context is partially related to how the members of the organization contribute pivotal to the process but the essential part being interpreting the actions and interactions considered pivotal from both organizations and applicants point of view.

According to [26], the goal of interpretive research method is to describe empirical evidence with meaning; particular to specific scenarios, and in the context of stakeholder experience and expectations. It is interesting to see if the interpretation of practical phenomena deviates from the traditional grounds likely resulting in poor performance of the process.

Interpretative research method is often helpful to understand complex and complicated system structures in and out of an organization in relation to different stakeholders. Stakeholders in the thesis project area and context are a diversified group of insiders in an organization having full control over the system and process, as well as individuals having partial control and are outsiders to an organization. [Geoff Walsham, 1995]. We are positioning ourselves as someone having a neutral opinion between objectivity and reality of the process within the organization. However, being an outsider to an organization and potential applicant, co-author experience and standpoint is also briefed in an attempt to strengthen the empirical evidence.

3.2 Inductive Inference

Parallel to qualitative analysis through empirical evidence and Interpretivism, the process analysis can be closely associated with quantitative research method as a secondary approach [Young, M. , Varpio, L. , Uijtdehaage, S. Paradis, E., 2020]. An inductive approach is often explored in relation to investigating the data to look for behavioral patterns that derives the adopted phenomena and practices in the context. Although building knowledge, exploring strategy is predominantly derived through literature review, in particular to describing the experience of stakeholders, “making the data talk” and relating it to specific objectives is often an apt approach. Data is collected and analyzed through NTT platform as mentioned in section 1.2. A strong fundamental ground is established to build a conceptual framework design moving from generic to specific through deductions and iterations of data extraction, transformation and analysis.

3.3 Interpretive Case Study

To support the project and to further interpret the process phenomena in practical scenarios, a case study approach and a workshop is found suitable [KLEIN H, MYERS M, 1999]. Case study approach allows the thesis work to investigate with specific “how” scenarios and its outcome in order to nail down the details and choose suitable techniques for describing the dynamics of the phenomena.

The case study in the project is chosen to be the recruitment process of Organization X, analyzed in depth to gain insights into the process and system phenomena, and discovering the dynamics of the process practices that can be altered for optimization. According to Yin’s case study methods [Robert K. Yin., 2015] following strategies are tried to fit the case:

- The thesis work will begin with investigating how Organization X is currently operating the recruitment process in particular to the problem formulated 1.3. Further to discover the potentials, case study and Organization X data is leveraged qualitatively 3.1 and quantitatively 3.2.
- As students, we only have access to Organization X recruiting history data but have no control over the recruitment process itself.
- Recruitment in Organization X or in any organization in general, is pivotal and is an ongoing process. To stay competitive in the job market Organization X expects existing recruitment pro-

cess study and optimization recommendations, which provides us an opportunity to leverage it for the thesis project through process mining techniques.

3.4 Process Mining Techniques

The thesis project work and case study relies on process mining techniques such as process discovery, process analysis, semi-structured interviews, process walkthrough and other digital data sources like process information systems to support and build the empirical evidence.

3.4.1 Process Discovery

Process discovery refers to the practice of gathering all relevant information about an existing process and organizing it to compose an as-is process model. Relevant documentation might be a textual and graphical description or log files and databases from IT systems. A general distinction exists between evidence-based and interview-based discovery, where the latter applies qualitative methods, and the first is concerned with quantitative methods. Interview-based discovery requires the thesis work to go through several interview phases where it is recommended to conduct initial and validation interviews with domain experts and other stakeholders. A domain expert is someone who holds specialist knowledge about a specific domain, for instance, tasks performed inside a particular work unit. The method provides a rich and detailed picture of the process and has the potential to reveal inconsistent perceptions among domain experts, [Dumas, M., 2018]. For superior insights, it is suggested both methods get followed since they can reveal inconsistent perceptions of business processes inside an organization. A critique of the interview-based discovery is that it is a labor-intensive method which is time-consuming and requires to possess some degree of interviewing skills, [Dumas, M., 2018]. Likewise, evidence-based discovery relies on access to datasets that can be analyzed through statistical methods. This method usually requires that an organization enable the resources to access and process a large amount of data from operating IT systems, [Davenport, T.H, 2013].

3.4.2 Process Analysis

Analyzing process models is fundamental in BPM and accounts for an essential part of the thesis project. Analyzing a process model helps an organization to establish an in-depth understanding of the process in scope, thus making it possible to manage and monitor business processes based on real

insights. The practice of process analysis can be either simple, very complex in-between depending on the level of complexity that exists in the process. Process complexity becomes affected by rules and divergence in a process, which also indicates whether experts or ordinary 32 workers are necessary to handle such analysis, [Harmon, P., 2010]. Therefore, process analysis may be conducted through different methods, including qualitative and quantitative analysis. The choice of method should depend on what current process information, data that is available, and the objective of the analysis. Qualitative techniques are very beneficial to go beyond numerical data and understand how and why issues occur in a process. Quantitative analysis uses statistical models on processed data such as system backlogs to provide knowledge about the real-time performance of a process that can be both descriptive and prescriptive, [Dumas, M., 2018]. While the project strategy is primarily inspired by qualitative methods, the quantitative analysis in the project is inspired by the dimension of “time” element where data simulation analysis can be well fitted.

3.4.3 Semi-structured Interviews

Interviews conducted for the project purpose as listed in 3, were scheduled through Microsoft teams as online meetings and recorded to avoid interpretation errors. The information collected from interviews is treated as empirical evidence. Transcribing the interviews is a manual exercise of listening to the audio/video files, interpreting and typing the shared experience into summarised text^{6.4} that will already ignite the interpretation of the process performance qualitatively as well as identifying improvement areas [S. E. Hove and B. Anda, 2005]. The fully transcribed textual material is included in the appendix A of the project.

The method originates from academic disciplines and has been practiced when conducting qualitative project study and to formulate the project objective relying on the information provided by the stakeholders [S. E. Hove and B. Anda, 2005]. Semi-structured interviews will facilitate flexible and open-ended questions chosen to pick up on the participants to uncover the perceptions and gain knowledge on the standard procedure. Further insight gained are into loose plans that are alternatively practiced to address the essentials. The interview questions will consist of specific and general topic questions to serve as a non-standard framework for the purpose.

3.4.4 Process Walkthrough

Subsection 3.4.4 is conducted as a case study and a workshop with Organization X. The workshop was held physically at their office premises. The information collected in this step is a combination of empirical evidence collected while discussing the process flow in the system and access to history of recruiting data from Organization X. Typically used in the analysis and design stage of the project to compile mappings of vital and granular level system functionalities. The workshop allows capturing detailed steps that are both manual and automatic phenomena carried out during process execution.

Inquiry about standard process proceedings and intuitive behavior is captured as well. This technique of capturing nonlinguistic, intuitive, and unconscious practices serves as a critical and supportive method to discover the tacit skills [Dourish, P., 2001, p.59] of the process executor leading to improved process performance. At the same time, the technique is also able to capture drawbacks behind the shortcuts leading to poor process performance. The workshop helped to perceive assumptions on the distal phenomena of how the information system is operated by clicks, pushing notifications, follow-ups, publishing job ads on different platforms manually, a manual iterative loop of tasks taking place while executing the workflow, handshakes between the stakeholders and so on. The reason to adopt this approach is to track all the human activities that go unnoticed but could be indirectly a reason for poor process performance and yet uncovered by the stakeholders.

During the workshop, process flows were drawn on a white board collaboratively by Organization X representatives so every step both traditional and cognitive as involved in the process goes on record. Each participant was enquired and encouraged to describe and elaborate their specific proximal and distal actions so that the descriptions are converted into mappings on the same white board and further in the project analysis, design.

4 Recruitment Process Theory

To enrich chosen thesis project area, the focus was turned towards the literature study to become inspired by the existing traditional recruitment process theory. Further to create a sense of findings made during project relevant empirical data collection. To gather relevant literature, different academic search engines were used such as Google Scholar, The Royal Danish Library: 'REX,' and AAU's 'Universitetsbiblioteket'. The initial strategy was to use different keywords that in some way, were related to business process management and recruitment process management. Following this, the snowballing technique inspired going through their references to illuminate other relevant cornerstones of the academic field.

The following section seeks to establish a theoretical foundation on the recruitment process for the thesis work and introduce concepts that are essential. The section constitutes comprehensive aspects and perspectives concerning primarily related to the field of management theory and human-computer interactions. To add up, the project is inspired by concepts from business process management, recruitment management, and technical innovation. Presented concepts get reviewed and assessed in an attempt to relate to the extensive learning and understanding of the project area.

4.1 Recruitment Process Management

In order to understand the theory behind the traditional Recruitment Process, the thesis work could simply base on [Alison E. Barber, 1998] alone that has defined what the recruitment is, all the stakeholders involved, the key dimensions of recruitment, and the stages of the recruitment process. Furthermore, the author also defines the importance of the recruitment process from both the applicants' and organizations' views. The reason for choosing the mentioned author's research to be the main reference is because these research articles: [James A. Breugh Mary Starke, 2000], [M. Humburg R. K. W. van der Velden, 2015], [K. Uggerslev N.E.Fassina D. Kraichy, 2012], [Ababneh KI, Schat ACH., 2007], [Adam Sulich, 2015], and [Bjorn Munstermann, Andreas Eckhardt, Tim Weitzel, 2010] all refer to [Alison E. Barber, 1998]'s book when defining and understanding recruitment and its process.

At the end of this section, is the theoretical knowledge on standardizing processes to understand potential optimization possibilities for organizations with increasing transparency on data.

Recruitment refers to the overall process of identifying, sourcing, screening, shortlisting, and interviewing candidates for jobs, either permanent or temporary, within an organization. [Alison E. Barber, 1998] define recruitment as those practices and activities carried on by the organization with the primary purpose of identifying and attracting potential employees. The primary objective of recruitment is to attract future employees. To do this, appropriate potential applicants must be identified, recruitment activities are then intended to help locate potential applicants, persuade them to pursue the recruitment process, and finally accept employment with the organization.

The author's research documented the importance of human resource management and how it has become increasingly clear that there is a relationship between human resource practices and measures, such as return on assets and investments, profitability, and even organizational survival. Here recruitment is a crucial part of effective human resource management which performs the essential function of drawing an important resource »human capital« into the organization. The success of human resource efforts as selection, training, and compensation depends in part on the quality and quantity of new employees identified and attracted through the recruitment process. Organizations devote considerable resources to recruitment, with average cost-per-hire estimates in the more thousands of DKK [Martin, S.L. Raju, 1992]. For example, Cisco, a successful information technology organization that puts a high value on innovative recruitment practices states; "The only thing worth more than a bright new idea is a bright new hire" [B. Lowendahl, 1997]. Although as important as recruitment has to business, recruitment has important consequences for individuals. Recruitment is a mutual concession. It is a "matching" process that occurs between firms with jobs, and individuals seeking jobs. Recruitment is intended to influence applicants' job choices and, because work is a central part of many people's lives, those choices in turn can have a substantial impact on applicants' well-being.

4.1.1 Key Dimensions of Recruitment

In order to understand the recruitment process and its elements, [Alison E. Barber, 1998] list 5 dimensions of recruitment; players, activities, outcomes, context and phases.

1. **Players:** The players refer to individuals or organizations playing a role in the recruitment process. [Alison E. Barber, 1998] states the primary players in the recruitment are the organization and the applicant being recruited and both are engaged in recruitment. Both these parties are critical to the “matching” process which ultimately leads to employment. However, between these two players, the author’s research indicates that it is the decisions of applicants or potential applicants that determine the effectiveness of recruitment. In addition to these two players there exists other parties such as recruiting agents and could be outsiders. Recruiting agents are those individuals who carry out the responsibilities for the recruitment function. They are in the recruitment, either internal department or external as an advertising agency. These other players do not take decisions on the recruitment or carry out recruitment activities but act on behalf of the organization represented.

2. **Activities:** Recruitment activities are the specific tasks, procedures, and actions undertaken for purposes of recruitment. They are what the actors involved in recruitment do. [Alison E. Barber, 1998] classifies activities as definition of *the target population*, *choice of medium or source*, *message delivery*, *making the offer*, and *general administrative issues*. Definition of *the target population* refers to decisions regarding where to recruit. For instance, whether to conduct local or national recruitment and which segment of the labor market to tap within a specific geographic region. *Choice of medium or source* refers to the method used to reach the targeted population. This can be a variety of sources such as word-of-mouth, employee referrals, job fairs, advertisements, employment agencies, and so on. *Message delivery* refers to the dissemination of information through the selected sources. *Making the offer* refers to the preparation of the final job offer for applicants who pass the selection criteria. The activity includes decisions regarding job attributes that are malleable for purposes of recruitment, for instance, entry pay level will be, as well as procedural issues, such as how long the applicant must decide on the offer and the degree to which elements of the offer package are negotiable. *General administrative procedures* refer to policies and practices for managing the overall recruitment function. These procedures have either an organizational or applicant focus. Relevant procedures from the organizational perspective would include performance management of those involved in recruitment as training and feedback provided. For the applicant, the perspective would include issues such as how the applicant is notified of the status of their application, and how promptly, by what means and how applicants are reimbursed for

their recruitment-related expenses.

3. Outcomes: The primary objective of recruitment is the identification and attraction of potential employees. Organizations are interested in attracting certain numbers of potential employees who have certain specific attributes. The attraction has by other means both quantitative and qualitative dimensions. Regarding quantity, the recruitment is most efficient when the number of applicants attracted is neither too small nor too large. Very large applicant pools place a heavy burden on the organization's administrative systems and are generally undesirable. With small applicant pools give the employer few options regarding which applicants to hire. Regarding quality [Alison E. Barber, 1998] mentions the best quality of recruitment is best defined in accordance with whatever qualities the organization had in mind.
4. Context: The recruitment process is affected by a host of factors that can influence both the kinds of recruitment activities, organizations choose to engage in and applicants' responses to those activities. These factors can be classified as both internal and external. External factors are outside of the organizations' recruiting environment, one such factor is the state of the labor market. Another is the availability of applicants relative to the availability of jobs clearly fluctuating over time. From the individuals' perspective, responses to recruitment may be constrained when few jobs are available. Internal factors primarily focus on characteristics of the organization itself, such as its business strategies for deciding the type of employees needed, the relative importance of human capital, its economic position meaning its ability to pay the employees, and its attractiveness to potential applicants. All these factors may constrain the recruitment options available to organizations and alters the importance of recruitment as means of attracting potential employees.
5. Phases: The recruitment process consist of multiple stages or phases. The initial application is a different phase from job offer acceptance, but it can be difficult to say with precision when a phase ends and the next begins. In [Alison E. Barber, 1998] the author discovered the systematic delineation approach of phases drawing classification of potential employees as they move through the recruitment/job search process. Three classifications were discovered that might be

useful markers of transitions from one phase to another: application population, applicant pool, and selectees. The applicant population is the group from which the organization can recruit as qualified for the recruitment. The applicant pool consists of those individuals from the applicant population who choose to apply to the organization. Lastly, selectees are those individuals from the applicant pool who are offered employment.

4.1.2 Recruitment Stages

Based on author research in [Alison E. Barber, 1998] the recruitment process is divided into three stages:

1. Generating applicants: Stage one can be characterized as a phase of extensive search. During this phase, organizations seek to reduce a large applicant population to a narrower applicant pool. From the pool, a subset of individuals will ultimately be pursued for hire. Relatively little information about each applicant is sought. On the other side, the applicant population from which applicants are drawn is largely faceless until the end of the phase, when they become actual applicants. The first stage is characterized by screening as opposed to the final choice, limited information about multiple possibilities, and very little interpersonal contact.
2. Maintaining applicant status: During the second stage of recruitment the pool of applicants is narrowed to a group of selectees, the individuals who have received job offers. During this phase, interpersonal relationships between the applicant and the representative of the organization are established. Also, it is at the end of this phase that the organization makes its choice regarding whom to hire. Stage two is characterized by personal contact, a search for detailed information, and on the part of the employer, an applicant is a final choice.
3. Influencing job choices: In stage three, the selectee decides whether to accept the offer of employment. This stage is one of the intensive information-seeking phases. It is characterized by accepting a single job and rejecting all others rather than screening as narrowing a large pool down to a smaller subset. This phase may be taken more seriously by applicants as a decision to accept one job effectively eliminates alternative opportunities.

4.1.3 Recruitment Process Measures

Literature suggests that an organization should identify and establish KPI's that directly relate to the strategic objectives and demands to measure the performance of a process. Through KPI performance can be assessed continuously and help managers to identify targets for improvements. In the process analysis, there are four generic measures that relate to time, cost, quality, and flexibility. Each measure should be accompanied by KPIs that are quantified units of measure, [Dumas, M., 2018] and [Hammer, M., 2015].

In [Bjorn Munstermann, Andreas Eckhardt, Tim Weitzel, 2010], relating to Process Standardization, the author defines that the most common process performance measures used in the recruitment process are:

- Time-to-hire: It measures the processing time between the identification of a vacancy and the final hire of an employee. There can be performance measures related to the time it takes to achieve specific steps such as candidate attraction or applicant tracking.
- Cost-per-hire: Equivalent to processing time the overall cost-per-hire can be quantified as the average cost per hire. It also includes expenses for job postings on online job boards or newspapers.
- Recruiting process quality: The current approach for recruiting process performance integrates measures such as applicants' quality or the quality of applicants' data in their evaluations. Relational quality measures like the degree of information for the operating departments and candidates' satisfaction with the provided information are also included within the evaluation of recruiting process quality.

The emphasis on KPIs related to cost and time is crucial for process analysis and should be deployed for quantifying a business process. The time of a process can exist as different variables, for instance, cycle time, execution time, and waiting time. Cycle time refers to the average time it takes to process a token from the starting point to the end, while execution time is what an actor spends on actually performing the task. Waiting time in a process is the portion of cycle time where work does not perform; for instance, if a worker waits for a manager to approve an order before the process can proceed. Waiting time can sometimes lead to bottlenecks in a process if there are not enough resources available to handle a case. Another reason for waiting time might be that some tasks follow a regular

cycle where a task awaits a batch of cases before it gets executed. Knowing the actual time of activities in a process is essential in order to calculate costs. Costs are representations of time multiplied by the cost of a resource and the number of cases that get processed in a workflow. In order to identify costs and time, it is required to know the work schedules and salaries for the resources operating the process, [Dumas, M., 2018].

4.1.4 Recruitment Process Standardization

The definition of recruitment encompasses a wide range of organizational activities, from traditional recruitment functions, such as advertising and producing recruitment brochures, to modifications of the work environment when necessary to recruiting new employees. Importantly, it focuses on those activities intended to influence outcomes and recognizes that the correspondence between recruitment practices and outcomes is flawless. Decisions are a function of some combination of recruitment and other forces. These other forces can set boundaries for the role that recruitment can play in the identification and attraction of employees. Forces as such affect the possibility to standardize the recruitment process.

Based on the research from [Bjorn Munstermann, Andreas Eckhardt, Tim Weitzel, 2010], process standardization is receiving increased academic and practitioner attention. Process standardization is among other possible levels to increase the performance of a given business process. By looking inside the organization, the thesis project discovers “process standardization” as one of the three “broad future research directions”. The attention is largely aimed at huge cost-saving opportunities through process standardization. However, process standardization as a tool of BPM can offer further value. [Bjorn Munstermann, Andreas Eckhardt, Tim Weitzel, 2010] demonstrates better operative process performance through business process standardization and argues that process standardization proves profit, increased transparency, and controllability. Additionally, it discovers that process standardization has a high potential to increase process flexibility and thereby allows organizations to react more flexibly and innovatively to changes. Further, its empirical findings indicates that standardized processes can significantly increase a organization’s readiness to outsource business processes or merge with or buy other companies.

5 State of the Art

In chapter 5 is introduce SAP SF introduced to develop an understanding of the software and its requirements to create an integration on top of it. Furthermore, the State of the Art chapter will introduce the data tables available in the different systems based on both software and Organization X. Further in this section, SAP SF is described in detail providing an understanding on an HR system and to establish a ground for the requirements to create a supplementary software module. The software module requirements are in relation to the thesis work area context that can be integrated into the widely used HR systems on the market. Organization X and NTT use and work in SAP SF therefore the thesis project chose to focus on SAP SF as software to experiment with and create an integration module for it.

5.1 SAP SF

SAP SF is a leading and go-to cloud solution for managing human resources activities, relevant analysis, and social collaboration in an organization. It is a software-as-a-service cloud solution that can accommodate smaller to larger organizations of any kind, located in any geographic location. Currently, it has a market share of 1.11% with more than 2479 companies using the software, [Datenalyze, 2022].

A comprehensive insight about SAP SF software and its application in organizations' HR recruitment activities is learnt from [Amy Grubb, Luke Marson, 2015] and [Amy Grubb, Kim Lessley, 2015] further in this section.

SAP SF provides a variety of HR solutions to perform different HR core and other processes such as; recruitment, onboarding, payroll and benefits, time management, performance management, learning management, and others. It is an automated system that can be accessed through a smartphone mobile application and its activities notifications can be sent through email services. SAP SF application supports different languages and configurations as required by organizations.

The *Recruiting* process from start to end is driven through the collaboration of different parties

namely the hiring manager, recruiting partner, superior manager, applicants, and HR operations. The parties are both internal and external to an organization collaborating to find the right candidates for jobs. Different interrelated steps of the recruiting process can be integrated and automated as a single combined and continued process for an organization. The standard steps of the recruitment process are creating a job position, approving the job, posting the job, engaging the applicants, selecting the candidate to hire, and advancing the selected employee for the onboarding process. To facilitate these steps in the recruitment process, the SF application offers configurable data models and templates - Job Requisition data model, Candidate data model, Candidate Profile, and Offer Details templates.

Applicants' interface in the SF application is configured through the candidate profile template allowing a candidate profile with key profile background elements, resume, cover letter, recommendation letters, transcripts if applicable, photograph, other relevant details, and documents as required. Often configurations are carried out in a way that all applicants must provide mandatory details and documents before submitting the application; the SF application facilitates different configuration possibilities for internal and external applicants, allowing internal applicants to leverage employee data mapping. To summarise, internal applicants to the organization have less effort in creating a candidate profile when compared to external applicants. The candidate profile template configuration is managed and controlled by the organization.

Further SAP SF application allows functionalities such as standard data integration possibilities for recruiting partners to automatically publish job advertisements on multiple job board platforms including organization career site, LinkedIn, and other platforms; for applicants with data integration permissions to import their LinkedIn profile data transfer for the recruitment process. Often the use of this functionality is very minimal as only the basic personal information can be integrated from LinkedIn, and other detailed information like qualifications, work history, and education details does not integrate correctly leading to adding or writing all the details manually by specifically external applicants.

Job relevant candidate assessments can be integrated as well from a specific third-party vendor in the recruitment process inside the SF application which allows sending vendor assessment URLs to applicants, viewing and assessing their results within the SF application. The system allows this step

as a hard stop for applicants to progress further in the recruitment process certainly making the SF application flexible to allow integration of relevant third-party vendor software modules that could interact and partially control the entire recruitment process. Similar to candidate assessment, offer creation, send, and acceptance is often carried out through third-party vendor software.

DPCS plays a vital role in the recruitment process and is taken care of in the SF system. DPCS is defined by the organization in the system which is visible to job applicants by describing how their personal data is used in an organization's hiring process. Applicants are allowed to either accept or reject the use of data as their privacy declaration, however, it is mandatory for applicants to accept the privacy statement to complete the application submission process. Additionally, applicants can either allow or disallow the organization to store their personal and qualification data for a number of days or to even consider other relevant open positions. The third-party integrated modules are indirectly benefited from this feature of the SF system, leveraging the DPCS as required.

SAP SF Integration The SF system allows access to its resources from other integrated client modules through an OData. OData is an open protocol that allows the creation and consumption of queryable and interoperable REST APIs in a simple and standard way. Microsoft initiated OData in 2007 and versions are released under the Microsoft Open Specification Promise. The standard is an ISO/IEC approved, OASIS standard which eliminates the worries about defining request and response headers, status codes, HTTP methods, URL conventions, media types, payload formats, and query options,[OData, 2022].

As an example, the REST API base structure to access a certain organization recruiting data is <https://api2.successfactors.eu/odata/v2/>, and the structure follows with an addition of different entity names as listed in 5.2. Meaning, that depending on which entity to access it is added to the end of the base URL. To access the base URL and related entity data it requires HR system credentials from the organization. SF is as explained in section 5.1 a private system, and requires the credentials of a user of an organization with the right access policies to access the data. For that reason, it is required to create a user to the system holding integration access to access the resources outside the system. For thesis work purposes, Organization X has generated a set of credentials for the project to access their recruiting entity data through the base URL.

5.2 Organization X Data

The recruiting data access gained through NTT is raw data related to Organization X. The data contains the history of logged activities pertaining to candidates, applications, interviews, and job requisitions entities for the period from 2010 till 1. April 2023. These entities include ID and sensitive information. However, the thesis work as mentioned in the delimitation section 1.6, excludes any sensitive data from the project. Appendix B has a list of data fields considered from the datasets and used in the thesis project, and the following subsections provide a detailed description of the same. For the creation of the conceptual design, it is needed to know and analyze ?? what data HR systems are holding.

5.2.1 Candidate

The Candidate entity from the recruiting module represents all the data related to the candidate profile including attachments. This is both background elements, and information of when the candidate created their profile on the HR system, also when he/she applied for a specific job. Furthermore, whether the candidate is an internal employee searching for a change or an external applicant. Besides this, the candidate entity contains information as to whether the candidate was offered a contract, when was the contract/offer letter was received by the candidate, and when was the contract signed and the offer was accepted by the candidate. Alternative to contract data, the candidate entity could hold information as when the candidate was rejected or disqualified. If the candidate was referred, the information regarding the referral is also maintained. A more detailed description of the different candidate entities can be found in appendix B.

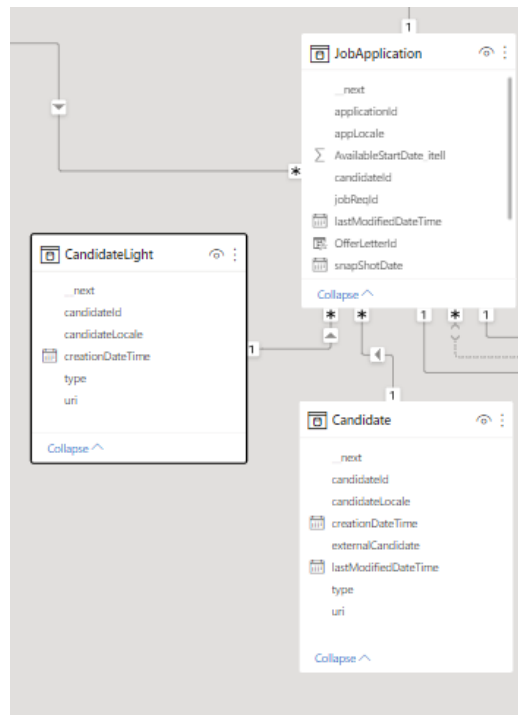


Figure 2: Recruiting Data Entity - Candidate

5.2.2 Job Requisition

The Job Requisition entity from the recruiting module represents data relating to job postings created by the manager with the required qualifications for the opening. It holds all the core information of the posting like department, job title, and location. The job requisition is also updated by HR, hiring manager, and manager's manager approvals information and is therefore containing multiple stakeholders related personal data as well. Job posting relevant information includes posted date, the deadline for posting, timestamp of job posting on the organization's page, timestamp of it posted on external platforms, and how many applications were received for the posting. The entity holds screening information if filled out by the manager in the form of questions or keywords that is required to apply for the open position. Furthermore, the entity holds status fields that are used internally to know the status of the job requisition of being approved or closed by the HR or the manager's manager. A more detailed description of the different job requisition entities can be found in appendix B.

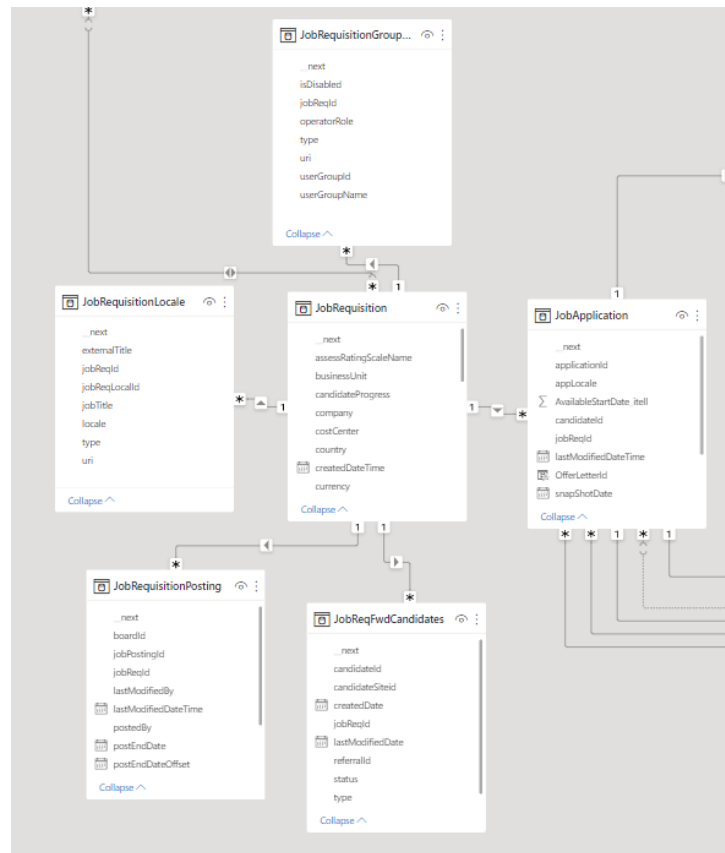


Figure 3: Recruiting Data Entity - Job Requisition

5.2.3 Job Application

The Job Application entity from the recruiting module represents all the related data from the Candidate, Job Application, and Job Requisition entities. It holds information such as when the application was created, which assessments were held, the CV and the motivation letter of the candidate, and so on. With CV, it is indirectly holding the qualifications of the candidate and as required for the job. Furthermore, the entity has statuses of whether the job application is open, disqualified, closed, withdrawn, saved, or drafted. To this, it also includes change history between the statuses. Lastly, it contains job interview information as to when the interview took place, how many were interviewed, which questions were asked, and an internal rating of how the interview went. A more detailed description of the different job application entities can be found in appendix B.

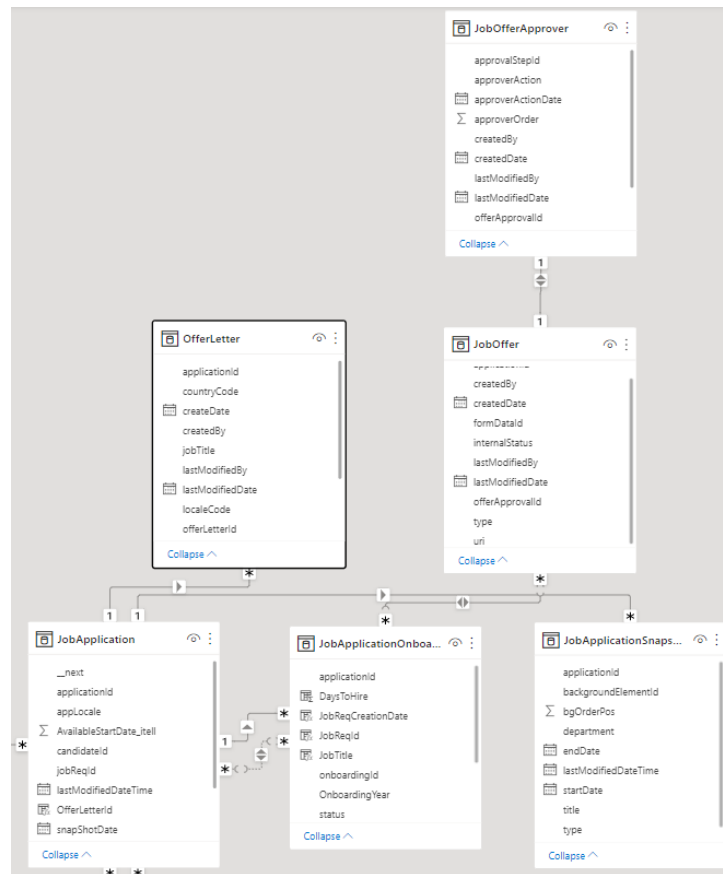


Figure 4: Recruiting Data Entity - Job Application

6 Analysis

This chapter is dedicated to analyzing the information collected on the basis of Theory and State of The Art chapters in the context of the semi-structured interviews conducted with the stakeholders and SAP SF recruitment system process study of Organization X. The analysis formulated will form the basis for developing a conceptual service module that can be integrated into the SAP SF system to improve the communication transparency between the applicants and the organization. Eventually, this integration must improve the user experience of applicants in the recruitment process.

The structure of the Analysis chapter will be focused on highlighting the data collection summary followed by the analysis of collected data to identify diluting factors for weak communication between applicants and organizations.

6.1 Data Collection Summary

Data collection was initiated and targeted to complete within the initial two months of the project timeline through semi-structured interviews and process walk-through workshops conducted in parallel. A total of three interviews were conducted in Copenhagen, Denmark who can be perceived as applicants in the recruitment process. A two-day case study workshop was conducted during March in Week 11 at Organization X involving its hiring managers and recruitment partners who perform different recruiting process activities in the system.

An overview of data collected and techniques used are listed in a table 3. Additionally, data-driven analysis is performed by extracting and transforming recruiting dataset(s) from Organization X. The extracted data is according to the details mentioned in state of the art chapter and in section 5.2.

Date	Technique	Role	Ref.	Duration
18-Feb-2022	Semi-structured Interview	Recruitment Consultant	Appendix A.1	30 mins.
15-Mar-2022	Semi-structured Interview	Hiring Manager P	Appendix A.2	40 mins.
16-Mar-2022	Process Walkthrough Workshop	Organization X	Appendix A.4	5 hours.
17-Mar-2022	Process Walkthrough Workshop	Organization X	Appendix A.4	5 hours.
29-Apr-2022	Semi-structured Interview	Applicant A	Appendix A.3.1	30 mins.
2-May-2022	Semi-structured Interview	Applicant B	Appendix A.3.2	30 mins.

Table 3: Data Collection Overview

6.2 Organization X - Case Study Workshop

As mentioned earlier in the above section, a recruitment process walkthrough workshop was conducted in collaboration with NTT and organization X. This is a case study centered on analyzing the recruitment process in the SAP SF system which will be described in section 6.2. The recruitment process flow from an organization perspective is investigated to understand the communication pattern between the organization and applicants through the SF system.

An introduction to organization X is described in section 1.2. In the workshop conducted with organization X, it was understood that their recruitment process varies geographically, specifically between Sweden and Denmark. In Sweden, store workers are hired more often than skilled workers, and a majority of recruitment processes say 80% of store workers are recruited with hand-written contracts, however, the details are later documented in the SAP SF system. Such cases are excluded from consideration for the thesis work as the process steps are carried out without any stoppers or formal communication between the organization and applicants.

As mentioned earlier in this chapter the recruitment process in organization X is managed through the SAP SF talent management software system. As mentioned in state of the art as well, the SAP SF software application comprises different and integrated modules namely Recruiting, Onboarding, Learning, Offboarding, Performance Management, and Compensation management. Although our workshop with Organization X involved discussing in depth most of the above-mentioned processes;

our thesis project intends to focus on one specific module “Recruiting” in the context of our problem formulation.

According to Organization X, an ideal recruiting process for a specific job position must take 2 to 3 weeks, however, the process timeline could vary, meaning few job positions are filled in 2 months, sometimes extended until 5 or 8 months. Further a condensed summary of the performance bottleneck is identified as the time taken for handshakes of the process between stakeholders in the organization delaying the recruitment process.

In relation to communication between the organization and applicants, there was no mention of providing application status updates to all those candidates in the recruitment process who applied for a specific position. Utmost importance is given to only shortlisted applicants going through screening interviews, first and second-round interviews, and further recruitment steps involved in the process. The bottom few shortlisted candidates will have to wait for either to be called for interviews or to be rejected often until the end of the recruitment process. The estimation of the maximum period that it takes to receive the decision from the organization is unknown until the end of the recruitment process to both applicants and the organization. A very detailed process flow with diagrams is provided in appendix A.4.

Most of the feedback and communication is handled through the SF system and is often provided in a standard message format without having customized to provide constructive feedback to applicants for instance rejection emails with improvement suggestions.

It was obvious from the workshop, organization X is more focused on the organization’s perspective of complexities and challenges involved in the delayed recruitment process and optimization; and is not very keen on optimizing the waiting period for applicants. For the same reason, the project analysis is continued to cover applicants’ perspectives through semi-structured interviews to collect more empirical evidence supporting solving the problem formulation 1.3 of the project.

6.3 Organization X - Dataset

The dataset of Organization X is analyzed to discover what specific entities and fields in historical data can be transformed and converted as statistical insight into the recruitment process specific to SAP SE, found in section 1.3. But in general, a similar methodology of analysis will be carried out for any other organizational recruiting data and HR system taken into consideration during future implementation.

In the dataset of Organization X provided by NTT holding candidates, job requisition, and job application data exists a variety of joins but centralized with the job application. The dataset is as mentioned from 2016 to April 2022. It is hence data from before COVID, during COVID, and now after slowly opening of the society, post COVID. As Organization X is in the retail industry, the organization was highly affected by the COVID pandemic. During the COVID pandemic appeared multiple lockdowns, which meant close of the stores. However, based on the workshop, appendix A.4, the employees at Organization X, mentioned that the sales went up during COVID as people got the desire for do-it-yourself projects at home. There was the online sales, that went up. Therefore, the portion of data is lower than expected in the period of the pandemic, which is from Marts 2020 till Marts 2022. The visibility of data among other noticeable facts in the dataset is explained in the two following sections.

6.3.1 Dataset - Applicant View

The candidate and job application datasets as mentioned in section 5.2.1, hold the relevant data of the applicants. The dataset Candidate, see appendix B, holds the value and information of 19,005 candidates who have applied for jobs at Organization X during the time period. Furthermore, it holds information about when the candidate profile was created, modified, and when the candidate applied. Besides this, it was discovered in the dataset that 18,822 of the candidates are external versus 182, who are internal candidates applying for a new position internally. The number is rather low, and Organization X has the possibility of investing resources in holding onto already hired employees. Both mentioned at the workshop, appendix A.4, and by the recruiting consultant, keeping existing employees is much lower costs, and provides a healthy picture of the organization for new potential employees. Furthermore, the recruiting consultant mentions the difficulties on the market today with finding new employees for higher positions, because of which keeping internal employees can reduce the pain.

The dataset Application, see appendix, holds the value and information of 15,244 job applications. The number is lower than the number of candidates. At the workshop, it was mentioned that store managers had a high tendency to hire store workers or other employees to the stores immediately after they meet at the store. Furthermore, it was mentioned, that store managers do not prefer to invest a high amount of time into the recruitment process, which is one of the reasons why the thesis work is not considering the recruitment process of hires of the store workers. However, it has an influence on the overall dataset. Besides this, the dataset is holding the status information of the application whether it is open, disqualified, drafted, saved, or withdrawn.

6.3.2 Dataset - Organization View

For analyzing the data from the organization's view. Power Bi has been used for visualisation to the report, figure 5, 6 and 7. The logic behind is done by joining the different IDs which is described in section 6.3.3.

The Job Requisition and Job Application data are, as mentioned in section 5.2.2 and 5.2.3, holding the relevant data for the organization regarding their recruitment process. The dataset, Job Requisition, see appendix B, holds the value and information of 1,249 Job Requisitions. Which is the number of Job posts Organizations X has created in the given time period. To these Job Requisitions, Organization X has received 14,200 applications. The information the datasets are holding is created by timestamp, department, when it was deleted, when it was modified, by whom, offer information, and joining IDs. Furthermore, it is possible to see how the candidate has applied whether it is through the cooperate site, referrals/forwards, or external sites such as LinkedIn or JobIndex. Besides this, it is also possible to see what location the applicant is applying for, whether it is Poland, Denmark, Norway, Sweden, or England.

However, overall and generic business KPIs as a number of applicants applied to what location and job title, is possible to find in the SF platform, mentioned in section 5.2.2. However, what is not to find is joins and modeling between the different datasets as the total duration time of the recruitment process. For all the activities, which we learned about in theory chapter XX, exist a timestamp in the dataset. By joining the different activities it is possible to see the full picture of the recruitment process

of the organization. The feature is not possible on SF as SF is not doing business intelligence. By doing so, we discovered that Organization X has a variety of ways to handle its recruitment process. In the workshop, they mentioned "one" way they follow, but looking into data, there exist 709 different ways the organization handles their recruitment process. By looking at data, the most common way the organization is handling the recruitment process is seen in figure 5. It has an average duration time of 12 days, however in general the organization has an average duration time of 93 days, figure 6. Which is high and does not match the expectations of 14 days. Other findings in the data are to see that most of the different variants of the recruitment process do not contain the expected activities mentioned at the workshop, which figure 7 is an example of.



Figure 5: Dataset join - Most common open variant



Figure 6: Dataset overview - Total average duration

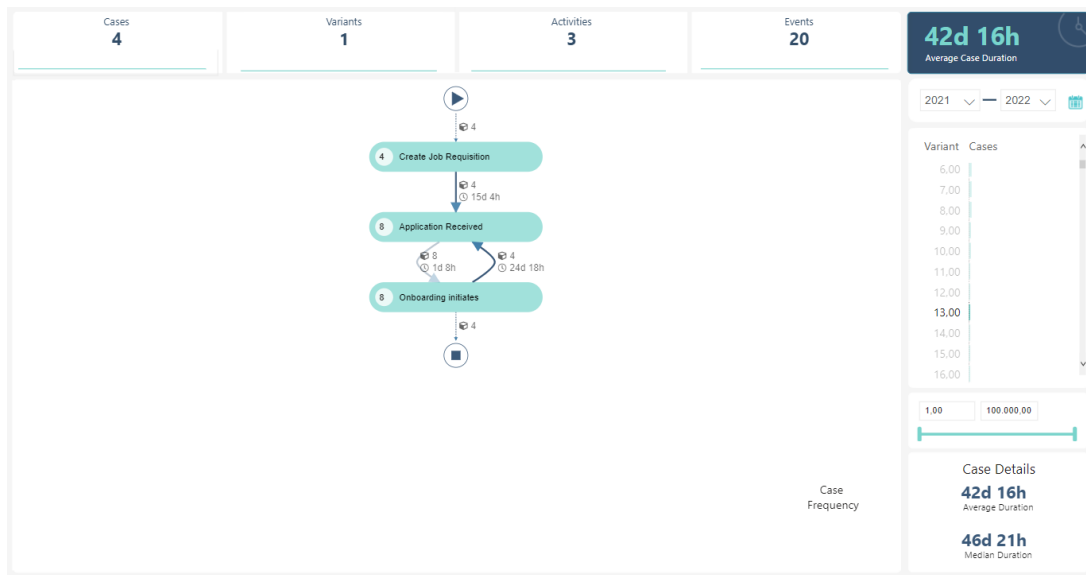


Figure 7: Dataset join - An example of an other variant

6.3.3 Connection between Datasets

Figure 5, 6 and 7 is created by combining the different IDs which exists in the datasets. By combining the different IDs with the latest updated timestamps and activity names from the entity datasets, a full process overview can be created. This overview can describe the organization's recruitment process, which SAP SF does not provide to the organizations in the system. Organizations can with this information get a full overview of how the SAP SF is actually used during the recruitment process and whether it is reaching the expectations. Thereby, can the organizations do process mining, create a standardized process and save major wasted costs. This is described deeper in section 6.5.

The above mentioned information and the main KPIs from the figures 5, 6 and 7 also could add up creating value from entity dataset Candidate. The different activity timestamps can be used on the applicant's view to show the applicant where exactly in the recruitment process the submitted application is. Status such as, if the organization started interviewing applicants or is "still" in the process of receiving applications. Additionally, it is possible to see in the Job Requisition entity how many applications were received. Besides everything, the applicant view can see all the information the organization is seeing. In figure 8 it can be seen that all the entity datasets can be combined,

whether it is Candidate or Job Application data that is looked up. However, should the applicant see everything the organization sees? This is discussed in section 10.4.

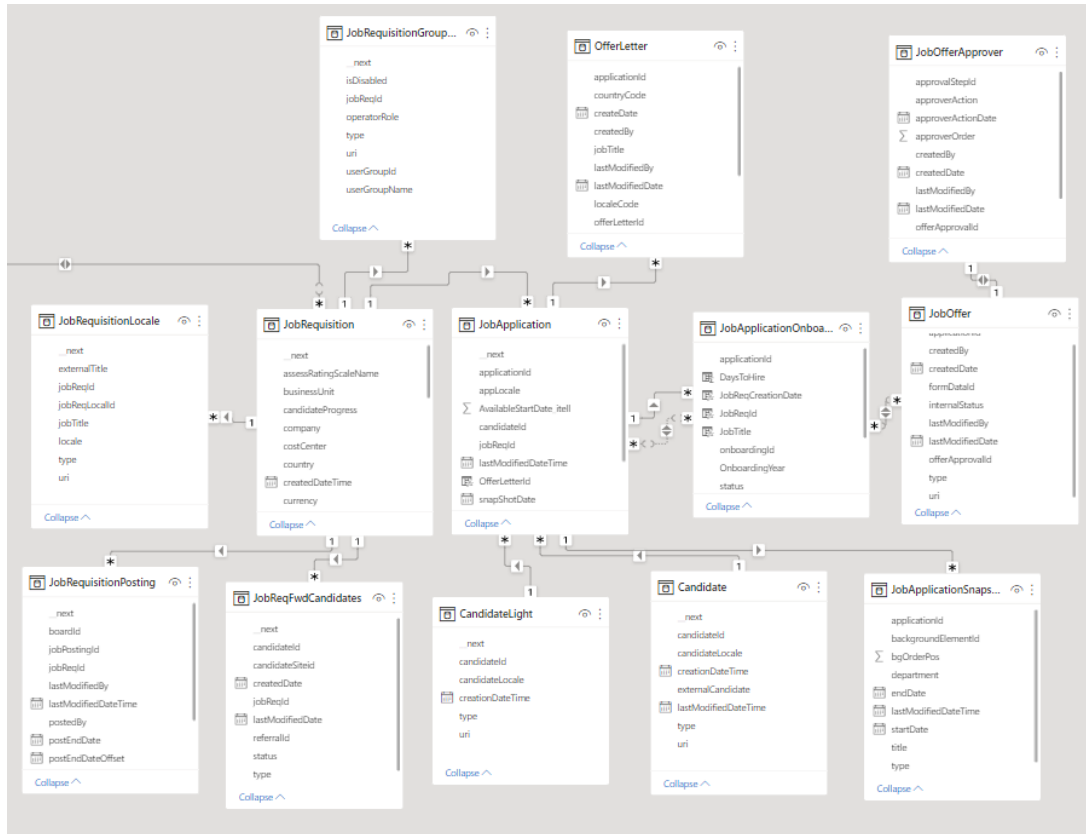


Figure 8: SAP SF Entity Datasets Relation - All data

6.4 Stakeholders Interview

Applicants are the main stakeholders in the thesis project, hence in this section, the analysis of the recruitment process from the applicants' perspective is elaborated. Furthermore, other stakeholders in the recruitment process such as the hiring manager and recruitment partners are also interviewed and their inputs are analyzed to cover all aspects of the project area. See section 6.4.

A detailed interview conversation with different stakeholders is presented as written text in Appendix A section and a condensed summary of the interview with main points relevant to the project

will be presented here. The following section will be a walkthrough of summarised interviews conducted in this regard.

6.4.1 Applicant A

Applicant A is a Process Mining Consultant working at NTT DATA Business Solutions A/S organization, born and raised in Turkey but currently living in Copenhagen because of work.

When the project idea of increasing the transparency between the organization and applicants was mentioned, Applicant A was willing to share relevant experiences and challenges faced during the job search in our conducted interview. While Applicant A discusses applying for almost around 150 jobs in the past, stresses the point that the response rate from the organizations was zero or very low. Out of 150 jobs applied utmost of 15 of his job applications were responded to by the relevant organization, the rest 90% of the organizations never responded. The organizations that never responded are relatively small companies having up to 200 employees.

Lack of Response. Though Applicant A accepts that lack of response may be due to fact that the organizations may have adopted such methods, however personally he thinks that responding to job applicants with appropriate feedback must be considered by the organizations. The efforts made in creating the job application need to be acknowledged, otherwise, the applicants do not know when to stop applying for jobs which puts job applicants in a stressful position.

Long time to respond. There was a scenario when Applicant A was going through a recruitment process with an organization and received a response from another organization for which he had applied around 3 months ago asking for his availability for the recruitment process. By then Applicant A had an assumption of being rejected from the organization that he wanted to work for, as he did not hear from them for a long time. Such delayed responses put applicants to make assumptions about the reputation of the organization on the rest of the process management methods.

Another experience is feedback response from the organizations when the job application is rejected. The feedback provided is not specific to how job applicants can be improved in relation to CV or how they could improve presenting themselves during a face-to-face interview but instead resem-

bles a generic statement of not meeting the expectations of the job position. These standard messages do not help the graduates who are searching for jobs for the first time unaware of the best practices and how to improve their CV and behavior.

Some specific instances to share. Applicant A was interviewed for a Finance job position when he applied for tech sales related job position. The job description and applicants' qualification requirements were not communicated between the time I had applied for a job and was called for an interview. There is a lack of transparency and lack of attention to detail in applicants' CVs in relation to the job requirements.

There is a need for a centralized system where all the applicants can see their application status updated as and when there is a change in the status of their application. Additionally, if there is the visibility of the statistics related to the job position on how many applicants are in the process and how well my application matches the job requirements then it clears most of the concerns of the applicants knowing their chances of being selected for the job and to move on with other job applications.

On the other hand, the start-ups take considerable time to respond to the applicants as they are very small in size and have time and resources to interact with the applicants at every stage of the application process. However, their acceptance rate is very low as they look for specific skillsets, and specific qualifications when compared to small, medium, and largely employed organizations.

Applicant A was excited about our thesis work area and focus being enhancing the transparency between organizations and applicants. Specifically to SAP Success Factors recruitment software, Applicant A had a concern about the system not being able to manage the applicant's profile for just once and able to apply for the jobs related to any organization through the managed profile. As of today, for every organization, a separate SF profile is to be created before the application is submitted and credentials are to be managed specifically to each organization separately.

6.4.2 Applicant B

Applicant B is an ex-employee at NTT DATA Business Solutions A/S who was undergoing a graduate program in the organization. Applicant B has a biochemistry and physics background from University,

however, is very interested in roles as Data Scientist IT Consultant. Having worked at Novo Nordisk for around four years, Applicant B decided to follow the mentioned interest by searching for relevant job opportunities.

Applicant B has experience applying for many Ph.D. programs in Universities when compared to applying for jobs in organizations and the insights are very helpful for our project. B has an overall satisfying experience with the hiring process, however, highlights a few of the challenges faced as an applicant.

In relation to applying to Ph.D. programs, B mentions that it was seldom that the application was shortlisted from Universities other than those B studied. B specifies that the majority of shortlisted applicants for Ph.D. interviews and further hired in a University are among the Master's program graduates within the same University where the position is held open. B believes that 9 out of 10 Ph.D. positions are offered to the master's students who graduated from the same University.

According to B's experience, the usual approach adopted in Universities is, once the application is submitted for a Ph.D. program with a motivational letter and CV, and if the application is rejected the status is received immediately from the hiring professor. If there was no communication from the University about the rejection of the application it is assumed that the application is shortlisted for the Ph.D. program by the applicant. However, B stresses that it is not informed to the applicant, out of the top 5 if the applicant's position is 3rd, 4th or 5th place in the queue to consider for further interviews and the hiring process. It is a long waiting time until these applicants have been notified with an invite for an interview or notified with a rejection email when someone has been hired for the position. B mentions that the rejection email usually had a clear and good explanation from the professors with the reason.

Though B responds positively to the procedure adopted by the Universities or organizations for not being able to communicate transparently about the status of the qualified applicants during the process; B believes that the provision of such statuses will positively improve the impression of the Universities or organizations for job applicants.

6.4.3 Applicant C

Applicant C is a co-author of the thesis, has around 14 years of IT experience, and currently finishing a master's program in Innovative Communication Technologies and Entrepreneurship with a dream of finding a job that suits C's best interest.

C had a very good experience with recruitment systems and organizations providing immediate feedback on the same day after multiple levels of interviews were also conducted on the same day. This experience was back in C's home country and prior to 10 years from now.

C is currently applying for several jobs through SAP SF and other recruitment systems for many different organizations and realizes the recruitment process is not simple and quick anymore. A condensed summary of current experience are; separate profile that needs to be created by entering the basic details and uploading a CV every time a new application is submitted to an organization, once the application is submitted and a standard acknowledgment email is received no further status is visible to the applicant, an organization have shortlisted C's application and calls for further conversation and interviews however this status is not visible in the system. The overall estimated hiring process completion period is often communicated verbally and not visible in the recruitment system.

When the application is rejected sometimes an email is received within a few days but often received after more than a month. Rejections are sometimes received through phone calls when C has moved until the final stages in the recruitment process but the rejection reasons are like either an internal candidate was hired or often we have decided to choose another candidate and "thanks for your time" but there is a lack of constructive feedback reasoning on how to improve and be hired in future.

Often applicants do not explicitly ask for constructive feedback due to the disappointing and stressful situation one is going through after advancing until the final stage of recruiting process but are rejected after spending hours of time in the process and assuming to be almost hired.

6.4.4 Hiring Manager

Hiring Manager, P, currently works at Novo Nordisk and has more than 25 years of experience within the Business Intelligence and Analytics field of the IT profession. P has been recruiting for many years and was interviewed to discover the recruitment process in general to the organization Novo Nordisk and also in relation to the SF system that is used in their recruitment process.

The activities that P is responsible for in the recruitment process are creating the job description, initial telephonic conversation with the shortlisted applicants to align with the job requirements and their interests, and conducting the job interviews with the top 3 applicants. P mentioned telephonic conversations and posting the Job Ad on different platforms are not being tracked in the SF system.

The majority of the activities within the SAP SF system are handled by recruitment partners and the activities are initial screening of all applicants to shortlisting top 5 candidates for the hiring manager to consider for the next level, sending email notifications through the system such as approval requests from higher managers or rejections to applicants.

HR partners are less involved in the actual recruitment process, in scenarios where there is already a hand-picked candidate internally or known external contacts, however, the process is documented in the SF system. HR partners are involved in the personality discussion interview with the applicants.

P specifies that the recruitment process is completed within the expected timeline of 3 weeks if there is proper planning, aligning, and blocking of calendars of both interviewer and interviewees. Delays could happen in the process if a certain external applicant is already in the final stages of the process and suddenly an applicant internal to the organization applies for the position. These unexpected delays put hiring managers in a situation of not being able to provide appropriate feedback and on time to the external applicants actively being interviewed in the process. Delays during corona situation were also a situation where the interviewer or interviewee is infected by corona and the interview schedule needed to be changed which increased the overall timeline of the recruitment process.

When asked P mentioned about one thing that would be nice to have changed in the SF system

is for applicants, the basic personal information that is entered in the submission form while sending the application. P believes that the information would already be provided in the CV and making applicants enter those details is duplication and is not used by the hiring managers unless it is used by the recruitment partners or the organization for some internal purposes.

6.4.5 Recruitment Consultant

Recruitment Consultant, L, Appendix A.1, is currently working at NTT as a recruitment consultant who advises and works closely with the organizations having SAP SF system. The challenges L sees in the client's system are near to what the Hiring Manager, section 6.4.4 see. Time, bottlenecks in the recruitment process, and unexpected events. However, when presenting the problem formulation to L responded quickly and believe in the need for a solution to it. Another major challenge L sees the organizations are facing competition is to find the right candidate and in most situations not able to find a candidate. Which L means is one of the reasons for high time consumption in the recruitment process. On the other hand, when multiple great candidates are applying but only one candidate is chosen for the position, the organizations find trouble maintaining a good relationship with the candidates being rejected. Therefore, L strongly means that the organizations should focus on creating a friendship during the recruitment process. This will be highly beneficial for the organizations, that mostly only think about themselves. However, L also mentions that organizations only think of their own needs as recruiting a candidate is a high cost.

Enhancing communication transparency between the applicant and the organization based on data opens up for both a better experience for applicants and a decrease in hiring costs spent on recruiting by the organizations. Consequently, having good experience for the applicants open up for a friendship for no cost, and perhaps faster recruitment in the future as the relationship might be established beforehand. In the cases where the organizations end up hiring the "wrong" candidate after onboarding, L believes control questions in the Job Requisition could be a good way to screen.

6.5 Connection between Interviews and Datasets

Based on the interviews the major challenge the interviewees face is from the applicants' view and the fact of not knowing what is going on after the job application is submitted. In other words, having

to know the status of the application submission until it is rejected or approved for the next step. Furthermore, information unavailability on when to expect a response from the recruitment process, whether an answer back from the organization will be in 2 days or 2 months. From the organization's point of view, the major challenges are the unexpected bottlenecks or different activities which delay the overall process. Furthermore, not knowing of whether the expected recruitment is carried out as it should and the time taken in specific areas.

These major challenges the interviewees and organization are facing are to be found in the data. Based on the analysis of the data, section 6.3, it was seen, that the historical data is holding information about the status of an application in the recruitment process, furthermore, it is seen that the data is holding information on all the activities that exist in the recruitment process, and also the timestamp of it. This opens up the possibility to inform the applicants of statuses through data, and organizations can rely on historical data to have an overall statistical view of the recruitment process. Thereafter to see if the expectations are met in the actual process, and optimize accordingly. These findings in the data can be used for optimizing the recruitment process, performing process mining, and renewing the standard process. The standard process can be renewed based on a combination of expectations from the applicants versus the expectations from the organization. However, mainly by looking into the data, by choosing the variant which is fastest on time and meeting the expected activities.

6.6 Stakeholders Analysis

In subsection 6.6, stakeholder analysis is performed with an intention of creating an overview of how the stakeholders are impacted in relation to the thesis project idea. The overview also highlights who and how much interest and power they have to make the project a successful integration into the HR recruitment system.

As mentioned at the beginning of the Analysis chapter, the core stakeholders of the overall HR recruitment system are Applicants, Hiring Managers, Recruitment Partners, and the Organization.

Figure 9 shows the different stakeholders and how they are categorized into how much impact/interest they have in the project idea and how much power they have to the success of the service integration to the organization's HR system. In the lowest right corner are the Applicants having a

high interest but low power. Organizations have high power and high interest in improving the user experience for applicants, however, it is assumed that through empirical evidence collected from applicant interviews that organizations have high power but low interest.

Hiring managers and recruitment partners don't have any power or interest over the service, however, could benefit from the overall optimization improvement when the communication transparency is enhanced between the applicants and organizations.

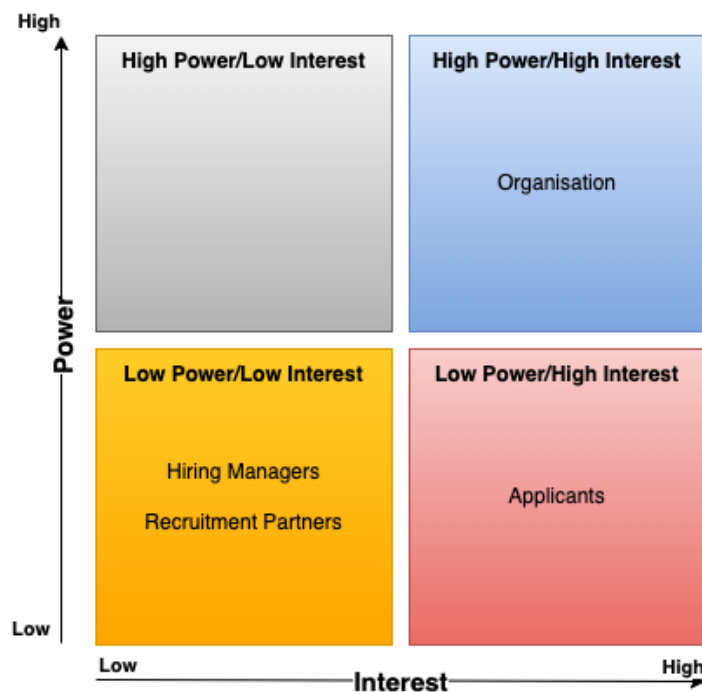


Figure 9: Stakeholder Analysis Chart

6.6.1 Value Proposition

According to applicants' interviews, what adds more value to the recruitment process are the following; enhanced user experience with the HR recruitment system being able to visualize actual status changes and updates of the submitted application without having to wait for longer periods, enhanced communication transparency platform between the applicants and the organization in relation to pro-

viding valuable feedback about rejection, notification about being qualified for the hiring process even if not being called for the interview immediately, centralized storage for candidate profile within SF system being able to be managed for all applications submitted to different organizations, an increase in the percentage of transparency rate and satisfaction rate in relation to hiring process with organizations.

To provision the applicant requirements, organizations must integrate our proposed service into their HR recruitment system. The assumption is that this integration adding value to applicants' user experience may result in taking the full advantage of the recruitment practices by the organizations that could improve the communication transparency between the applicants and them resulting in a branding incentive.

Another aspect of proposed service integration is not only limited to adding value to the Organizations' recruitment process but can also extend its value to serve Universities where SAP SF HR recruitment system is used for recruiting Ph.D. positions or similar.

6.6.2 Establishing KPIs

As mentioned in the introduction chapter 1, the project work is focused on enhancing the applicants' user experience and reducing the associated stress in the recruitment process for applicants. To measure if the proposed service module meets the expected outcome, two KPIs are established - transparency rate and satisfaction rate in percentage.

These KPIs are helpful for both analyzing and evaluating the thesis project work. For this purpose, the SF system view from the applicant side is used to validate prior to and post-integration of the project service module to the SF system. These KPIs must ideally be leveraged by the Organizations to periodically validate and improve their performance in the overall recruitment process and towards enhancing their applicants' user experience.

Transparency Rate% is perceived as the number of statuses currently visible to applicants against their submitted application versus the visibility of the statuses after our service module is integrated into the SF HR recruitment system. As mentioned earlier the evaluation of this KPI is performed by

visualizing the applicants' view of the submitted application in the SF system.

Satisfaction Rate% evaluation is performed through prototype testing conducted through a case study with a specific Organization upon the service module implementation and integration. The KPI is validated by conducting applicants' surveys in relation to their experience with the overall recruitment process using the SF system which is integrated into the service module interface.

7 Design

The conceptual service design described in this chapter is an integration module SmartProfile recommended in order to enhance applicants' user experience. The reason for naming the design solution "SmartProfile" is; that it is mainly focused on enhancing an applicant user interface by providing current job application statuses and analytical recruiting statistics. However, the service and module design is also intended to optimize the overall experience of the recruitment process for both applicants and the organizations. The design solution purely relies on regular extraction and transformation of untouched historical recruiting data using advanced and strategic methods. Further in this chapter, the module currently is focused to be designed and described as a supplementary extension for the SAP SF HR recruitment system, central to interviews conducted, case study, and the data leveraged from Organization X 6.1. The solution can be visualized as a process solution in addition to recruitment, onboarding, payroll and benefits, time management, performance management, learning management, and others in SAP SF 5.1. However, the design considerations will be targeted to fulfill the requirements of the module to be easily converted potentially as a platform in the future.

7.1 SmartProfile Use Cases

As described in the Analysis chapter, specifically in the value proposition section 6.6.1, the functionality of the proposed service module gets activated upon integration and interaction with the SAP SF HR recruitment software system. The service module will give full control to one of the core stakeholder of the thesis work "Applicant" while the main SF HR recruitment system is under the control of another stakeholder "Organizations"; resulting in two use cases for the design.

The first use case for SmartProfile is to enrich the applicant interface based on data extracted from the existing SF HR system through module integration. Based on the interviews, workshops, theory, system data, and analysis it was quickly discovered that there is no consideration of applicants' concerns in today's recruitment processes. Therefore, the SmartProfile design is intended to enhance applicants' interface with statistics based on historical data extracted from specific organizations they applied for jobs. When an applicant has created a profile and applied for the job after filling out the required information, he/she will be navigated back to see a job application status overview pro-

vided by the module interface. This status view interface can be imagined as a separate analytical tab provisioned through the service module. Here the applicant can visualize a applied job positions related statuses along with the expected duration of the wait for receiving a reply from the organization. Furthermore, the applicant can see the duration the organization spent on screening, when they begin interviews and when it is expected to complete a hire. All these details categorized based on the department, location, and job title the applicant has applied for. The status of the applications will be labeled to specify whether it is applied, in review, interview in progress, offered to hire or not selected. Lastly, based on the collected feedback through surveys, an applicant will be able to see other applicants' experiences specific to the organization of interest. Figure 10 shows the described use case scenario of an applicant using the SmartProfile module.

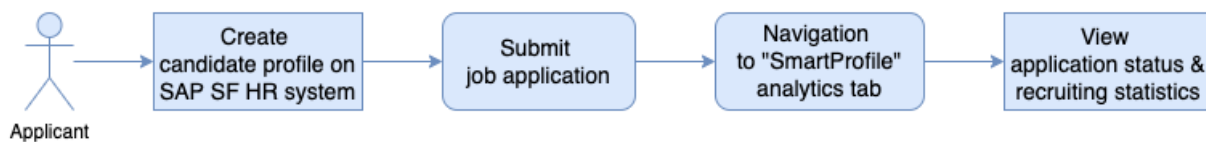


Figure 10: SmartProfile | Use Case 1

The second use case approach is to optimize the user interface on the organization's front-end of the SF HR software. By gathering data from entity datasets Candidate, Job Requisition, and Job Application, which can be read about in section 5.2, it is possible to set up the full recruitment process from end to end. This is not a feature in today's HR systems. Currently, HR systems provide overall summarized statistics and not deep, insightful, business intelligence statistics as understood from interviewing an SAP SF recruitment consultant, Appendix A.1. With the service module integration, it is possible to have the process outlined for the organization to know among other statistics; the exact time spent on recruiting, where the bottlenecks occur in the process, and how different HR employees and managers handle recruiting. Knowing this gives clear possibilities for the organization to optimize the recruitment process and further provide a good and enhanced process experience for future employees in the first impression. Figure 11 is demonstrating the use case scenario from the organization's perspective in SmartProfile. Unlike a tab-like interface provisioned to applicants, this use case can be visualized as an additional process solution similar to recruitment, onboarding, and so on for the organization. The employees may be allowed to access this tab with enriched statistical information about the recruitment process.

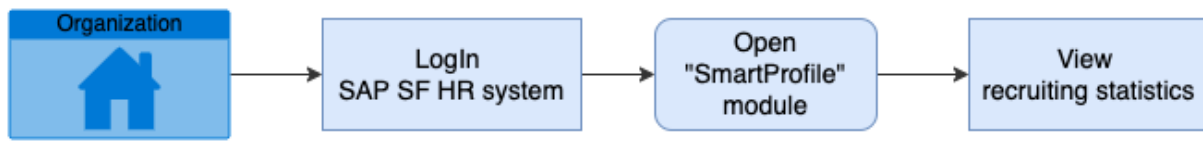


Figure 11: SmartProfile | Use Case 2

7.2 SmartProfile Context Diagram

SmartProfile design solution has two parts. One is the interface design for Organization X applicants and is shown conceptually, and the other part is the regular data extraction and its automation from Organization X's SF HR system already implemented using the NTT platform. Figure 12 shows the Success Factors SmartProfile service module derived conceptually in this context. And we the developers of this service have full control over the part of the implemented module.

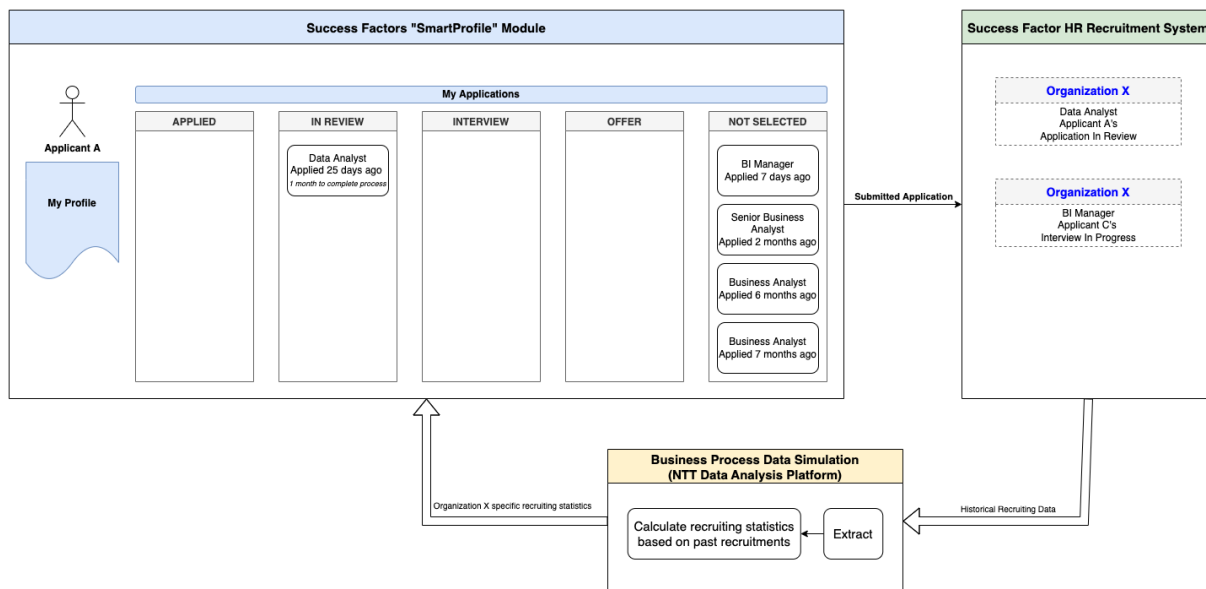


Figure 12: SmartProfile | Integration with Success Factor HR Recruitment System

In the diagram, the individual components facilitating different services of the solution are shown separately. SF HR recruitment system is not part of the design solution but is included to show how application statuses and data are integrated with the service module. However, all different components can be imagined as a fully functional HR system solution. Additionally, this also means

that the functional requirements of the service module are limited to the integration with the main system, [I. Sommerville, 2016, p.85]. The fully integrated system functions automatically facilitating regular status and statistics updates for both potential and current employees. NTT platform shown in this context diagram could be replaced by other data extraction and analytical platform which could suffice the needs of data transformation to generate recruiting statistics.

7.3 SmartProfile Service Architecture

SmartProfile is as mentioned earlier a conceptual design and SF extension module which serves the needs of “Applicants”. The needs of the applicants, found in the sections 6.4.1, 6.4.2 and 6.4.3, were prioritized in relation to the enhancement of communication transparency between the applicants and organizations. However, complexities involved in managing the SF system profile for every organization they apply to is not being addressed as it would require to design the solution as a platform like LinkedIn, JobIndex or similar.

The service module will show the number of days passed from the date of application submission for each job position applied by the applicant. Additionally, the module can be configured to notify application status changes. These changes will be automatically discovered soon after regular data extraction from the SF HR system. In order to update the application status change in the service module, the organizations are recommended to ensure the logging of status updates in the HR system entities, found in section 5.2.

As a preliminary step to building this service module, it is important to automate the extraction of the historical recruiting dataset of Organization X associated with the SF system into the NTT Data Business Solutions platform. The extracted dataset is then leveraged to calculate for instance "average number of days to hire" among other recruiting statistics. The average number of days identified can then be seen on the applicant interface to know the countdown duration as the "number of days/weeks/months to complete process".

The takeaways for designing the conceptual service module are based on the outcome of the analysis from the stakeholders’ interview, the historical recruiting dataset from Organization X and its data structure, architectural principles, literature study, and knowledge gained from the academic courses

in relation to building a service that provides a good user interface, enhanced user experience and process optimization.

7.3.1 Design Considerations

As discussed in section 5.1 and section 6.2, the SAP SF HR recruitment process provides a user-friendly interface for Organization X to perform their recruitment activities in collaboration with applicants, hiring managers, and recruitment partners. However, the entire process is controlled and driven by the Organization X representatives such as recruitment partners and/or hiring managers, thereby applicants have little control over the SF system and minimal knowledge of job application status.

The current system has an interface for applicants to enter personal details, upload CVs and submit the application; with no further action or access to the system. Recruitment process progress communication is predominantly handled from the organization's end and communicating through only emails with the applicants. In other words, SF system interaction design is more user-friendly to organizations than to applicants. It is also noticed from stakeholders interview, found in section 6.4, that applicants cannot manage their profile created on any organization specific interface after submitting the application and cannot track the submitted application status. To overcome these limitations for applicants the service module has to provide an enhanced applicant user-friendly interaction design to them.

As mentioned in the introduction section 1.5, the expected outcome of the project is a service module to suffice the requirements collected through stakeholders' interviews specifically applicants. The design does consider provision statistics collected through organizational recruiting history data.

For the benefit of having the flexibility to use modern tools and communication technologies, it is considered to have the service module's data analytics platform built as a separate system. Currently, the project is leveraging a fully equipped NTT managed analytical platform to extract historical recruiting data and then generate the recruiting statistics. Furthermore, this separate system is interacting with the SF HR recruitment system for regular historical data updates into the service module. This is done using a well-defined communication channel and mechanism built leveraging REST APIs as defined in section 5.1.

In the future, when the service module is going to be implemented, it will be aimed to build as a loosely coupled independent system and certainly similar to a candidate pool platform. The platform system can be integrated into any HR recruitment system and is not limited to only SAP SF. Figure 13 is demonstrating the loosely coupled systems as an example. Through the integration, the organizations could gain the access to a list of interesting candidate profiles that are being created and managed within the SmartProfile service module. The service module could potentially contribute to optimizing the recruitment process of specific organizations. Allowing organizations to take full advantage of the module integration and find the best suitable candidates from the pool within a short period of time. Furthermore, it is considered that the organizations could avail "Branding" incentive through applicants feedback collected and summarized showing their improved applicants' user experience.

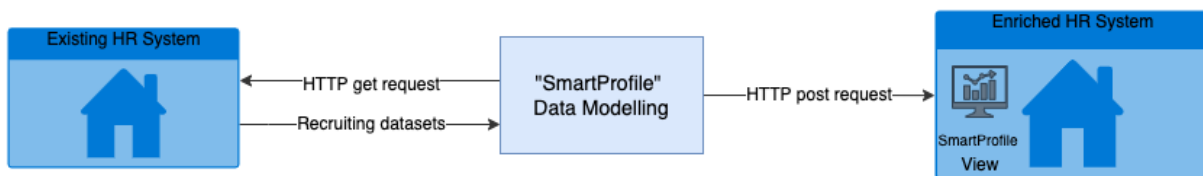


Figure 13: SmartProfile | Service Module

To summarize, the SmartProfile view in figure 13 has two interfaces. One for the applicants and one for the organization. The interface of the applicant is considered to be holding status updates known from recruiting data logs from the organization's system. It also includes statistics such as expected duration time, and expectations on when the next step will happen in the process generated from NTT analytical platform. Another is the interface of the organization, holding an overall view of the recruitment process end-to-end. Furthermore, it is considered that the organizational interface holds summarized and varying statistics of the recruitment process that has been done. Also, the average duration time, which was discovered in section is considered to be displayed.

7.4 Requirements Definition

The requirements of the service module and its integration to the main HR recruitment system are prioritized using the MoSCoW prioritization guidelines [11]. The goal is for the service to fulfill all the requirements below.

NO.	Requirement	Priority	Ref
1	The service module must be able to integrate with developed HR systems.	Must	7.3.1
2	The service module must be able to process a new user as an Applicant allowing to create a profile with personal details and uploading CV.	Must	7.3.1
3	The service module must be able to interact with organizations HR system to submit job applications.	Must	7.3.1
4	The service module must be able to model real time application status based on system log data.	Must	7.3.1
5	The service module must have a mechanism for updating the application status on applicants' interface view when logged in an organization.	Must	7.3.1
6	The service module must have a mechanism to extract data and perform transformations	Must	7.3.1
7	The service module must have a mechanism for creating an interface for the organization and provide the organization with overall process statistics.	Must	7.3.1
8	The system module must have a mechanism to integrate the outcome of Requirement No.6 into the applicants' interface view.	Must	7.3.1
9	The service module must be able to store and update Applicants created profile data.	Must	7.3.1
10	The service module must be able to integrate with other developed HR recruitment systems other than SF.	Should	7.3.1
11	The service module could have the ability to allow organizations to access candidates profile pool and contact immediately for any relevant opportunities.	Could	7.3.1

Table 4: Initial Requirements

The main requirements for the project are the 1st, 2nd and the 6th requirement, mentioning the systems capability to predict the correct age and gender of the customer. These requirements are explained more in depth below:

ID	FR 1
Name	The service module must be able to integrate with developed HR systems.
Summary	The service module must be able to integrate with HR recruitment system to be able to interact with organizations' system and extract their recruiting data. It must in terms be able to do get- and post requests to the HR system.
Rationale	One of the main parts of the service module, is being able to allow and interaction with new and existing organizations' associated with SF HR recruitment system, and activation of the service .
Inspiration	Section 7.3.1
MoSCoW	Must

Table 5: Requirement no.1

ID	FR 2
Name	The service module must be able to process a new user as an Applicant allowing to create a profile with personal details and uploading CV.
Summary	The service module must be a allow new Applicants to create their personal profile in order to submit applications and view application statuses through the Applicant's interface view.
Rationale	One of the other main parts of the service module, is creation of Applicants profile to process and view relevant data
Inspiration	Section 7.3.1
MoSCoW	Must

Table 6: Requirement no.2

ID	FR 6
Name	The service module must have a mechanism to extract data and perform transformations.
Summary	The service module must have a mechanism to extract organizations specific recruiting history data and perform transformations to create recruiting statistics and patterns to the interfaces.
Rationale	The retrieved data from the HR system must be modelled and transformed in the service design with business intelligence.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 7: Requirement no.6

A more detailed explanation of the different requirements can be seen in Appendix C.

8 Case Study - Organization X

In the project, Organization X has been used as a case for understanding the recruitment process background. The case study with its historical recruiting data has been very supportive in answering the problem formulation. In the following section, it is explained how the Organization X case study data analytical solution was partially implemented and used as a foundation to build the SmartProfile conceptual design solution and answer the problem formulation. However, the following section is not an explanation of full implementation, but a prototype, to provide a demonstration of why certain tools and technologies used are considered in relation to the performance of the design.

8.1 Tools Used

For the case study and related data analysis, technologies from the Microsoft Azure platform have been majorly used. NTT is a partner with Microsoft Azure and is therefore supporting the project with a fully equipped stack of technologies from Microsoft Azure. NTT is using Microsoft Azure extensively and has a high interest in adapting it even more to implement their current project solutions. NTT sees Microsoft Azure as a very secure, and reasonably priced platform for exploring and supporting customers.

8.1.1 Cloud Networking

As the project is operating with HR data, and is intended to use for larger organizations holding a large number of resources and data, but also itself holding a variety of resources, it is crucial to have a strong IT infrastructure. For the project, an Azure Virtual Cloud Network is set up. It is used as an architectural approach to built-in software at a global scale from edge to edge which delivers consistent, pervasive connectivity and security for apps and data wherever they reside, independent of underlying physical infrastructure. In other words, the virtual network connects all devices, servers, virtual machines, and data centers through software and wireless technology.

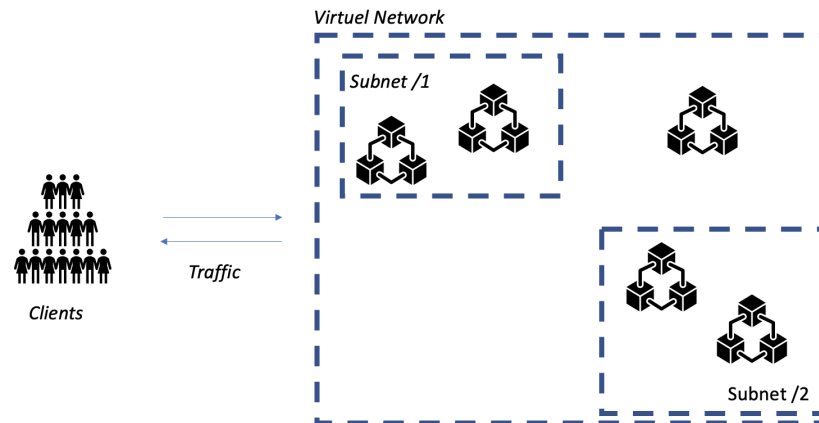


Figure 14: Architecture - Virtual Cloud Network

Figure 14 is the architectural description of both how the traffic is incoming to the virtual network, but also the architectural approach of how the resources are split within the virtual network. By default, a virtual network allows traffic access from all the resources within and between the virtual subnets. Outside traffic will not have access to the virtual network but will need to be approved when trying to access the virtual network. It is possible to change the network access manually both in the virtual network and subnets between private-endpoint access or public-endpoint allowing all incoming networks. The intention of using a virtual network is both to provide great flexibility for the organization to add-in on the resource but also for SmartProfile to dynamically increase resources and packages for clients, without affecting already existing solutions.

An other reason, for creating a cloud networking is to keep the different organizations data separately, and in that way avoid any risk of getting in complications with mixing different system data.

8.1.2 Network Security

As the project is, as mentioned, operating with HR data it is crucial to have security around the software. The software itself is not holding any sensitive data, but as it is connecting to existing HR systems, it is important to block unnecessary traffic from the software. Both to ignore potential hackers and that the software is not the reason for an opening for hackers, but also to provide credit towards the organizations holding the SF system.

For the project, an Azure Firewall is set up to monitor and control the incoming and outgoing traffic. In that way decide whether to allow or block specific traffic based on a defined set of security rules. The Firewall monitors and controls based on predetermined security rules and establish a barrier between a trusted network and an untrusted network. Trusted networks are the networks inside the network security perimeter. This is the approved network that is being protected. Untrusted networks are networks that are known to be outside of the security perimeter. They are untrusted since they are out of administrative policies and are typically the private networks the self-created network is protected from.

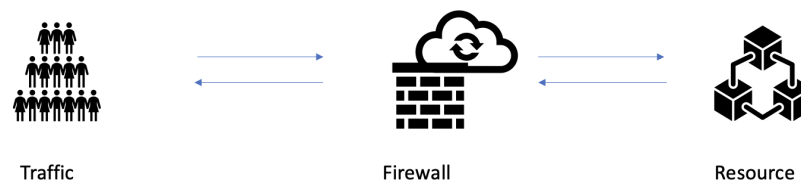


Figure 15: Architecture - Firewall

Figure 22 is an architectural description of the traffic flow with the setup Firewall. The Firewall is a wall between the outside and inside traffic to a or more resources. By default, a Firewall is blocking all kinds of client traffic, but by manually allowing IP addresses or other security credentials the resource can be accessed. The Firewall used for the Case Study is a Cloud Firewall, the next-generation firewall, which is intended to deploy within a virtual data center. It protects the created solution's own servers in an infrastructure-as-a-service model. The firewall application exists on a virtual server and secures incoming and outgoing traffic between cloud-based applications, [Barracuda, 2022].

8.1.3 Azure Data Factory

Azure Data Factory has been used for getting data from the API and converting the data from semi-structured data to structured data. It is Azure's cloud ETL service for scale-out serverless data integration and data transformation. Therefore, by using Azure Data Factory exists no dependencies to an on-premise server, which opens up for opportunities to implement the solution whenever and wherever. Furthermore, it allows to create of data-driven workflows for orchestrating data movement and

transforming data at scale, which does not limit the size of the organization and its data and opens the possibility to be integrated into both small and large organizations.

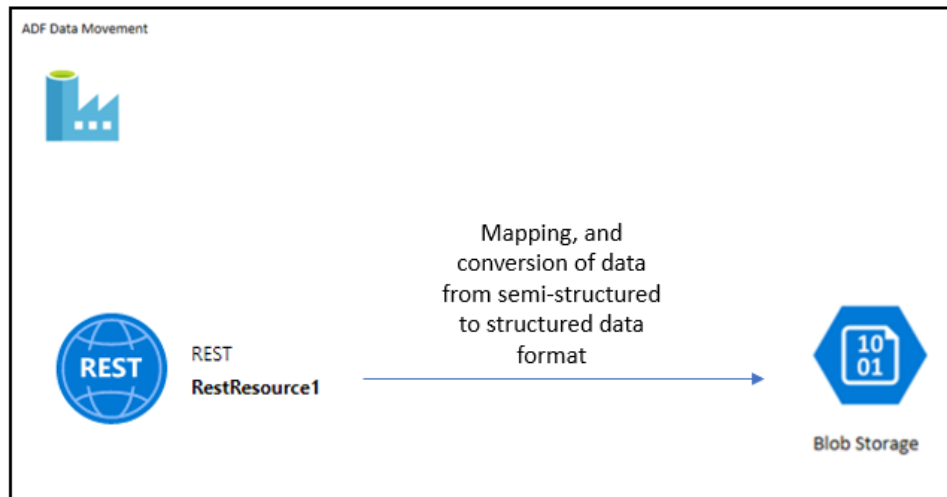


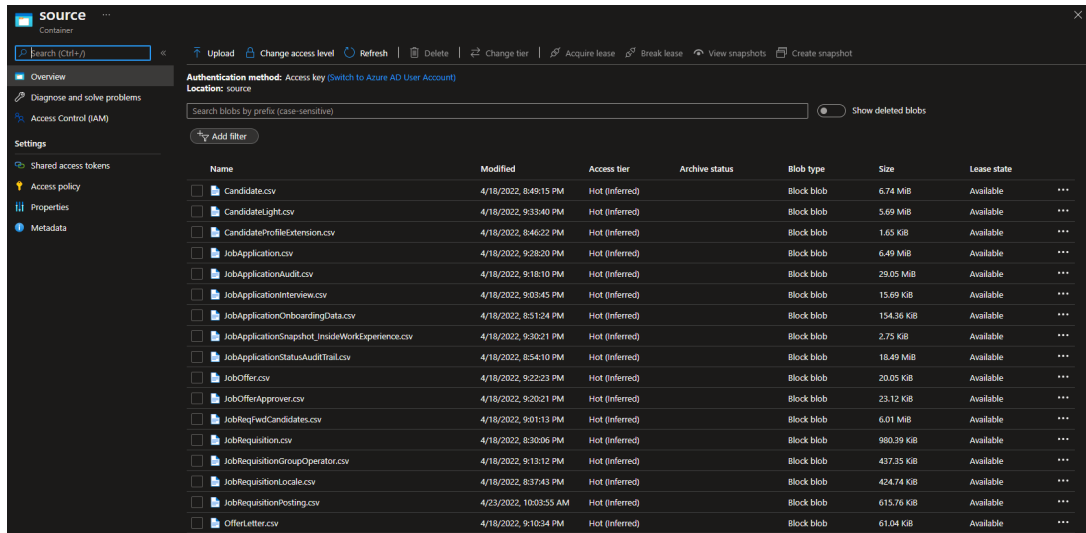
Figure 16: Architecture - Azure Data Factory (Self-created)

The process with Azure Data Factory has 3 steps. Firstly, it gets the data using the API which connects to Organization X's HR system. Beforehand we have done an analysis of what data is needed, which is possible to read in section XX. Based on this information, a Master table holding a URI for each needed data source is created, which the pipeline in Data Factory is using to access Organization X's system. After getting the needed data, the next step is the conversion from semi-structured, JSON formatted data, to structured table data through mapping. The last step of the process is the loading of the data to Azure Blob Storage, where the data is stored.

8.1.4 Azure Blob Storage

Azure Blob Storage has been used for saving digital data. Azure Blob Storage is a Cloud Storage opportunity that is a mechanism that enables a computer to retain data. Specifically, it is a cloud computing model that stores data on the internet through a cloud computing provider that manages and operates data storage as a service. It is known for elasticity, scalability, and flexibility. Azure, the cloud provider manages capacity, security, and durability to make data accessible. To access cloud storage is possible through traditional storage protocols or direct API. Azure Blob Storage is object storage that

is ideal for building modern applications from scratch or import of existing data stores for analytics, backup, or archive. This is the reason for choosing Azure Blob Storage for the project case study.



The screenshot shows the Azure Blob Storage interface for a container named 'source'. The left sidebar contains navigation options: Overview, Diagnose and solve problems, Access Control (IAM), Settings, Shared access tokens, Access policy, Properties, and Metadata. The main area displays a table of blobs with columns: Name, Modified, Access tier, Archive status, Blob type, Size, and Lease state. The table lists 20 CSV files, all of which are 'Block blob' type and 'Available' state. The files are sorted by modified date, with the most recent at the top.

Name	Modified	Access tier	Archive status	Blob type	Size	Lease state
Candidate.csv	4/18/2022, 8:49:15 PM	Hot (Inferred)		Block blob	6.74 MiB	Available
CandidateLight.csv	4/18/2022, 9:33:40 PM	Hot (Inferred)		Block blob	5.69 MiB	Available
CandidateProfileExtension.csv	4/18/2022, 8:46:22 PM	Hot (Inferred)		Block blob	1.65 KiB	Available
JobApplication.csv	4/18/2022, 9:28:20 PM	Hot (Inferred)		Block blob	6.49 MiB	Available
JobApplicationAudit.csv	4/18/2022, 9:18:10 PM	Hot (Inferred)		Block blob	29.05 MiB	Available
JobApplicationInterview.csv	4/18/2022, 9:03:45 PM	Hot (Inferred)		Block blob	15.69 KiB	Available
JobApplicationOnboardingData.csv	4/18/2022, 8:51:24 PM	Hot (Inferred)		Block blob	154.36 KiB	Available
JobApplicationSnapshot_InsideWorkExperience.csv	4/18/2022, 9:30:21 PM	Hot (Inferred)		Block blob	2.75 KiB	Available
JobApplicationStatusAuditTrail.csv	4/18/2022, 8:54:10 PM	Hot (Inferred)		Block blob	18.49 MiB	Available
JobOffer.csv	4/18/2022, 9:22:23 PM	Hot (Inferred)		Block blob	20.05 KiB	Available
JobOfferApprover.csv	4/18/2022, 9:20:21 PM	Hot (Inferred)		Block blob	23.12 KiB	Available
JobReqfwdCandidates.csv	4/18/2022, 9:01:13 PM	Hot (Inferred)		Block blob	6.01 MiB	Available
JobRequisition.csv	4/18/2022, 8:30:06 PM	Hot (Inferred)		Block blob	980.39 KiB	Available
JobRequisitionGroupOperator.csv	4/18/2022, 9:13:12 PM	Hot (Inferred)		Block blob	437.35 KiB	Available
JobRequisitionLocale.csv	4/18/2022, 8:37:43 PM	Hot (Inferred)		Block blob	424.74 KiB	Available
JobRequisitionPosting.csv	4/23/2022, 10:03:55 AM	Hot (Inferred)		Block blob	615.76 KiB	Available
OfferLetter.csv	4/18/2022, 9:10:34 PM	Hot (Inferred)		Block blob	61.04 KiB	Available

Figure 17: View of Azure Blob Storage (Self-created)

In the Azure Blob Storage exists all the converted data in each owns .csv file. Azure Blob Storage is used for holding the data tables as a backup and provides NTT possibilities to work with the data in other relations as well. For the project, it is used for storage and both the raw data and after it has been modelled in Snowflake. Figure 17 is a snapshot of the data tables stored in Azure Blob Storage.

8.1.5 Snowflake Database

Snowflake is being used for data processing. Data processing refers to a technology used to manipulate data by a computer or tool as the conversion of raw data to machine-readable or human-readable form, the flow of data through the CPU and memory to output devices, and formatting or transforms of output, [Britannica, 2021]. Snowflake copies the data from Azure Blob Storage into the project's own created database. In Snowflake exist two folders, one holding the raw data and one holding the views/modelling/transformation of the raw data. A deeper description of the transformation and joining between the different tables can be found in section 6.3.3. Lastly, in Snowflake is created the two final views are used on the system. One for the applicants and one for the Organization. The

result of this can be found in section 8.3.

8.1.6 JavaScript

JavaScript is being used to both visualize and load the transformed data back to the specific HR system. In the header of the script is specified the HR system, where the body of the script is divided into two parts. One handling the candidate view, and one handling the organization view. JavaScript is a beneficial programming language for the project, as it has both data handling modules, and visualization modules and is able to communicate with browsers and systems.

8.2 Data Handling Process

Section 8.2, is describing the whole process from getting the data out of the system to providing specific information to the stakeholders. Also, how all the different tools are connected in the process.

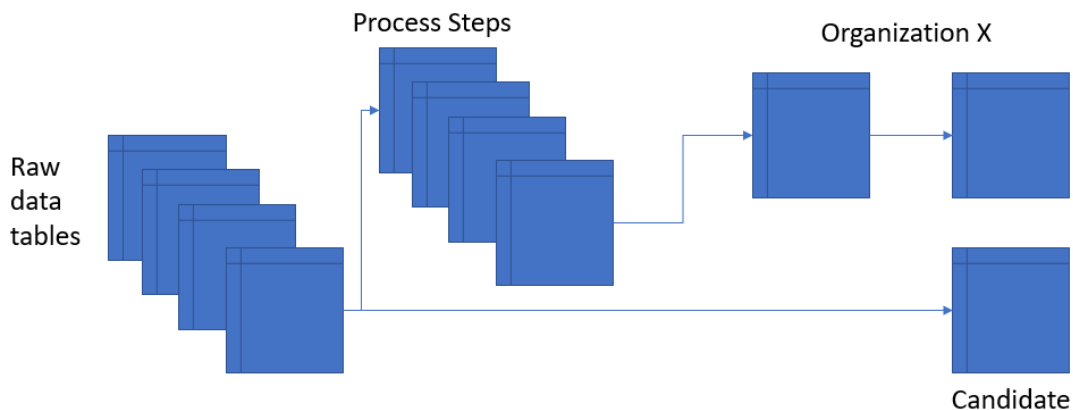


Figure 18: Architecture - Snowflake

Figure 18 is an illustration of the structure of the views in Snowflake. All the modelling in Snowflake is done with the programming and data language SQL. The "Raw data tables" is the copied tables from Azure Blob Storage. When looking at the flow towards Organization X firstly, the views specifying the different process steps are created. Each view is separately creating each of the expected process steps based on joining different raw data tables. A deeper description of the modelling behind can be found in section 6.3.3. The next step toward the final view of Organization X is gathering all the

needed information for the organization. This includes end-to-end process activities, duration time, and responsible employees. See section 8.3.2 for final result. When looking at the flow towards the candidate, exists one view modelling and gathering all the necessary data. This, among other things, includes expected duration time, number, candidates applied, success ratio, and feedback. See section 8.3.1 for final result.

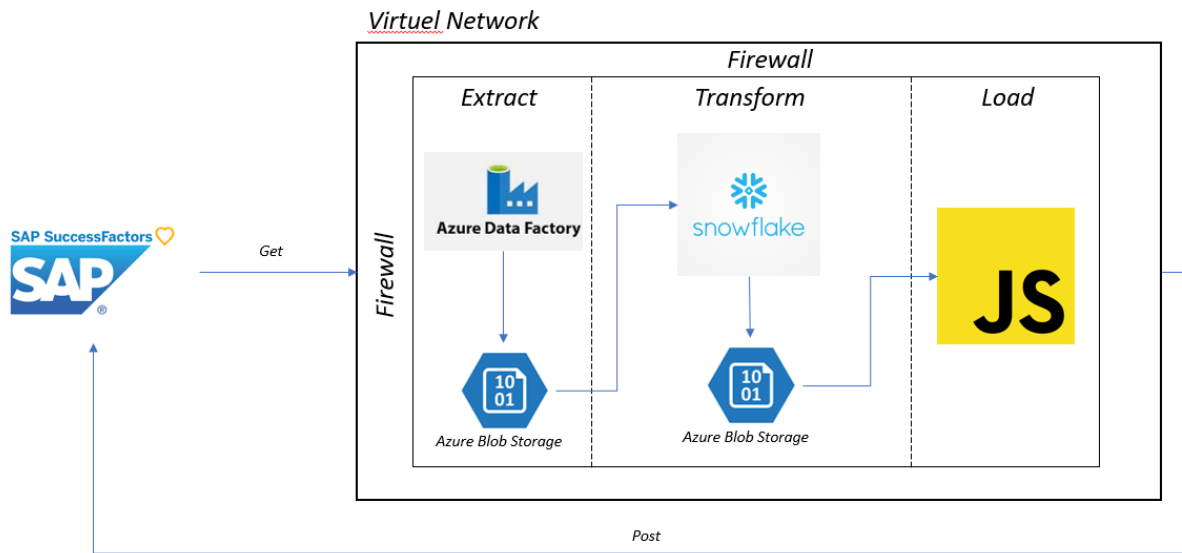


Figure 19: Architecture - Solution

Figure 19 is the architecture for the full process from getting/retrieving data to posting the software to the existing SAP SF system. Firstly, specific datasets are retrieved through ADF and pushed to Azure Blob Storage. From Azure Blob Storage is the data copied into Snowflake as raw data. After copying, the different data tables are being transformed in terms of joined and added with logic. After modelling, the two final tables are being pushed back to Azure Blob Storage. Lastly, JavaScript is loading the data, creating visuals based on the data for both the candidate view and the organization view. The script is afterward posted the final software to the respected SAP SF as a tap. The result of the visuals can be found in Section 8.3.

8.3 Final Results

The following section is describing the final views both the candidate and the organization is viewing based on the historical data.

8.3.1 Candidate Interface Prototype

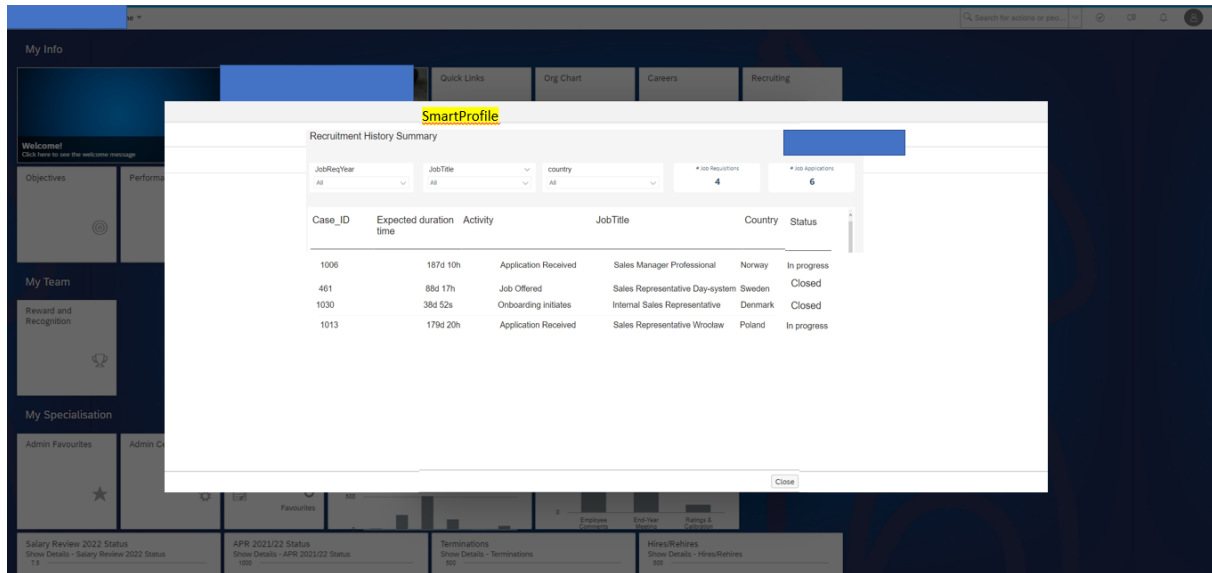


Figure 20: Prototype of candidate interface in SF - Example

Figure 20 provides the view, the applicants will see, after had applied for a job position in SF. Here the view informs the applicant with what status the job requisition is in. Whether they are still in the progress of receiving applications, or started on-boarding. Furthermore, it is providing the applicant with the expected duration time. Here, when the applicant can expect the recruitment process to be finished and a respected candidate is hired.

8.3.2 Organization X Interface Prototype

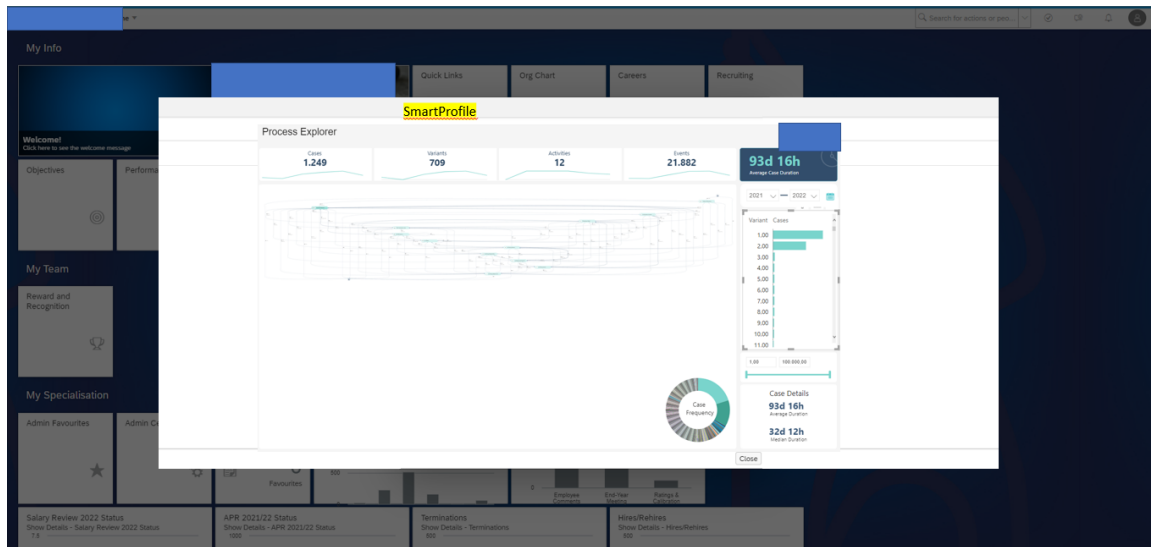


Figure 21: Prototype of organizational interface in SF - Full view

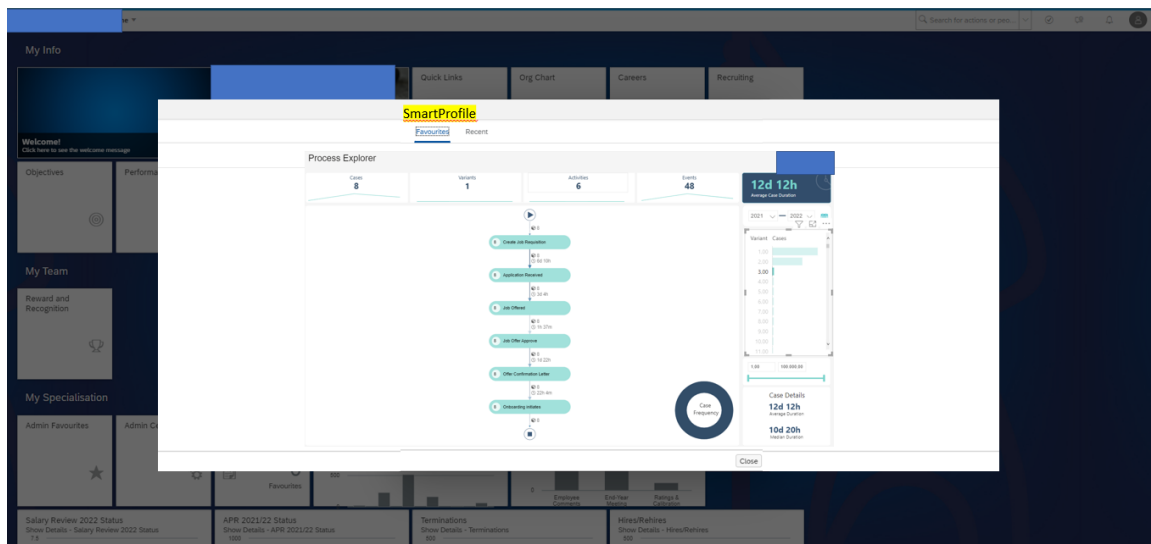


Figure 22: Prototype of organizational interface in SF - Zoomed view

Figure 21 and 22 are showing the design consideration for the organizations interface. The two figures is the interface view on the description in section 7.3.1.

9 Shortcomings of the Thesis

9.1 Multiple Profile Creation

Based on the interview with Applicant A, appendix A.3.1, one of the biggest and most time-consuming challenges he/she experienced was having is to create a profile per organization he/she applied at. Creating a profile requires both passwords, uploading CV on new, uploading a motivation letter, and manually filling out information already written in the CV as personal info, and earlier experience. Applicant A mentions he/she has 100+ logins to different HR portals. Also, the hiring manager mentions, appendix A.2, that this part of the recruitment system is a "waste" step as he/she does not see where this extra information is used. It is only the CV and motivation letter a hiring manager and HR look at when screening and selecting. In the thesis, eliminating this challenge has not been assessed nor considered a part of the project.

In the state of the art, section 5, it was discovered that HR systems are implemented and developed customized and separately to the organization. There are no dependencies on SAP overall even though SAP is the organization that created the ERP system. This thesis project is creating a module that can be integrated into existing HR systems, and since different HR systems have no master dependencies it is not possible with the created module, section 8, to create a connection between different HR systems. One way to solve the challenge with multiple profiles the applicants are meeting, the design could have been a platform connecting applicants and different HR systems. Based on the state of the art, it was discovered that HR systems have API possibilities that give the opportunity to retrieve the needed data to create a proper user interface for both the applicant and the organization to analyze the recruitment process. This would highly benefit the applicant. However, at the workshop, appendix A.4 the organization mentioned already having several systems internally for HR. One for recruiting, one for payroll, one for onboarding, one for employees, and one overall with the whole organization. Therefore, a high exist in organizations not willing to buy an extra platform to connect with the applicants, as they already have an HR system where it is expected for the applicant to apply. Additionally, the recruitment consultant, appendix A.1, mentioned that organizations do not spend extra resources on meeting the applicant in the recruitment process, but are looking at their own needs as they already spent a high amount of resources on recruiting the right candidate.

Therefore, with a high risk of organizations not being interested in adopting an extra platform and spending extra resources on recruiting the platform will have no value. Furthermore, it was concluded that creating a platform fulfilling this challenge of the applicants will not create transparency between applicants and organizations but solve another problem only related to the applicants.

10 Discussion

10.1 Counting on the Historical Data

The modelled data provided to the user interface is as mentioned based on historical data. This includes data affected by Covid-19 and non-Covid-19 time periods, also periods where the organization might have had bad financial years. These fluctuations will be visible in the data, which both applicants and organizations will rely on. For organizations, it is convenient to ignore the bad numbers as they know the background of the data. However, for applicants, this is unknown information and might rely on unrealistic numbers.

10.2 Reliability of Data Qualitatively and Quantitatively

Organization X is as mentioned the case study for the project. Organization X has since 2016 had 1249 openings. However, 251 of the positions are still open, which decreases the total number. Additionally, in the total is the hire of store assistant included, which decreases the number further. Therefore, have the system data used in the project been low, but realistic for a retail organization. Also, as earlier mentioned the dataset is also from a period while Covid-19 existed, which may have lowered the number. However, the dataset in the project has mainly been used to understand what kind of data exists in an HR system and if it is possible to provide a data-driven solution for the stakeholders. Therefore, the quality of the data is high for the project, but the quantity is low. Section 10.4 and section 10.3 is diving into how the quantity of the dataset can be both a benefit and a risk.

10.3 Organization Perspective of Integrating the Service Module

Based on the interview with the recruitment consultant, appendix A.1, organizations do as mentioned not spent extra resources on considering the applicant end of the recruitment process. For organizations, the recruitment process is about finding the right resource who can fill in the missing position with the needed qualifications. By integrating this solution into the organization's already existing HR system, the organization will not have to use extra resources in the recruiting process on establishing and maintaining a good relationship with rejected but future potential employees. The solution is as mentioned based on the organization's historical data which among other things includes the dura-

tion of time the organization spent on the end-to-end recruiting, the number of succeeded hires, and feedback on the experience from earlier applicants. Since the solution will be on historical data and automatically updated on the user interface when an applicant is searching for a position the organization will not have the control over what information will be shown to the potential employees. The time to hire might be very high, which can have the consequence of the applicant already will not patiently wait for that, and decide on accepting another offer. Besides this, there is a potential risk of earlier applicants not providing proper feedback on the experience with the organization which can influence the applicant negatively on the first impression of the organization. If the organization has "negative" KPIs shown based on the data providing a bad picture of itself, certainly, a specific department looking for fresh candidates has risks of being judged based on totally different departments or irrelevant organizational history data. Taking this drawback into consideration, the organization might not be interested in adopting the solution, with a fear of showcasing a bad impression to potential employees.

10.4 Applicant Perspective of Integrating the Service Module

Based on the theory saying, section 4.1, the recruitment process is ignoring the applicants' perspective and applicant interviews having the experience of feeling ignored and not considered, the thesis work quickly discovered a lack of consideration on the applicants' needs. For the individual applicant, the recruitment process can be a stressful period as he/she could have high financial stakes back at home and therefore be genuinely dependent on the process. When having such stakes and dependency, there also exists a high risk of bonding feelings and economical pressure which might influence the applicant's well-being. Therefore, this thesis project urged to develop a solution to increase the communication transparency between the applicants and organizations in the recruitment process and in the applicants' favor. Based on the interview and data it was fast discovered that it is possible to increase the transparency with data. In the interview conducted, Applicant A conveys that the feeling of being unattended and not knowing anything about the application status makes you further feel disappointingly unfortunate. As described in section X it is possible to create the transparency with KPIs as to where in the process the application is, what an applicant to expect how long time it will take, and how many other applications the organization has received on that specific position, success ratios and earlier applicants feedback. However, with the intention of the solution decreasing the job-seeking stress and increasing the collaboration between the applicant and the organization the solution might have the opposite effect. The solution providing these factors could risk the applicant becoming

stressed about the process, and have the desire to keep an extra eye on the time and be creating the need to write to the organization the moment the time spent has exceeded if that happens. This could decrease the expectations of the organization, and the applicant can end up becoming disappointed with the organization.

Another high risk is the applicant waiting and holding back from replying to another organization while relying on feedback from a certain dream organization. This could create a bad experience on top of another bad experience for the applicant because of the dependency on the applied positions with full faith in the recruiting process.

10.5 Generalization of the Solution

The solution is created based on the stakeholder challenges, the provided data, and access to a specific organization's SAP SF system. SAP SF has been used as a case study to understand what data HR system has, and how to access it. SAP SF today on the market has a wide amount of one-to-one competitors, [Gartner, 2021]. Certainly, similar HR systems are assumed to log the ongoing recruiting activities with timestamps and maintain historical data. The overall recruitment process described in section 4 is mostly identical across the industry and does not apply only to SAP SF clients. Therefore, the final solution based on standard recruiting data structure will also benefit other HR system clients. The solution majorly requires API access to the system and historical data on the activities created in recruitment process entities such as candidate, job requisition, and job application or similar. However, all the activities expected in the SAP SF recruitment process are not a must to be logged in the system. It can on the other hand also be a finding for the organization that their process is not following the industrial expected process, and optimize the business towards that.

Overall, it is possible to generalize the solution as it is not developed fully dependent on the requirements of SAP SF. The JavaScript which is an HTTP post request must be changed in the header with the appropriate and specific HR system name and entity details. Most well-known HR systems developed are not seen as a platform. Therefore it is possible to handshake with the system using an HTTP post command. The solution is well suited for the organizations holding their own HR system, not shared with others through a platform.

11 Conclusion

The thesis project is conducted with the support of Applicants, Organization X, and NTT Data Business Solutions A/S. Based on the interviews conducted with the applicants 6.4, the majority of organizations do not communicate with application statuses and feedback transparently. The aim of the thesis work was to derive a conceptual design in the form of a supplementary SF service module to enhance the user experience for applicants and additionally improve recruitment process performance for organizations.

Revisiting the problem formulation, a condensed analysis of stakeholders interviews, data availability, and analysis of recruiting dataset directed to draw a suitable interface design solution SmartProfile for applicants to interact with specific organizations effectively. The conceptual design was enhanced by integrating the statistics into the applicant interface which was derived from the historical recruiting data collected from Organization X. It was possible among other related statistics, to quantify the "expected average number of days taken to hire" from recruiting data entities. In conclusion, it was shown with the recruiting system entities data there are possibilities to meet the main challenges of applicants' user experience, and thereby possible to enhance the communication transparency between the applicants and organizations to a high extent. The required data to show insights on the applicant's view is from the organization's activity logs with timestamp that facilitates with statuses of application in the recruitment process. In that way, the applicant will be updated on the current status going on. The main architectural approach and requirement to SmartProfile are to be able to integrate with the HR system, through HTTP get requests to access the required data and post request to send the modelled statistics back to the system. Assuming larger HR systems have API integration and SmartProfile has the required system credentials it is thereby seen to an high extent the possibility to generalize the service module.

To analyze the inputs collected from stakeholders and to back up the qualitative analysis of the recruiting trend, the interpretative research method was considered suitable to understand the behavioral pattern of the recruitment process and organizations through the lens of applicants. Besides the interpretative method, a phenomenological interpretive approach was adopted to analyze the case study workshop conducted with Organization X's hiring managers and recruitment partners. Consid-

ering all aspects of the recruitment process and multiple scenarios of the process flow, the workshop was beneficial. It was discovered that organizations' interests are centered around finding the best candidate for the recruitment process. Evidently, through empirical evidence collected, there is a lack of responsibility to provision application statuses and constructive feedback to the qualified applicants, and certainly not on time.

The next step is to optimize the solution through implementation and testing of the proposed design with the SF HR recruitment system, and further its evaluation by meeting stakeholders' needs.

12 Future Work

The proposed service module conceptual design, found in section 7.3.1, is the foundation for future work for this project, certainly, the initial implemented service is a supplementary product and extension to the SAP SF HR recruitment system. Further in this section, future work is elaborated into different progressive and achievable milestones.

Service Module Implementation and Integration: As mentioned in section 1.5 and 1.6, the scope of this project is limited to a conceptual design of a service module and is not possible to implement the solution due to the timeframe required for full implementation. Evidently one of the core future tasks considered in this context is to implement the module "SmartProfile" itself based on the proposed system design.

Upon successful implementation of the service module, the next step is to integrate the module with the SAP SF HR recruitment system to practically see whether the system works as per the initial requirements defined in section 4.

Testing and Optimization: As of now, it is not possible to leverage the applicant interface and test the results of the service module. Therefore, the module will be tested post-deployment of the fully implemented and integrated SF HR recruitment system through a business case. The business case for testing the service could be potentially a collaboration with Organization X or any other organization that leverages the SF system for the recruitment process. Thereafter, the project KPIs defined in section 6.6.2 will be measured for both applicants and organizations respectively. The test results paving the path for diversified optimization areas is iterative. Initially to simply optimize the service module in general and meet the requirements of applicants, next to the recruitment process for case study related organization, finally to draw a road-map and convert the optimized service module as a generalized product to make it ready for integration with any HR recruitment system.

Trade the Service/Product: The service module resulting from this project outcome creates an opportunity for the authors of this report to trade the service. Initially, the potential buyers of this service are certainly SAP SF HR systems customers (organizations). One of the primary approaches is to back

up the service trading to organizations are applicants' recruitment process feedback analysis itself, section 6.4. The secondary approach is strengthening trade with a market analysis of competitive HR recruitment systems not having enough prominence given to the applicants. Further extended with the effects of its importance through the thesis project KPIs established, found in section 6.6.2. A strong supportive argument is that a sample of organizational data from the SAP SF HR system has already been tested as a use case in this project.

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A Appendix - Interviews and Workshop

A.1 Recruitment Consultant

Interview with L from NTT. The interview lasted approximately 30 minutes, and where held in the beginning stage of the project, the 18th of February. The interview where held on online on Microsoft Teams and the interviewee where interviewed by Poomika Kumarasamy and Rekha Ramachandra

– **Q: Can you please tell me about yourself and your role?**

L: My name is L, and I am a SuccessFactor Recruitment Consultant. I am the link between our clients and NTT. I consult in the system SuccessFactors which is a part of the whole SAP universe. I help my clients to standardize and implement their recruiting solution and process is a big part of it. SAP SuccessFactors is a cloud-based software for human capital management using the Software as a service model. It supports the HR department for holding all data concerning applicants and recruiters. I do not myself do operational recruitment, which I have not done since 2016. This means, I am not a part of the recruitment process as such, but my clients are, and I can answer from the perspective of my clients and their challenges and experience I have noticed on the sideline.

– **Q: Do you see any challenges your clients meet during the recruitment process?**

L: In the perspective of my clients the main challenge is to find the right talents. This is a huge challenge both in finding applicants matching fully to the application, relying on what is said and presented by the applicants but also finding applicant matching to the organization culture as a part of having them staying after the typical 3 month trial. Besides this, the whole recruitment process is long, the dream for a manager is to find someone within a month, but that is just a dream, and typically recruiting someone can easily take between 3-6 months.

Another challenge I see my clients facing is not taking advantage of internal mobility. Utilizing internal employees with transferring them among the departments instead of letting them go.

– **Q: What do you, with your experience, believe could be done to avoid these challenges?**

L: Definitely control questions. So, when selecting applicants among all the applicants they should have filled out a sheet with control questions. So, while judging and rating it is not only based on motivation letters and resumes but also answers to control questions related to the job post. The control questions cannot be templates, but should be created from the manager as his test to applicants also open questions, with no possibility to answer wrong or right.

– **Q: Do you believe data could help optimize the process? If so how?**

L: Well, it depends on what you can see in data. I have not tried to work with the recruitment process by looking at data in business intelligence ways. However, I know SAP SF have an analytical page where you can see the time spend and internally the status with responsibility of the job applications. Although, I definitely think it could be interesting to see if data could help. I am despite working at NTT where we love data. So, without knowing precisely, I do think data could help, yeah.

– **Q: Do you see any bottlenecks in the recruitment process, today?**

L: Approvals during the recruitment process from internal people as managers and recruiters. To receive an approval on continuing with a potential applicant can take up long time. Both because several subjects needs to be addressed or many internal employees are involved to approve and may take up time as well.

– **Q: How do the applicants get feedback today?**

L: When an applicant is applying for a job they are required to create a profile holding information about them self and their application. Here they can follow the process of their application. The typically two or three steps an applicant meets in the system today is “Open”, “In progress” and “Closed”. When an applicant is found the other applicants receive an email thanking them for applying, but the position is occupied. In my point of view this is not good maintenance of relationships with the applicant. As earlier mentioned a big challenge is to find talents, but my clients also experience the challenge the other way around, so having two perfect matching

talents for one position, where they have to let go of one of them. Here it could be beneficial for the client to maintain a good relationship with the other talent for future cases where applicants with talent are missing.

- **Q: What is your thought on a more transparent application based on process data as a both update and feedback method for applicants?**

L: That sounds really interesting. I have not heard of it before, but I definitely think it would add up value to both the organization and the applicants! As mentioned the organizations is struggling with finding the right candidate, and sometimes struggling with having too many good candidates at the same time. For this issue, it could be good for the companies to create a friendship with the rejected candidates for future use. This would definitely be a good investment. Also, if it is based on data and the organizations do not have to use extra resources, it is definitely a win solutions. Already by just hiring one good candidate the organizations spent an high amount of costs, and are purely interested in decreasing these costs. Therefore, the organization itself would not spent more resources on maintaining relationships with rejected candidates if it requires extra costs.

- **Q: Is it possible to ensure that applicants are able to see their application statuses in the SAP SF HR recruitment system and even log these statuses in the relevant data tables?**

L: It is definitely possible by creating some repeated piece of code scripts in the recruitment system. However, its not enabled by default and organizations do not choose to provision such statuses very transparently for couple of reasons. One reason is that are not very particular about who in the process is hired from shortlisted candidates, second reason that enabling application status will increase the expectations from applicant's side which could later turn into disappointment if not proceeded further in the process. Even the actual duration of the hiring process is ideally 2 weeks, however, the job market is very competitive to hire a skilled employee. There is a high possibility of loosing a very qualified applicant in the middle or far end of recruitment process leading to an extended hiring duration for other qualified applicants in the queue.

A.2 Hiring manager

Interview with P from Novo Nordisk A/S. The interview lasted approximately 40 minutes, and took place Tuesday the 15th of March. The interview where held online through Microsoft Teams and the interviewee where interviewed by Rekha Ramachandra and Poomika Kumarasamy.

– **Q: Could you tell about yourself and your role?**

P: I am P, I am 55. I have been working in this area of Business Intelligence and Analytics for more than 25 years. I have been recruiting a lot of candidates and employees over the years.

My role compared to HR are to align all the information related to what I expect from the candidate and communicate this to HR. HR have the responsible for all the administrative and also posting ads to find the relevant candidate. For instance HR do the screening. Then I look into the screening, and then I am the one putting the interview up in the system. However, this might be dependent on whether you are used to work in SuccessFactors, otherwise HR can do this part where you with an email send which screened candidates you want to interview.

– **Q: Do you at Novo Nordisk have a standard process you follow for recruiting talents and to what extend are you following it?**

P: We have a system called SuccessFactors. It is a system where we setup all the information so HR and me as a Hiring Manager can communicate about the candidates. We have the system to support. When I worked at Coloplast we used the same system. There are of cause a lot of similarities, but also of cause things that is done in different ways from company to company. I believe it is the system that is setup to automatically send emails to applicants. If they get rejected for instance, it is by the system that they get the email that they are rejected. So, we have the system, and it is in the system we have the steps we follow. Although, a little bit depend on the level of position we will have HR more involved or not. Whether it is internal, external or if we already have a candidate.

– **Q: Is all your activities in SuccessFactors or do you also have manual activities?**

P: No, I do not think so. No matter if I have a candidate or not, for instance already know who to hire, I still in SuccessFactors have to create the position, and it will go for approval for my management. So, all that approval and forward of the requisition to the different players, is done in the system automatically. However, then ofcourse, what is not in the system is the Job ad. You can place the job ad in many different places. Well, I do not know if it is tracked, where it is posted, but all communication around how the job ad should look like and so on is on email and not in the system. Also I myself have an activity of calling the screened candidate before inviting them to the interview. Just to chat, and see if I like that person. After that an automatic Email is sent to them inviting them to an interview, but this phone call is not tracked in the system.

– **Q: How do you do your screening?**

P: I give HR some keywords as Business Intelligence, Python and so on, and HR uses these keywords in the screening. They do not call anyone, this will be purely based on CV and motivation letter. Sometimes it happens that people apply with no experience at all, which is why we do the screening.

– **Q: What is the activities after you have selected the screening candidates?**

P: Then the interviews start, we usually go with 2 interviews. The first interview is usually me and one from my team. The first round is the technical round where we typically choose 5 candidates. Then for second interview we also have HR and typically bring 2-3 candidates into this round. That is where we have the logical test and the personality test. Usually, before the second interview I contact HR and ask if there is any areas I should be aware of, and we need to ask more into. This part is not logged into the system, just something I do.

– **Q: How does the system look and work from the Applicant side?**

P: Yes they create a profile, which they to upload their CVs cause we ask them to do so. Almost everybody is also uploading a cover letter, but on top of that they also have to fill out some fields, which is the fields you also cover in the CV. It is name, experience, certificates and so on, which

is expected in the CV. Due to GDPR we are not allowed to hold this information, so we can not use this information for anything. So, this part I think is unnecessary for the candidate.

– **Q: Do you see any challenges today both in your recruitment process but also general related to recruitment?**

P: It is not so much about the system. The system is a guidance and guiding you through everything. It is mostly about the planning and aligning the timeline. From the beginning you are blocking the whole period to both interviews and planning, is good. However, often you plan all this after you find the candidates, which creates a huge delay in the whole process which is both annoying for us and the candidate. Ofcourse with planning from the beginning it is expected to find candidates within a specific time period. However, with good timing and planning from the beginning, you can also give really good feedback to the candidate.

This is not something we are lacking on today, but it is mostly in unforeseen situations. For instance, we have tried during a planned recruitment process that an internal employee suddenly comes in the middle, and also applies. Or other unforeseen as that the HR Partner is busy, and the calendar's does not match.

– **Q: Do you have any priorities or policies with internal and external recruitment?**

P: No we do not, but lets say you have an external and internal candidate, and they are both similar on the technical part, which is what I focus on. Then the internal would be better, since nothing new up start or extra resources has to be used on the internal. It is not because we have a policy around that, but here at Novo Nordisk we are trying our best to keep people in the organization. So, we are definitely focusing on developing people. We are every year having meetings with our employees of where they see themselves in two years, and doing what we can to meet that, and thereby developing them towards that.

A.3 Applicant(s)

A.3.1 Applicant A

Interview with Applicant A, newly hired junior consultant from NTT DATA Business Solution A/S. The interview lasted approximately 30 minutes, and took place Tuesday the 29th of April. The interview where held online through Microsoft Teams and the interviewee where interviewed by Poomika Kumarasamy.

– **Q: Could you tell about yourself and your role?**

A: I am a process mining junior consultant at NTT Denmark. I have 2 years of experience, and a lot of experience applying to jobs. Right now I do ETL, and basically I do business intelligence. I am from Turkey, moved here to Denmark, two months ago.

– **Q: We would like to see your view as an applicant searching for a job. So, could you tell about your overall experience with recruitment and challenges?**

A: I will tell you about when I was searching for job after university. So during that process I think about i made about 150 applications. Well first of all the return, the response rate was absolutely low. Out of 150 applications I only got reply from 15 companies. Heard nothing from the rest. I searched both big and small companies, but most was small companies or medium sized, around 200 employees. I would expect an organization like this to get back to applicants. Well, it makes sense that the organization is only thinking about themselves, but personally you want to hear something from them. Look, I made 150 job applications after university. However, when noone is replying to you and you keep making applications, there is no stop to it, and you just keep doing. Which makes me as a application put in a bad position. This is definitely one of the issues.

The second challenge is as a new graduate when you apply to jobs. You get rejected, which is normal, but you want to improve yourself, and you ask for feedback. However, the feedback you get is a copy-paste from a template. Saying, you did not meet the expectations, like a general state. Nothing specific, like how to improve the CV, or if you had a face-to-face interview, any feedback on how you speak, or what you said. Especially as a new graduate, it is the first time

you are doing it. You have no experience. If your rejections don't help you improve yourself, you will have a hard time on getting long. Personally, whenever I got a response, I always asked for feedback, but most of the time they did not care to send feedback, or you would get the template feedback. A challenge I had.

– **Q: Did you meet any challenges while you got recruited?**

A: I have two different experience both with late response and job interview. In the late response, I have as mentioned applied for a lot of jobs, and the later response you get the more jobs you apply for. So, out of those 150 job applications I applied for, I properly made first 50 and then waited a week or two, and then did 50 more, and so. One of the cases. I managed to wait plenty of time in the beginning of a specific job application, and did not get a response, and finally after months I got a reply from another organization reach out to me for an interview. While this was happening, I got reply after months from a organization I applied for in the beginning and got called for an interview. So, at this point I already had a process started with the first organization and when they come back to you after such a time as 2-3 months later, you seem to be the second choice. I immediately thought, they already had rejected me, or in reality they were just really slow which were quiet disappointing. Especially when this is a organization you really wanted to work for, but they come so late you also get a wrong first impression of them.

Similar to this case I had another case, where I got called in for interviews months after also, but where I at this point had signed with a organization. Here I was disappointed since I really was interested in one of the companies coming back to me late but could not do anything since I already had signed with another organization.

– **Q: When looking back, do you believe this could be improved?**

A: I believe the way this should be done is that you need a centralized place, where the organization can share this information. So, you have kind of a portal where you can check where you are in the process. So, as soon as you apply, you get like status, yes, we received your applicant, yes, we are processing it now and so on. So, clear steps of what is happening, so you know where

you are at in the process. So that lack of transparency in the recruitment process is a challenge.

Another experience I got a call for an interview. I am as mentioned a tech guy, but I was call in for a finance position. The opening was a technical position I searched for but when I went there, I got interviewed for finance. Obviously, this is a very specific case. So, between me applying for the job till I got called in for an interview they changed both the position and qualities they were searching for. This they did of cause within the organization but called me in for an interview if I was qualified for the changes. Here I felt like I wasted my time, and there were no considerations from my perspective. This was about what the organization needed and did not notify me anything about change of requirements. That is another point of the lack of transparency.

- **Q: We are working on a project to enhance the communication transparency between the applicants and the organizations by among other things by providing historical data and KPIs about the organization itself to the applicants. You would be provided with information as expectations on response time, information on location, department and more. Do you think would have changed your view or helped you in your recruitment process?**

A: I think that would be great. It would be great in terms of setting expectations. So, for example the organization I really wanted to work for, if I had known earlier that they spent 2-3 months on calling in for an interview. I would have had some hope or at least taken for initiatives to remind them of my process after ending time limit. I think this sort of information would have been very helpful and useful. For instance, when you are searching for university. There are usually statistics about how many people apply for the education, how many got in. Also, typically these top 5 universities accepted this percentage of people from these schools and so on. Like what they ended up accepting. So, you know whether if your chances are low or not. Knowing information like this will make yourself set realistic expectations to yourself. This would also help the organization to only receive relevant and realistic applications, instead a bunch where the application is out of sight. I really see this as a win-win.

Another case instead of education system. For instance, on LinkedIn, when searching for a job there. There are details as salary range, how many people are there, and other statistics, that pro-

vides information's and helping the applicants on expectations. However, the main thing is still as an applicant you really want to know where you are in the process. Otherwise, what happens is that you end up sending a lot of emails, and you do not get reply, and you do not want to send anymore because you do not want to disturb the contact person. So, the status will help a lot.

- **Q: Our thesis project expected outcome is to create a module/extension to already existing HR systems that will create the transparency between the Applicant and the organization. Both by changing the UI and creating statistics for the organization, but also for the organization to see how their recruitment process it going.**

A: Then you are creating both helpful insight for the organization and the applicant. I would really like that, at least the user side of it. It would be helpful. Also, it will eliminate applicants to call the organization and ask for status multiple times or asking how far they are in the process, if they have not heard anything yet.

Another issue I just realized, do not know if this relates to your problem formulation. When searching for jobs, every time you must create a profile to apply for a job. So, if I apply to 10 companies, I must create a profile 10 times and, upload my CV 10 times, which is annoying from applicant perspective. At this point I have so many different Success Factors logins. Furthermore, when creating a profile, I am providing manual information again which is already in the CV. So, double work multiple times.

- **Q: Can you talk about your experience from Turkey with recruitment? Difference country wise you noticed.**

A: I think it would make more sense to compare company sizes instead of country. I have applied for both small, medium and large sized companies in both Turkey, UK, and Denmark. And my overall challenges here is the once I have mentioned. What I noticed most difference is smaller companies as start-ups really takes their time to talk to you, get back to you, being more personal in the communication. Where larger companies, are selfless. My experience was that smaller companies really set of time to investigate who you are and if it is a match. Even though, you would expect this from big companies, since they have the resources to do so as well. Of

cause the start-up has more to risk by hiring the wrong candidate.

A.3.2 Applicant B

Interview with Applicant B from NTT DATA Business Solutions A/S. The interview lasted approximately 30 minutes, and took place on Monday the 2nd of May. The interview was held face-to-face in NTT office premises and the conversation was recorded through a mobile application by Rekha Ramachandra with the permission of the interviewee.

– **Q: Could you please introduce yourself?**

B: I have a background in biochemistry and physics from university, after working at Novo Nordisk for few years currently working at NTT Data.

– **Q: As you already know, we are doing a process mining project which focuses on enhancing user experience in relation to selection process for applicants, in relation to this area what is that you think the organizations should work from their side in the recruitment process?**

B: The selection process for instance, it must not be based on someone you know in the organization you apply, instead it must be based on actual qualification and CV of the applicants. However, once the applicant is on-boarded rest process is smooth.

NTT specifically lacks Branding of their organization. They do a lot of cool stuff, but no one knows about it. AI wise NTT is on No.4 in the world however it's not advertised well.

– **Q: When you applied for a graduation program how was the recruitment process and what you think could have been better?**

B: I did not apply for the graduation program through the system. I was referred through a contact in this organization to the hiring manager of the graduation program, after a conversation and hearing my interests, I was hired.

- **Q: Have you applied for any other jobs prior to NTT and roughly how many jobs you applied to, how many you got response for interviews?**

B: I have applied for a lot of PhD programs, again the experience is to better to know someone from the university. Though I received response from most of the universities for a conversation, but it was none I got through because of a hand-picked candidate they already had in the process. It is vital that the applicants are chosen from different backgrounds and experiences, from outside and internationally to improve from different perspectives. For instance, I am from scientific background, but I am also interested in data science, hence opportunities must allow an applicant to be qualified for a position with is a mixed combination of background and interest in the organization to bring out innovations. In a way, hopefully the cover letter and motivational letter written with great interest and enthusiasm be considered than the actual CV for the position looking at the problem-solving skills most vitally than the system you have worked with for say 20 years.

- **Q: Are you saying that to get a job, one of the criteria is to know someone in the organization you apply?**

B: Yes, networking works by far much effectively. For example, in NTT with no prior IT background I was able to get into a graduate program through a contact working at NTT.

- **Q: Through the system that you apply for jobs, is there any improvement that you expect in terms of user experience?**

B: The system that I have come across while applying to University of Copenhagen (KU), it is very good in relation to email communication on application submission and status changes. KU also focuses on hiring applicants from outside and my first impression on the process was very good, similar to the impression that I have on NTT Data. On the other hand, DTU system is totally opposite, the system is very rough, and no status updates are known, and every information needs to be fed manually.

- **Q: Were you able to know the status of your applications progressively from the organizations**

you have applied to?

B: When I applied for Novo Nordisk, it was communicated very well of the statuses. They are a big organization and I think they have a good system and process that performs recruitment process very good to attract the best candidate.

On the other hand, while I was applying for PhD programs it was different experience. Universities must work on the recruitment system, status updates provision and considering the candidates external to the University. They spend very little time on attracting external applicants and candidates who complete PhDs in the university also start to work as professors in the same university with no opportunities for job applicants. They often consider master students from their own universities as potential PhD candidates, 9 out of 10 PhD positions are offered to the master students graduated from same university. Being one among from the Danish community and qualified for the position it is still very hard to find an opportunity that interests the most.

– **Q: What is your experience in the time taken for processing your applications?**

B: Regarding status updates, again for PhD applications, when the application is submitted it is read through manually by the hiring professor, if disqualified the rejection notification is sent immediately after application deadline date. If qualified for next and until final level, there is a notification sent calling for a conversation, interviews and once the final candidate is chosen there is an email sent if I am chosen or rejected in the final process. However, when I have not received the rejection email but good enough for the job, it's a long waiting time until you have been notified to be called for an interview or notified when you finally receive the rejection email, and you know that someone else was hired for the position. And this is purely an assumption if you are 3rd, 4th, and 5th qualified applicant for the position. I guess it is the only way to know the final status when you have been qualified and waiting for the turn to get interviewed.

One suggestion would be to notify the qualified candidate about the status even if they are not being called for the interview by the hiring professor immediately. Otherwise as an applicant it is a very bad feeling about sitting and waiting for very long period not knowing the actual status of the application.

- **Q: When you are communicated with feedback, is it very clear and transparent with the reason?**

B: Yes, it is very clear at least with the PhD programs that I have applied so far.

A.4 Organization X HR Recruitment Workshop - Day 1 and 2

A.4.1 Summary of Recruitment Process Flow

In this section below a summary of the bottlenecks impacting the performance of the recruitment process increasing the overall time taken is provided. The summary is provided in relation to every sub-process involved in the Recruiting process through SF HR recruitment system.

Job Requisition

There are following potential bottlenecks of creating the job requisition at first place during handshakes and ownership of the process:

- Hiring manager is delayed from entering the details in SF software system because of the unfamiliarity with the system or recruiting partner who is familiar with the SF software system is unable to gather the job related required information from hiring manager on time.
- Delays in approvals by Recruiting Partner team and Superior Manager.
- Bottleneck delays in framing the job advertisement because of the dependency of job description details from hiring manager.
- Delays in proceeding to next step due to a dependency in posting the job advertisements on different job advertising platforms.

Job Application

According to the recruiting team, advancing this stage of the process responsibility lies between applicant and hiring manager. It is an iterative and time consuming process to screen all the interesting applicants profile through phone interviews and shortlisting only a few candidates for further proceedings. Once the applications are screened and shortlisted, the delays can occur if the availability of the parties involved for different levels of interviews and assessment are unsettled within the expected

time frame. Reasons for unsettling could be vacation, sickness and seldom emails ending up in spam folder.

Job Offer

Potential bottlenecks at this stage are listed below:

- Often delays due to offer information not being entered in SF software system by hiring manager. Along with offer information
- Applicant's SSN and bank account information not being provided in the expected time frame by the applicant because often email notification sent to the applicant to enter the SSN details ends up in spam folder.
- Delays in feeding the offer contract information into Penneco system from SF software system.

A.4.2 Detailed Recruitment Process Flow

This section focuses on the internal practices adopted by Organization X and carried out within the SAP SF software system. The purpose is to reflect and acknowledge on the described system, tasks and resources used in the process. More importantly to visualize the communication pattern adopted between the organization and applicants.

The recruiting process flow according to SAP Success Factors reference guide, 2022, [5, p.1446] and also according to the information documented during the workshop is divided as following sub processes - Job Requisition, Job Application and Job Offer.

Job Requisition

The main stakeholders involved in this sub-process are Hiring Manager, Recruiting Partner and Superior Manager. See Figure 23 for the process flow. It is preferably Hiring Manager who is responsible for creating a hiring request as "Job Requisition" through the SF software system because of being able to make the appropriate job description for the position. However, Recruiting Partner often creates job requisition on behalf of Hiring Manager; reason being either Hiring Manager is not familiar with the software system to enter/select/deselect appropriate information required to create the job requisition

or he/she is busy.

Once the job requisition is created, it awaits approval from Superior Manager. Upon approval from Superior Manager, job advertisement is prepared using the job description provided by the Hiring Manager by inserting it into a predefined standard format and published on the Organization X careers page along with other job portals like LinkedIn.com, glassdoor.com, Jobindex.com to be accessible by potential applicants.

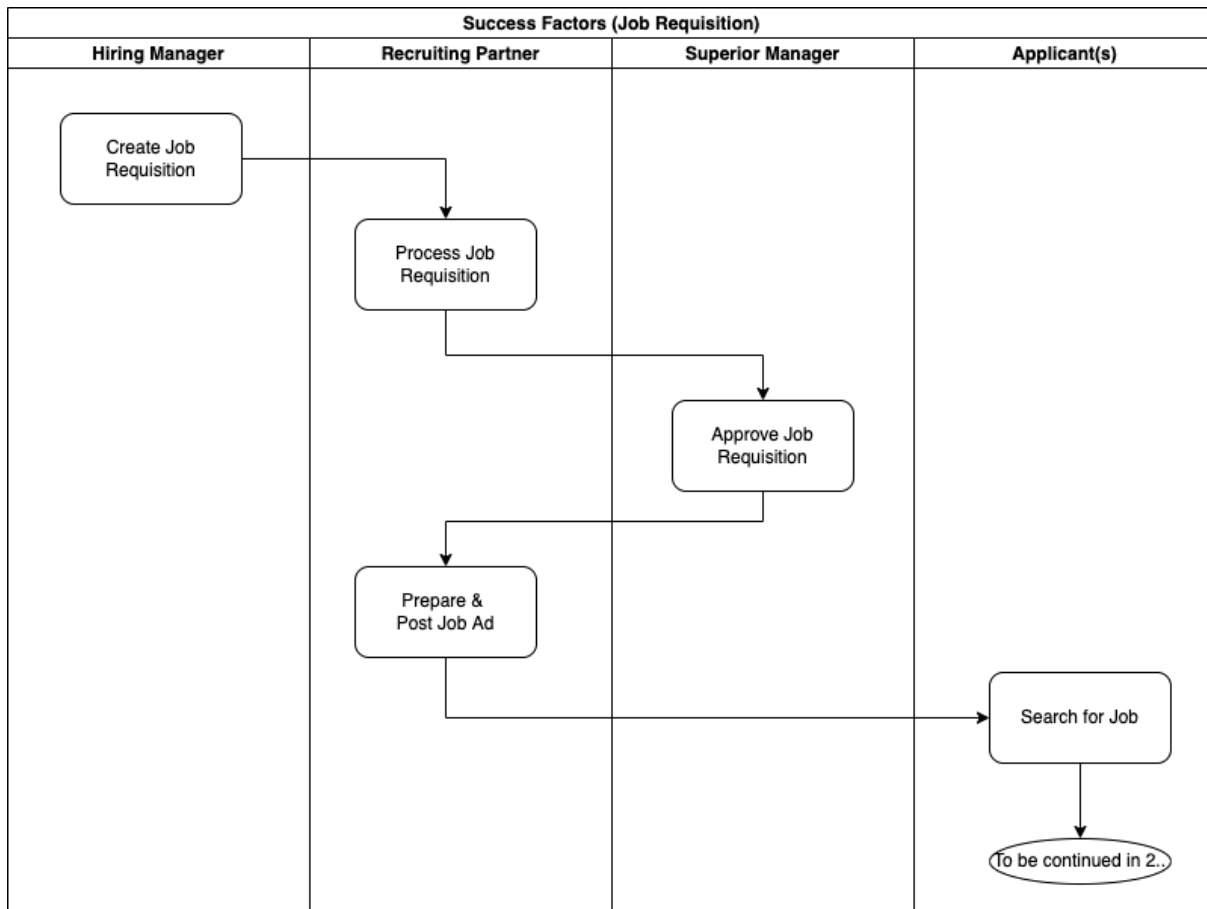


Figure 23: SAP Success Factor Recruiting Sub Process - Job Requisition [self-source]

Job Application

The participants involved in this sub-process are Applicants, Recruiting Partner and Hiring Man-

ager. As the name of the sub-process implies, it starts with applicants searching and applying to Organization X jobs through posted job advertisements. The sub-process flow depicted in Figure 24 and 25 below, is a typical flow of steps in a best case scenario of an applicant's candidate profile after creation is further processed and advanced until the job offer is released by Organization X, on-boarded as an employee.

Elaborating the process flow, applicant applies for the open position by creating candidate profile on the SF software system and receives acknowledgement of job application through email confirmation. Job application and candidate profile is viewed both or either by Hiring Manager and Recruiting Partner to shortlist relevant and interesting application for initial conversation with Hiring Manager and this process is termed as "screening interview".

Shortlisted applicant will receive a phone call or an email for screening screening interview and during the same conversation, Hiring Manager will propose for the first interview with the applicant if the conversation is further convincing to proceed with the candidacy. Seldom Recruiting Partner will perform the initial screening interview based on the questions facilitated by Hiring Manager. Upon agreement of availability and time through phone calls and email exchanges, applicant receives first interview invitation. The process will advance with the actual interview between the applicant and hiring manager, followed by interview feedback. If the applicant gets through the interview process, he/she will receive an online assessment link as part of the hiring process. The online assessment focuses on checking the applicant's logical, verbal and numerical intellectual qualification designed as a required criteria to become part of a challenging and demanding work environment. The applicant has to score above average to be able advance further in the hiring process and receive second interview invitation. During second interview hiring manager and recruiting partner will assess the applicant based on the online assessment and other relevant hiring factors leading to a final feedback for applicant's candidacy for the open position.

During the job application process as described above in this section, there are other possible scenarios when the applicants' job application is rejected at different stages; initial screening, post first interview, post online assessment and post second interview. A rejection email however in any of these cases, is sent to the applicant often at the end of hiring process that is when the open position is filled

by one of the finally selected applicant; in other words when the job requisition in SF software system is closed.

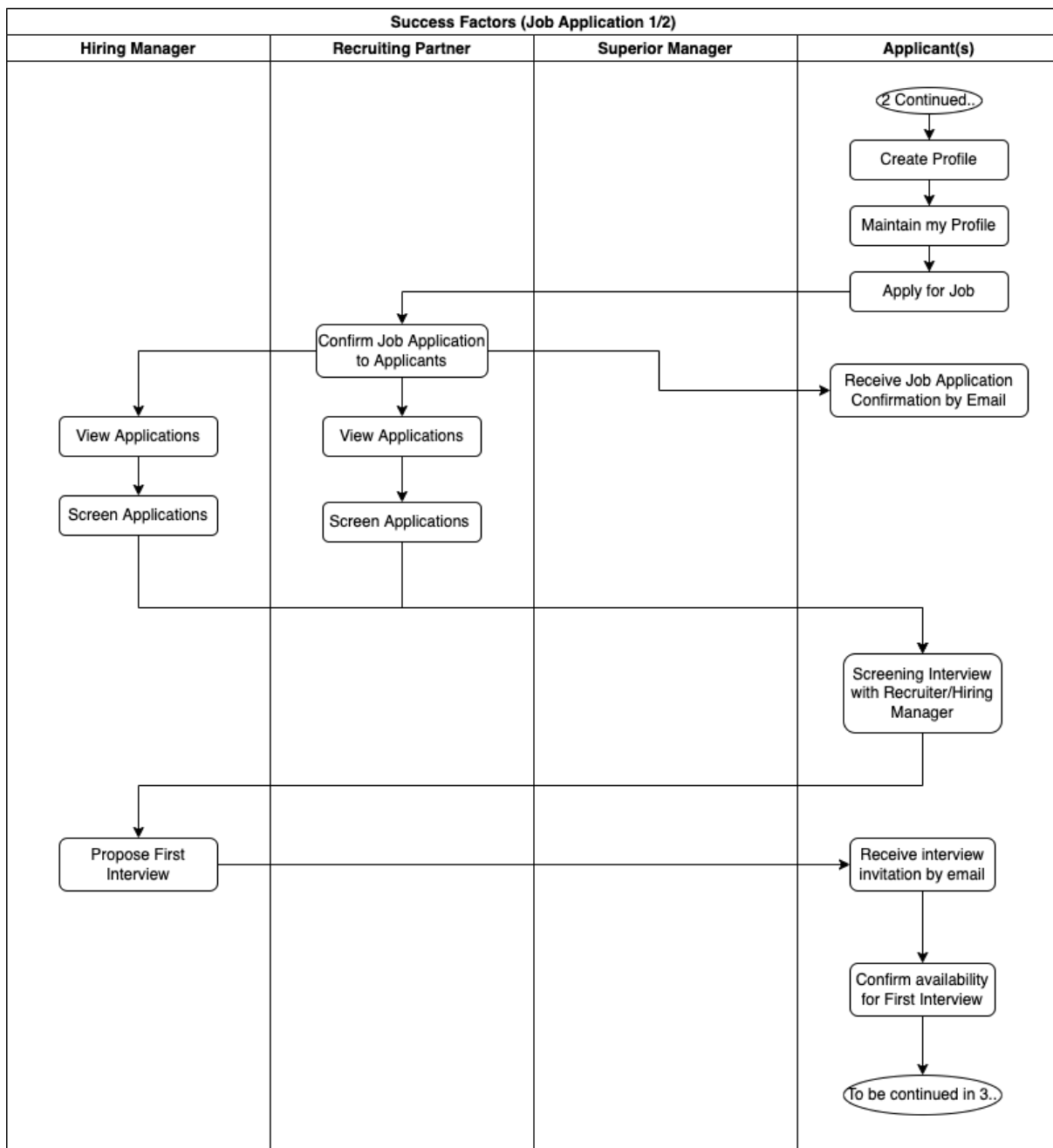


Figure 24: SAP Success Factor Recruiting Sub Process - Job Application 1/2 [self-source]

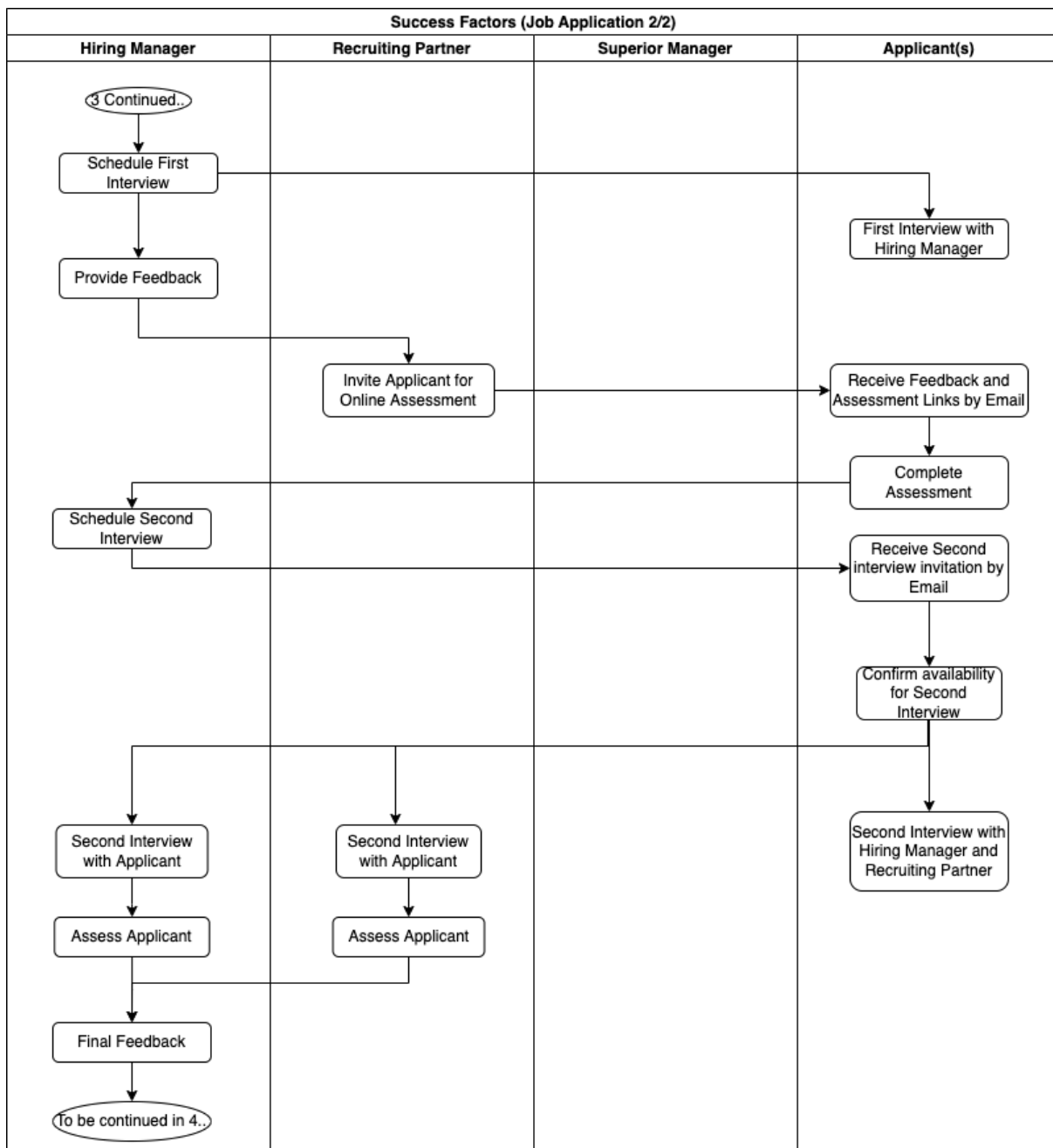


Figure 25: SAP Success Factor Recruiting Sub Process - Job Application 2/2 [self-source]

Job Offer

At this stage, an applicant is selected after going through multiple levels interviews and handshake of information required to release the job offer. Information required for creating an offer is social security number (CPR number) and bank account details which is entered in the SF software system by the applicant after receiving the final feedback by hiring manager; after which hiring manager creates offer information in SF software system that includes salary package, designation and related office accessories details in the offer.

Recruiting Partner approves the offer information created by hiring manager and advances the applicant's candidacy further for HR Operations team. HR Operations team creates the legal offer letter in another software application system known as Penneco and sends it to the applicant for acceptance.

Applicant offer acceptance decision is received by HR Operations and is informed to hiring manager and recruiting partner. Recruiting Partner is now ready to close the job requisition after setting the applicant status as "hired" in SF software system. From here, next stage of human resources management process is initiated - "Onboarding".

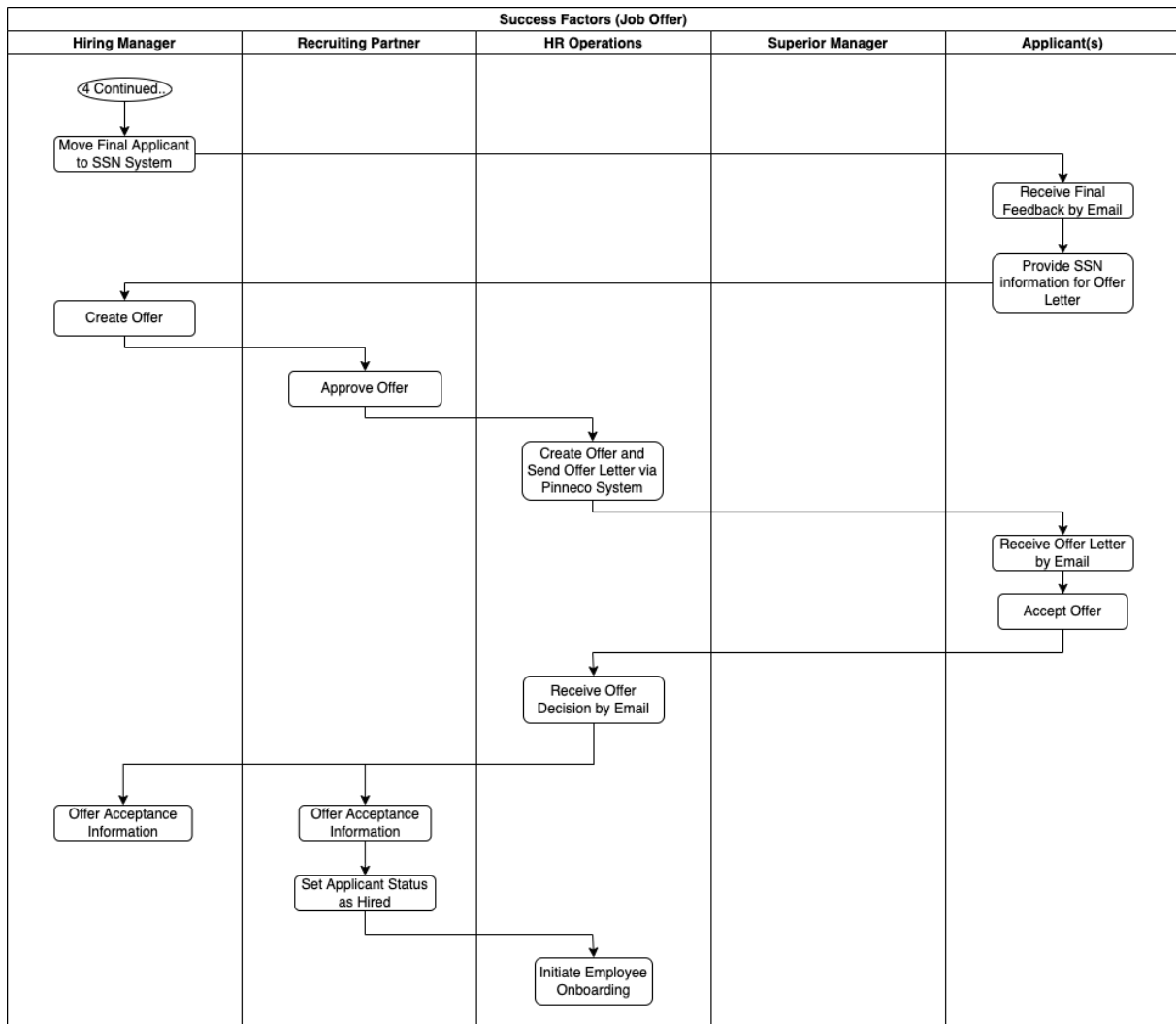


Figure 26: SAP Success Factor Recruiting Sub Process - Job Offer [self-source]

B Appendix - Dataset

In the following sections appears a description of all the dataset consisting of 18 entities.

B.1 Metadata

The OData metadata is a machine-readable description of the data model of the APIs and enabling creation of powerful generic client proxies and tools. With other words the Metadata entity is the library holding all resources to be found through the REST API associated with Organization X. It is all resources within the Human Resource Process. Based on the Metadata source all the datasets associated with the recruitment process has been identified. The relevant datasets and descriptions of them is explained below.

B.2 Candidate

The entity Candidate represent the candidates in the Recruiting module which include core candidate profile data, background elements, application status, comments and data privacy setting information. The dataset consist of the fields: *candidateId*, *lastModifiedDateTime*, *externalCandidate*, *creationDateTime*, and *candidateLocale*. The candidateId is relation key to the application.

B.3 CandidateLight

The entity CandidateLight entity represents the candidates but with fewer fields. The dataset is good for validation of the candidates and associated data. The dataset consist of the fields: *candidateId*, *creationDateTime*, and *candidateLocale*. The candidateId is relation key to the application.

B.4 CandidateProfileExtension

The entity CandidateProfileExtension holds hidden data about the candidate. This is data that is not entered by the candidate but observed by the CRM system, as logs of the entries regarding the candidate. The dataset consist of the fields: *candidateId*, *lastModifiedDateTime*, *createdBy*, *lastModifiedBy*,

createdDateTime, and *mdfSystemRecordStatus*. The *candidateId* is relation key to the application.

B.5 JobApplication

The entity JobApplication contains core application data. The dataset consist of the fields: *applicationId*, *AvailableStartDateItell*, *status*, *sourceLabel*, *jobReqId*, *lastModifiedDateTime*, *candidateId*, *appLocale*, and *snapShotDate*. The *applicationId* is the relation key to the other datasets, and the *candidateID* is the key to relate the application with the relevant candidates.

B.6 JobApplicationAudit

The entity JobApplicationAudit represents the job application audit information. The dataset consist of the fields: *revNumber*, *fieldOrderPos*, *refType*, *source*, *changedBy*, *fieldId*, *lastModifiedDate*, *lastModifiedBy*, and *fieldType*.

B.7 JobApplicationInterview

The entity JobApplicationInterview contains the interview information and user details of who interviewed the applicant. The dataset consist of the fields: *applicationInterviewId*, *templateType*, *source*, *applicationId*, *startDate*, and *status*. The *applicationId* is the relation key between the interview dataset and the application dataset.

B.8 JobApplicationOnboardingData

The entity JobApplicationOnboardingData represent the Job Application Onboarding Portiet information. The dataset consist of the fields: *onboardingId*, *submittedBy*, *submittedOn*, *applicationId*, and *status*. The *applicationId* is the relation key between the onboarding dataset and the application dataset.

B.9 JobApplicationSnapshotInsideWorkExperience

The entity JobApplicationSnapshotInsideWorkExperience represent the job application Snapshot background information. The dataset consist of the fields: *backgroundElementId*, *lastModifiedDateTime*, *endDate*, *title*, *bgOrderPos*, *applicationId*, *department*, and *startDate*. The applicationId is the relation key to the other job application datasets.

B.10 JobApplicationStatusAuditTrail

The entity JobApplicationStatusAuditTrail represents the job application status audit trail information. The dataset consist of the fields: *revNumber*, *lastModifiedDateTime*, *createdBy*, *lastModifiedBy*, and *createdDateTime*.

B.11 JobOffer

The entity JobOffer contains core offer data. The dataset consist of the fields: *offerApprovalId*, *lastModifiedDate*, *lastModifiedBy*, *internalStatus*, *createdDate*, *createdBy*, *formDataId*, and *applicationId*. The applicationId is the relation key between the job application and job offer.

B.12 JobOfferApprover

The entity JobOfferApprover represents the approvers of the Job Offer. The dataset consist of the fields: *offerApproverId*, *offerApprovalId*, *lastModifiedDate*, *lastModifiedBy*, *approverOrder*, *approverActionDate*, *createdDate*, *createdBy*, *approverAction*, and *approvalStepId*. The offerApproverId is the relation key between the Job offer approver dataset and the Job offer dataset.

B.13 JobReqFwdCandidates

The entity JobReqFwdCandidates represent the details of the candidates forwarded to a job requisition. The dataset consist of the fields: *jobReqId*, *candidateId*, *lastModifiedDate*, *referralId*, *createdDate*,

candidateSiteId, and *status*. The *jobReqId* is the relation key between the forwarded candidates and the job requisition.

B.14 JobRequisition

The entity JobRequisition contains core application data. It represents the data of a Manager requesting HR for initiates to a potential employment. The dataset consist of the fields: *jobReqId*, *templateType*, *createdDateTime*, *jobCode*, *numberOpenings*, *costCenter*, *currency*, *deleted*, *statusSetId*, *country*, *businessUnit*, *lastModifiedDateTime*, *templateId*, *openingsFilled*, *formDueDate*, *formDataId*, *assessRatingScaleName*, *internalStatus*, *positionNumber*, *organization*, *department*, *lastModifiedBy*, *candidateProgress*, *templateName*, and *location*. The *jobReqId* is the relation key between the job requisition and other JobReq related datasets.

B.15 JobRequisitionGroupOperator

The entity JobRequisitionGroupOperator contains information of all the recruiting groups, which are associated with job requisitions. An administrator links the groups to a job requisition template and recruiting groups are then linked to the job requisitions during their creation. The dataset consist of the fields: *userGroupId*, *jobReqId*, *operatorRole*, *userGroupName*, and *isDisabled*. The *jobReqId* is the relation key between the requisition Group and the job requisition.

B.16 JobRequisitionLocale

The entity JobRequisitionLocale represents the data about external/internal job description header, footer, external or internal title, external or internal description, and status in different locale. The dataset consist of the fields: *jobReqLocalId*, *jobReqId*, *jobTitle*, *externalTitle*, and *locale*. The *jobReqId* is the relation key between the requisition locale and the job requisition.

B.17 JobRequisitionPosting

The entity JobRequisitionPosting represents the job requisition posting details. The dataset consist of the fields: *jobReqId*, *jobPostingId*, *postStartDateOffset*, *lastModifiedDateTime*, *lastModifiedBy*, *postedBy*, *postingStatus*, *postEndDate*, *boardId*, and *postEndDateOffset*. The *jobReqId* is the relation key between the requisition posting and the job requisition.

B.18 OfferLetter

The entity OfferLetter represents the Offer Letter of the application in Recruiting Management, which includes building a letter from a predefined template, reading it, and sending it to the applicant. The dataset consist of the fields: *offerApprovalId*, *internalStatus*, *createdDate*, *lastModifiedDate*, *lastModifiedDate*, *createdBy*, *lastModifiedBy*, *formDataId*, *applicationId*, *createdDate*. The *applicationId* is relation key to the application and the *offerApprovalId* is the relation key to the applicant and its offer Approval.

C Appendix - Requirement list

In the following sections appears a description of all requirements for the solution.

ID	FR 1
Name	The service module must be able to integrate with developed HR systems.
Summary	The service module must be able to integrate with HR recruitment system to be able to interact with organizations' system and extract their recruiting data. It must in terms be able to do get- and post requests to the HR system.
Rationale	One of the main parts of the service module, is being able to allow and interaction with new and existing organizations' associated with SF HR recruitment system, and activation of the service .
Inspiration	Section 7.3.1
MoSCoW	Must

Table 8: Requirement no.1

ID	FR 2
Name	The service module must be able to process a new user as an Applicant allowing to create a profile with personal details and uploading CV.
Summary	The service module must be a allow new Applicants to create their personal profile in order to submit applications and view application statuses through the Applicant's interface view.
Rationale	One of the other main parts of the service module, is creation of Applicants profile to process and view relevant data
Inspiration	Section 7.3.1
MoSCoW	Must

Table 9: Requirement no.2

ID	FR 3
Name	The service module must be able to interact with organizations HR system to submit job applications.
Summary	The service module must be able to interact with organizations HR system and submit job applications on behalf from the SmartProfile.
Rationale	The design must be able to interact with the HR system through the necessary HTTP request.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 10: Requirement no.3

ID	FR 4
Name	The service module must be able to model real time application status based on system log data.
Summary	The service module must be able to model real time application status based on system log timestamp. For each time the organization is doing modification on the specific case (Job requisition) the service module will retrieve that log.
Rationale	The connection the service module is establishing must be able to make a get request each time a log is being created
Inspiration	Section 7.3.1
MoSCoW	Must

Table 11: Requirement no.4

ID	FR 5
Name	The service module must have a mechanism for updating the application status on applicants' interface view when logged in an organization.
Summary	Based on data, the service module must have a mechanism for updating the application status on applicants' interface view when logged in an organization. The logged data must be modelled by the service module and provide the different activities as status for the applicants' interface.
Rationale	The retrieved data from the HR system must be modelled and transformed to status fields.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 12: Requirement no.5

ID	FR 6
Name	The service module must have a mechanism to extract data and perform transformations.
Summary	The service module must have a mechanism to extract organizations specific recruiting history data and perform transformations to create recruiting statistics and patterns to the interfaces.
Rationale	The retrieved data from the HR system must be modelled and transformed in the service design with business intelligence.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 13: Requirement no.6

ID	FR 7
Name	The service module must have a mechanism for creating an interface for the organization and provide the organization with overall process statistics.
Summary	The service module must have a mechanism for creating an interface for the organization on their HR System to provide the organization with overall process statistics. This based on own historical data.
Rationale	One of the main parts of the service module, is being able to allow and interaction with new and existing organizations' associated with SF HR recruitment system, and activation of the service.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 14: Requirement no.7

ID	FR 8
Name	The system module must have a mechanism to integrate the outcome of Requirement No.6 into the applicants' interface view.
Summary	The service module must have a mechanism to extract organizations specific recruiting history data and perform transformations to create recruiting statistics and patterns to the applicants interface.
Rationale	The retrieved data from the HR system must be modelled and transformed in the service design with business intelligence.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 15: Requirement no.8

ID	FR 9
Name	The service module must be able to store and update Applicants created profile data.
Summary	The service module must be able to update the applicants profile and hold the latest version.
Rationale	When an update is happening on the candidate profile, the system must be able to update it in the stored data.
Inspiration	Section 7.3.1
MoSCoW	Must

Table 16: Requirement no.9

ID	FR 10
Name	The service module must be able to integrate with other developed HR recruitment systems other than SF.
Summary	The service module must be generalized and in-appended on the case study, therefore, able to integrate with other developed HR recruitment systems other than SF.
Rationale	The organizations must provide the needed credentials for the HTTP header to interact with HR systems.
Inspiration	Section 7.3.1
MoSCoW	Should

Table 17: Requirement no.10

ID	FR 11
Name	The service module could have the ability to allow organizations to access applicants profile and contact for any relevant opportunities.
Summary	After the service module is implemented and as a generalized solution, if the organization is interested in finding suitable candidate quickly from the service module pool of candidates, the system should have the possibility to provide for such information to organizations.
Rationale	The system must be able to create a communication channel, with which organizations can access candidate details from the service module.
Inspiration	Section 7.3.1
MoSCoW	Could

Table 18: Requirement no.11