Universiteit Leiden

ICT in Business and the Public Sector

The contribution of organizational structure components whilst implementing a disruptive technology within a central governmental context

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MASTER'S THESIS

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Abstract

Introduction

Organizational structure is involved with organizing all kinds of processes and activities associated with the implementation of disruptive technologies. It is questionable to what extent central governmental organizations understand the contribution of organizational structure components throughout the implementation of a disruptive technology; however, early recognition of organizational structure implications can provide organizations with guidance during the implementation process, allowing them to deal with disruptive technologies in a structured and responsible manner.

Objective

The primary objective of this study is to identify the contribution of organizational structure in the implementation process of disruptive technologies within central governmental organizations.

Method

Within a multiple-case study, organizational structure components are categorized as units of analysis. As a result, it is possible to assess the contribution of each component of organizational structure in practice. A contribution is regarded as a component of organizational structure that aids in the implementation process. A literature review establishes how organizational structure component, *processes*, *project management*, *business and IT alignment*, *knowledge management*, and *organizational culture* are reflected in the implementation of disruptive technologies. The multiple-case study consists of two implementations of the disruptive technology AI and one implementation of traditional software within three different central governmental organizations. Additional research is required to prioritize the contribution of organizational structure components. The research design of this study does not include a measurement method aimed at prioritizing the contribution of components of organizational structure.

Results

The organizational structure components *project management* and *business and IT alignment* do not seem to contribute to the implementation of the disruptive technology AI within a central governmental organization, while incorporating both components can be beneficial for structuring the implementation. Incorporating human judgment into the process and formalizing activities throughout implementation promotes transparency and repeatability in decision-making. On the other hand, the contribution of the components *knowledge management*, *processes*, and *organizational culture* is found in the results of both the disruptive technology cases in this study. Within the traditional software implementation, all examined components of organizational structure have a contribution to the implementation process.

Conclusion

Formalization of activities during the implementation of a disruptive technology enables central governmental organizations to work in a structured way with a multidisciplinary team and address issues such as legislation, transparency, and the reproducibility of decision-making during the implementation phase of a disruptive technology. This study provides central governmental organizations a guideline to organize their disruptive technology implementations in a formalized manner, establishing regulated implementation procedures and limiting the spread of unfettered AI applications.

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1 Introduction

The Dutch central government is faced with the challenges of implementing algorithms and artificial intelligence (AI) applications in a controlled manner that ensures the applications' quality. The application of algorithms allows Dutch central governmental organizations to make calculations in their policies that would otherwise be overly complicated or time-consuming for employees to perform. However, these algorithm-based applications have direct implications for Dutch citizens in some cases. In recent years, two examples have come to light in which algorithms are misapplied within the Dutch central government. The most well-known case is the childcare benefit scandal, in which individuals were erroneously labeled as fraudsters due to the employment of algorithms, which led to ethnic profiling. Amnesty International concludes that this is a form of discrimination and hence a violation of human rights (Amnesty International, 2021[1]). Within the second example of the "System Risk Indication" (SyRI), algorithms were also employed to detect and counteract benefit fraud and misuse (Ministry of General Affairs, 2020[2]). In the case of SyRI, the Dutch court determined that, notwithstanding the system's permissible use of data analysis techniques, the system provides insufficient safeguards to protect individuals' privacy.

We follow the definition of AI from the European Commission, which the Dutch government also uses. According to the Dutch central government's strategic action plan for AI “Artificial intelligence (AI) refers to systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals.’’ (The European Commission’s high-level expert group on artificial intelligence, 2018.P1[3], Ministry of Economic Affairs and Climate, 2019[4]). AI algorithms are a subset of algorithms. Algorithms are a collection of connected instructions that solve a specific issue or execute a certain activity; this can be accomplished without AI. Not all algorithms incorporate AI, yet a subset of these algorithms does. This is when the disruptive aspect intervenes.

The Netherlands Court of Audit concluded from their study on the algorithm usage within Dutch central governmental organizations that AI algorithms are heavily reliant on data, making the quality and reliability of data two critical factors to assess (Netherlands Court of Audit 2021[5]). Both algorithms in the case study of this thesis are consistent with these findings, as they are data-driven and trained by hand. The algorithms require manual model construction; thus, this guided method of algorithm learning is most similar to supervised learning. ‘’Supervised algorithms need humans to give input and required output, in addition to providing feedback about the prediction accuracy in the training process.’’ (Saravanan and Sujatha, 2018 p.945[6]). This thesis examines the disruptive technology AI via the perspective of implementations of AI algorithms within the Dutch central government, focusing on the contribution of organizational structure components to the implementation process in a central governmental organization.

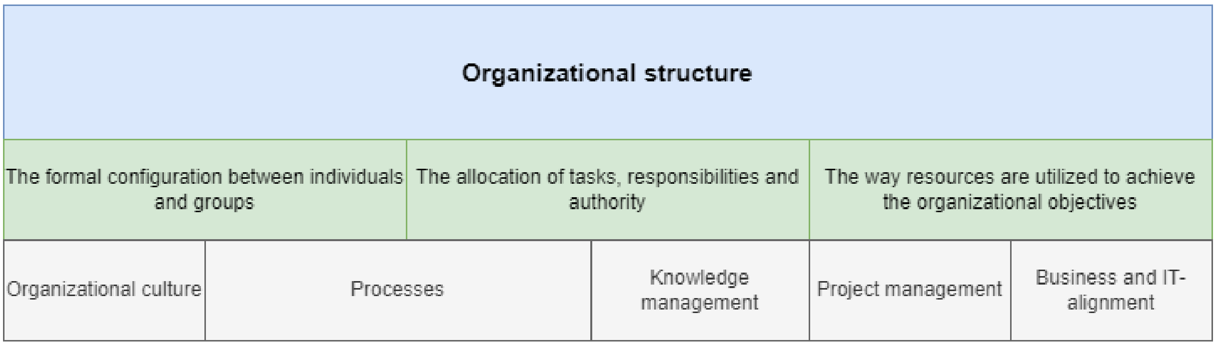
According to a report from the Netherlands Court of Audit, most implemented algorithms within the Dutch central government are considered relatively simple (Netherlands Court of Audit 2021[5]). The term "simple’’ refers to how these algorithms generate uncomplicated, automated decisions that have little impact on Dutch citizens. Nonetheless, the Netherlands Court of Audit anticipates that algorithms will become more sophisticated when self-learning algorithms are applied to solve more complex calculations. Future implementations are less concerned with the automatization and execution of straightforward tasks. It is critical to keep the application of algorithms predictable to be future-proof. Most algorithms within the Dutch central government are developed bottom-up at an operational level within the organization. ''Senior ministry officials and Chief Information Officers (CIOs) at ministries have little insight in this process'' (Netherlands Court of Audit, 2021, p37 [5]). As a result, top management is unable to perform timely risk assessments and cannot evaluate the potential negative impact of algorithms on governmental services.

Furthermore, the Council of Europe addresses that the increasing importance of algorithms within decision-making processes calls for a better understanding of the design and components of decision-making procedures (Council of Europe, 2017[7]). A stakeholder involved in an algorithm-based process must be aware of their possible bias during the design of such processes. During the design of processes, a mismatch may occur between the intention to innovate and the organization's disruptive innovation capabilities. Bridging this gap between the intention to innovate and the innovation capabilities should become an integral part of an organization's innovation strategy (Assink, 2006[8]). Understanding how organizational structure components are involved and their contribution to the implementation of AI algorithms can assist in bridging this research gap.

Organizational structure is involved in organizing all kinds of processes and activities associated with the implementation of disruptive technologies. When implementing a disruptive technology, the availability of resources, existing processes, and shared values within an organization all impact an organization's ability to implement disruptive technologies (Christensen and Overdorf, 2000[9]). Thus, existing organizational processes will be impacted as central governmental organizations work to create and expand the competencies necessary to effectively capitalize on the prospects presented by AI (European Commission, 2020[10]). Due to the general complexity of these disruptive technologies, an assessment of potential consequences is required as well as additional research into how technologies integrate, interact, and change and their societal implications (Schuelke-Leech, 2018[11]).

This thesis examines how components of organizational structure contribute to the implementation of the disruptive technology AI. The following definition of organizational structure is formulated from existing definitions of organizational structure in the current body of knowledge; organizational structure is the ''formal configuration between individuals and groups regarding the allocation of tasks, responsibilities, and authority within the organization'' (Lunenburg, 2012, p1[12], Galbraith, 1987[13], Greenberg, 2011[14]). Furthermore, organizational structure is a method that defines how resources are used to achieve organizational objectives (Akbari et al., 2012[15]). Figure 1 groups the points that arise from the existing body of knowledge on organizational structures underneath the components of the definition mentioned above. This figure depicts schematically how the concept of organizational structure is divided into components. The contribution of these five components of organizational structure is examined in a multiple-case study within three central governmental organizations. The literature review addresses the theory and logic behind these components.

Figure 1: Organizational structure components



1.1 Problem statement

Future algorithms will be more sophisticated in terms of technological complexity and task automation capabilities. As a result, central governmental organizations must make initiative-taking efforts to ensure their readiness for the consequences of the growing algorithm's complexity. ''The consequences of growing complexity are declining predictability and controllability, as well as increasingly unintended consequences of private and public attempts to govern via algorithms.'' (Just and Latzer, 2016, p254[16]). Thus, while implementing AI algorithms within a central governmental context, efforts must be made to consider societal implications and adhere to existing structures, processes, and legislation. Initiatives in this area are ongoing; for example, the Impact Assessment voor Mensenrechten bij de inzet van Algoritmes (IAMA) is released in July 2021. IAMA is an assessment tool focused on the responsible development and implementation of algorithms. The instrument enables an interdisciplinary dialogue by those accountable for developing or implementing an algorithmic system. The project sponsor within the governmental organization is primarily responsible for conducting the IAMA (Gerards et al., 2021[17]). The likelihood of the algorithm-related risks listed before should be reduced due to this impact assessment.

The Dutch central government's use of algorithms has been the subject of numerous discussions in recent years. The aforementioned childcare benefit scandal indicated the implications of algorithms on citizens, legislation, and the decision-making of algorithms. Furthermore, the Netherlands Court of Audit evaluated the algorithm's accountability, transparency, privacy, and ethical implications inside the Dutch central government. Implementing the disruptive technology AI impacts how organizations organize their processes and policies. The challenge is whether organizations understand how these five components of organizational structure are involved and their contributions throughout implementation. Understanding the role and contribution of organizational structure early on provides organizations with guidance during and after implementation, allowing them to deal with the application of a disruptive technology in a formalized and responsible manner.

1.2 Thesis overview

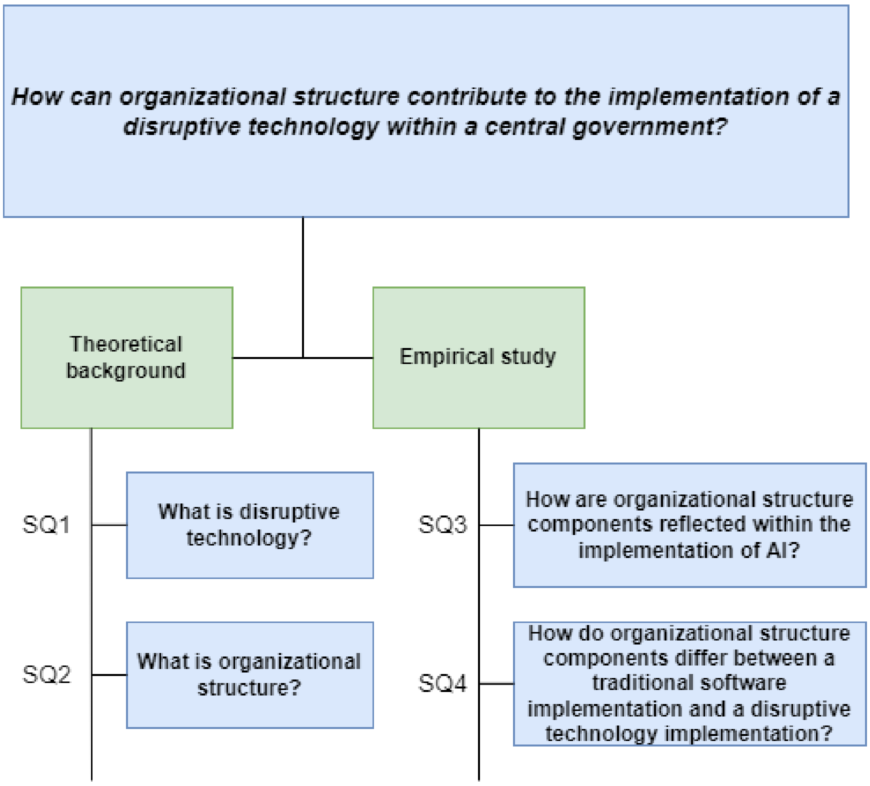
This thesis is structured as follows. Chapter one provides a brief overview of the subjects addressed in this thesis and why they are currently relevant. Chapters two and three formulate the research objectives, scope, limitations, design, and methodology. The fourth chapter then reviews relevant literature on disruptive technologies and organizational structure. The findings of the performed research are covered in chapter five. The discussion of results, the conclusion, and recommendations for future research are presented in chapters six and seven of this thesis. The semi-structured interview questionnaires and the transcriptions of the nine interviews are found in the appendix of this document.

2 Research objectives

This study aims to improve the understanding of the organizational structure that must be considered when implementing the disruptive technology AI within a central governmental organization. Organizational structure is used as an umbrella concept for various components related to organizational design and organizational architecture. The literature review performed for this thesis results in an operationalization of organizational structure, allowing for a detailed examination of the underlying components. A multiple-case study provides additional insights, which are discussed in greater detail in the methodology chapter of this thesis. This research will help future disruptive technology implementations within central government organizations by providing insight into how organizational structure can aid in the implementation of a disruptive technology.

Figure 2 provides an overview of this research's formulated research question (RQ) and sub-questions (SQs).

Figure 2: Breakdown of RQ and SQ's



The first section of the literature is devoted to disruptive technology, specifically AI. The literature review discusses the distinction between disruptive innovation and disruptive technology, the consequences of implementing disruptive technology, and the distinction between disruptive technology and traditional software. The introduction and scoping sections describe the funnel that leads from disruptive technology to AI algorithms. The second section of the literature review addresses SQ two by examining the existing body of knowledge of the five identified components of organizational structure. SQ two discusses why specific facets of organizational structure are being examined in this research and how the components were chosen. The definition of organizational structure stated in the introduction is leading throughout this study.

Through a multiple-case study, this research compares implementations of disruptive technologies, emphasizing the role of organizational structure components. A case is defined as an implementation of a disruptive technology within a Dutch central governmental organization. For comparative purposes, a case can also be a traditional software implementation. The aim is to examine how components of organizational structure contribute to the implementation of a disruptive technology. Furthermore, the case study contributes to a better understanding of the common organizational structure components used throughout the implementation process of central governmental organizations. As disruptive technologies are known to disrupt complete business models, the consequences in terms of alignment, process design, and the impact on organizational culture may be more severe than with a traditional software implementation. We define disruptive technology as ''A specific technology that can fundamentally change not only established technologies but also the rules and business models of a given market, and often business and society overall.'' (Oxford reference, 1997[18]). Section 4.1.1 discusses the far-reaching implications of disruptive technologies.

The multiple-case study includes nine interviews with three employees from the same central governmental organization, with a unique role in the implementation process. Three distinct roles are chosen to clarify the contribution of organizational structure components from three distinct perspectives. The semi-structured questionnaire is divided into sections that correspond to the components of the organizational structure depicted in figure 1. This approach enables the component's contribution to implementation to be specified and articulated in an organized and repeatable manner across the case studies.

This study:

- Provides an overview of organizational structure components and their implications while implementing a disruptive technology.
- Provides data scientists, project managers, and other stakeholders participating in the implementation process with knowledge regarding the contribution of organizational structure components to the implementation of AI algorithms within the context of a central governmental organization.
- Deconstructs broad concepts such as organizational structure and disruptive technologies to enable the knowledge to be applied to more specific situations.

2.1 Academic relevance

This study addresses several studies conducted on individual organizational structure components. The concepts of organizational structure, disruptive technologies, and software implementations are extensively studied. An analysis and operationalization of the involvement of these extensively studied components on the implementation of disruptive technologies within central governmental organizations lead to valuable context-specific knowledge. This research yields insights into organizational structure components and their contribution to the implementation of disruptive technologies within the context of central governmental organizations.

The findings and recommendations are primarily applicable to central governmental organizations, as there may be cultural and organizational structure distinctions between private sector organizations and central governmental organizations. However, these distinctions are not discussed in detail in this thesis's literature review and discussion sections. In addition, for each organizational structure component, literature on central governmental organizations and public sector organizations is described. Thus, the researcher strives to set on previously conducted research aimed at this specific context. Furthermore, the findings of this research encourage further research on the contribution of organizational structure components to the implementation of disruptive technologies within and outside the context of central governmental organizations.

2.2 Scope

The scope of this research project is confined to central governmental organizations. The multiple-case study is focused on two cases of disruptive technology implementations. As noted in the introduction, two cases include the implementation of AI algorithms, yet a traditional software implementation is also examined. These implementations are studied at three distinct Dutch central governmental organizations. This research explores the contribution of organizational structure components during the implementation of a disruptive technology within the specific context of a central government. The application of AI within algorithms is the main disruptive technology in this study. The components of the organizational structure that were considered relevant based on the literature review are depicted in figure 1 in the introduction. This figure explains how organizational structure components relate to one another and where each component is categorized.

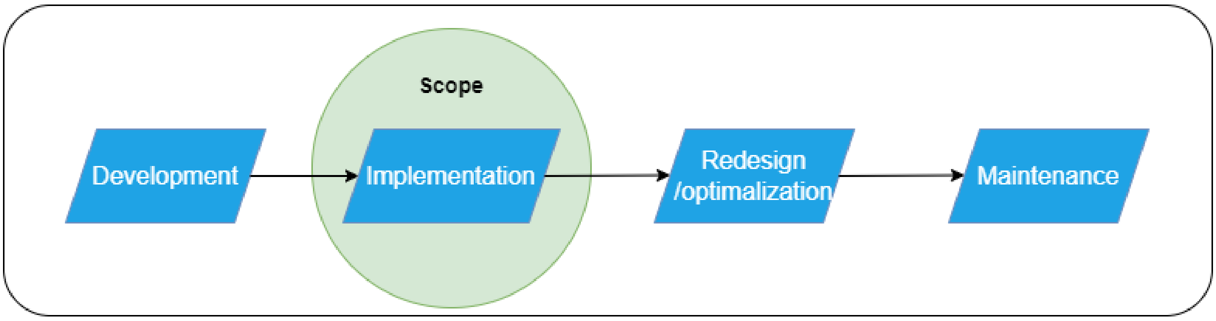
Because no comparison to a non-AI algorithm is made in the results and discussion section, the term AI algorithm is omitted; thus, algorithms refer to AI algorithms within the results and discussion section. The methodology chapter discusses the impact of algorithms; within this study, the impact is not necessarily related to the AI application but rather to the extent to which existing processes are impacted and the complexity of the automated task. The literature review and empirical study in this thesis focus on the organizational structure components that contribute to the implementation of AI. Furthermore, the second half of the literature review is based on existing definitions and studies on components of organizational structure.

The definition of organizational structure is overly comprehensive and can be further broken into other organizational structure components. The introduction discusses the original definition of organizational structure and all the organizational structure components examined within this thesis. The methodology chapter outlines the criteria used by the researcher in selecting cases and interviewees. The phase of implementation was chosen based on the following criteria:

- The data scientist is responsible for almost all aspects during the development phase. To some extent, other roles are involved during the implementation phase, allowing for multiple perspectives on the algorithm.
- Decision-making during the implementation phase has implications for the follow-up process. Documenting those decisions contributes to a more transparent working method for AI implementations within the Dutch central government (Ministry of Justice and Security, 2021[19]).

The interviews revealed that developing an AI algorithm is roughly divided into four phases. As illustrated in figure 3, this thesis focuses on the implementation phase. The development phase and the other phases indicated in figure 3 are inextricably linked; therefore, as this is a process with interrelated steps, we mention the contribution of these phases throughout the empirical component of this research. The phase in which the organizational structure component contributes is indicated; further analysis of these phases is beyond the scope of this study. The phases are repeated in the results and discussion section of this thesis to examine the role of organizational structure components.

Figure 3: Phases of application of AI algorithms in the Dutch central government, based on the empirical findings of this research



The interviews took place over two months, and all interviewees agreed to the transcripts of their interviews. The population analyzed consists of nine individuals directly involved in the implementations. These stakeholders were asked about the involvement of the organizational structure during implementation using a semi-structured questionnaire. Since three distinct viewpoints are formed through interviews and document analysis, this study provides a comprehensive perspective of three separate implementations within the Dutch central government. The generalizability of the results on AI algorithm implementations for non-central governmental organizations may be limited because resource allocation is market-dependent, profit-driven, and large organizations must invest in an AI algorithm application within their processes where small organizations lack the resources.

3 Research methodology

Qualitative research methods are chosen as the research instrument for this study, and in-depth interviews are performed to acquire qualitative data from multiple cases. A multiple-case study is conducted to answer the objectives of this research. This case study focuses on the contribution of organizational structures and underlying components such as culture, the alignment of business goals with the IT implementation, processes, and project management while implementing a disruptive technology in a central governmental organization.

This multiple-case study is focused on two cases of disruptive technology implementations and one traditional software implementation case to draw comparisons in the field of organizational structure components between the cases. Case studies aid in understanding phenomena involving concrete context-dependent knowledge (Ridder, 2017[20]). Given that the primary objective of this study is to examine two disruptive technology implementations and one traditional software implementation in the context of central governmental organizations, the case study assists the researcher in gathering information and developing an understanding of this context-specific phenomenon.

A literature review is performed during the case study's design phase to understand disruptive technologies and organizational structure components. The probability of a relationship between organizational structure and the implementation of disruptive technologies is studied using this literature review to substantiate this theoretical premise. Following that, extensive research into the contribution of these components is performed via a case study. The case selection approach should be linked to the previously formed theory via the literature review; this way, it may be avoided that the chosen cases do not contribute to the explanation of the research subject. Section 3.22 outlines the procedure for doing so.

Several challenges for AI implementations were identified during the literature review. These challenges are identified in the areas of organizational capabilities, organizational infrastructure (Reim et al., 2020[21]), trust, people (Hengstler et al., 2016[22]), and knowledge management (Misuraca and van Noordt, 2020[23]).

Search engines and the Google scholar, ScienceDirect, Core, and Leiden University libraries are used to identify current research on disruptive technologies and organizational structures. The following keywords have been used in combination or solely, disruptive technology, emerging technologies, AI, algorithms, transparency, disruptive technology implementations, implications of disruptive technologies, organizational structure, process design, organizational culture, innovation culture, public sector innovation, central government innovation, and Dutch central government.

A semi-structured interview approach is most suitable for this research as it encourages a thorough exploration of the interviewees' answers. This build-in flexibility is essential as the overall goal is to understand a particular phenomenon. Thus, being able to ask more in-depth questions about this phenomenon may lead to valuable case-specific insights. Semi-structured interviews have a standardized section of questions, which is beneficial for the overall reliability, as reliability describes the uniformity of the analysis techniques used (Noble and Smith, 2015[24]). Moreover, in-depth interviews are less concerned with generalizing to a larger population of interest and do not rely on hypothesis testing (Dworkin, 2012[25]). The data gathered via in-depth interviews with stakeholders is transcribed for coding. The interviewee validates the given answers afterward via e-mail to reduce the risk of misinterpretation. To minimize bias of the interviewer, open-ended questions are used as much as possible and loaded language is avoided as much as possible (Salazar, 1990[26]).

For reasons of privacy, the transcriptions are anonymized. The input of the interviewees may strengthen or refute theories discovered during the literature review on organizational structure, governance structures, and experiences with disruptive technologies that are already well-established within a central governmental organization. Afterward, the interviewees are asked two additional standardized questions to ensure that all essential topics have been covered and that the interviewee's expectations are met.

The case study method examines the underlying aspects of organizational structure theories and their relationship to the implementation of disruptive technologies. It complements the literature review by allowing for an in-depth analysis of characteristics through conducting interviews. In addition, another qualitative research method, document analysis, is used. Document analysis provides documentary evidence that can be combined with the data from the interviews to reduce bias and establish credibility (Bowen, 2009[27]). The document analysis procedure is discussed in more detail in section 3.2.3.

3.1 Grounded theory

The grounded theory is applied based on the output of the aforementioned data-collection methods. A ground-up strategy is used for the analysis, in which it is checked whether patterns can be derived from the acquired data to arrive at concepts. Throughout the analysis process, the interviews are coded and classified to serve as a foundation for identifying any connections between categories and concepts throughout the analysis phase. During this phase of analysis, links are developed between the identified concepts. Built on a thematic analysis, a conceptual model is made based on the coded transcripts of the interviews. With these concepts, the goal is to arrive at theory and design a conceptual model that clarifies the set of concepts. Section 3.4 of this thesis explains the coding process in more detail.

3.2 Case study

Components of a case study protocol (CSP) are used to structure the case study. This protocol includes an overview of the cases studied (sections 5.1.1, 5.1.2, and 5.1.3), a description of the data collection procedures (chapter three), and the questions for data gathering (3.3 and appendix A). Case descriptions and the interpretation criteria for the findings of this study are discussed in the discussion section of this thesis. A multiple-case methodology is applied in this study as analyzing a traditional software implementation, and a disruptive technology implementation already requires two cases to be studied. Studying a single case of disruptive technologies makes the research design vulnerable as your analysis depends solely on a single case of disruptive technology. This case study yields three cases in total, enabling the possibility for data analysis for each case and across the three cases, which is helpful in discussing case similarities and differences through literal and theoretical replication.

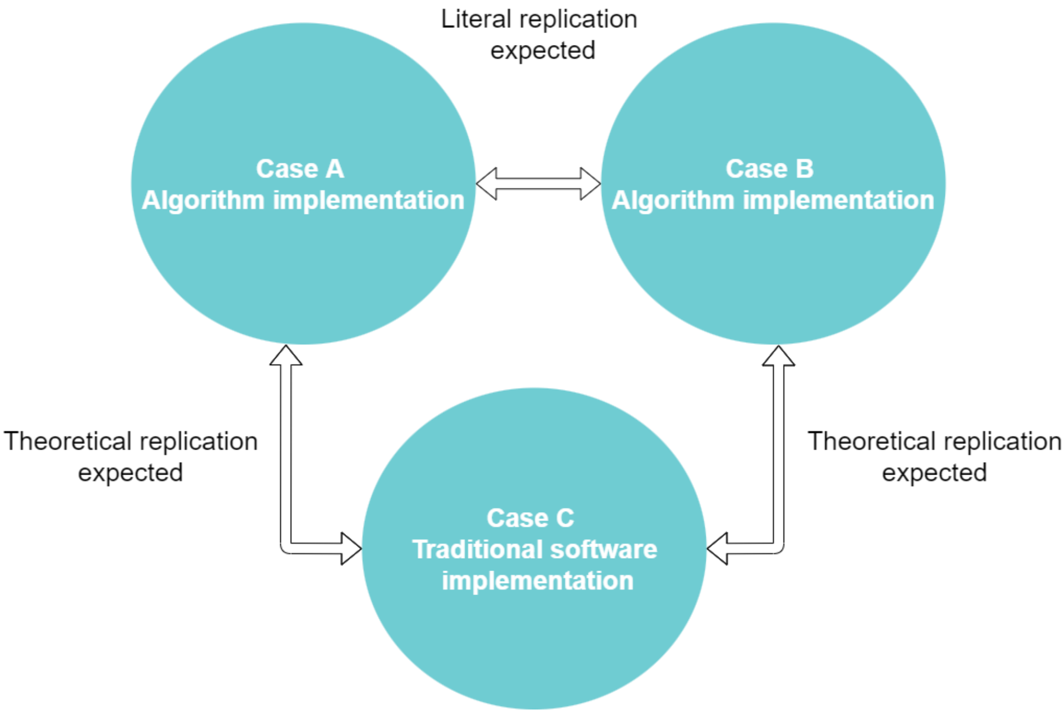
An embedded research design is used in this multiple-case study, as it includes various units of analysis. The concept of organizational structure involves multiple components, as stated in the literature review. These organizational structure components are considered separate units of analysis, allowing the researcher to summarize and analyze the case study findings per component. The results lead to a conclusion on how these factors contribute to the implementation of disruptive technologies within central governmental organizations. These components are included as units of analysis for the case study. Table 1 presents the units of analysis. The units of analysis correspond to the sections of the semi-structured questionnaire to emphasize the significance and added value of each interview question within each segment. The table also includes other theoretically relevant data. This information is obtained from the literature review.

Table 1: Case study design: Units of analysis

Units of analysis:	**Kinds of data**	
Organizational structure component 1: Project management	Documentation and formalization of activities	Roles, tasks, and responsibilities
Organizational structure component 2: Knowledge management	Managing knowledge transfer	IT knowledge during implementation
Organizational structure component 3: Processes	Processes ex-ante and ex-post implementation	Optimization and automatization
Organizational structure component 4: Business and IT alignment	Existence of procedures and compliance with procedures	Alignment with goals of the organization
Organizational structure component 5: Culture	Subcultures and shared values	Resistance to change

Two of the cases in this case study focus on implementing disruptive technologies. Studying cases of the same disruptive technology allows for the identification of components that emerge in both cases. This is called literal replication. The traditional software case is selected to indicate opposing outcomes, called theoretical replication. Literal replication may be applicable to several organizational structure components; thus, it is useful to analyze whether these components are similarly involved during the implementation of disruptive technologies. The third case, the implementation of traditional software, is likely to generate contradictory results, as disruptive technologies exhibit distinct characteristics from traditional software. The first section of the literature review discusses examples. Figure 4 summarizes these replication principles and illustrates the predicted replication types between the cases in this case study.

Figure 4: Case study research design



3.2.1 Screening of candidate cases

The number of implemented or fully operational disruptive technologies considered comprehensive enough to study within the context of the Dutch central government is limited due to the limited number of eligible candidates for the two disruptive technology cases. The findings of the Netherlands Court of Audit's report (Netherlands Court of Audit, 2021[5]) regarding the comprehensiveness and maturity of implemented algorithms at Dutch central governmental organizations are considered to avoid analyzing implementations that are not operational (3.2.2 point one). Examining an algorithm that performs simple decisions or performing routine tasks in a non-complex environment is considered less relevant for this case study as the likelihood of organizational structure components being involved is low. Furthermore, the algorithm must include an AI application; this does not have to be entirely self-learning; supervised learning is also suitable (3.2.2 point four).

3.2.2 Case selection procedure

The case selection method is described in detail below. The fit with the case study research design in figure 4 was considered during this selection process. It is expected that literal replication is possible between the two disruptive technology cases and theoretical replication between the traditional software implementation and the two disruptive technology implementations. Point four of the case selection procedure does not apply to the selection procedure of the traditional software implementation. It is feasible that the complexity of the implementation influences how much and to what extent organizational structure components are involved during an implementation (Netherlands Court of Audit 2021[5]). However, an in-depth explanation of complexity is beyond the scope of this study, as we are examining how components contribute during the implementation phase and whether these components vary between a disruptive technology and a traditional software implementation. The case selection considerations are listed below.

1. To what extent the disruptive technology or traditional software is operational or implemented.
2. Availability of documentation, e.g., business case, project plan, implementation plan, roles, tasks, responsibilities, risk analysis, and process documentation.
3. Availability of knowledge: interviewing stakeholders: to gain a comprehensive view, e.g., of a specific implementation, interviews with people in various roles are valuable. An analysis based on opinions and viewpoints can describe different interests of stakeholders.
4. The algorithm must incorporate an application of AI, as this is considered the technology's disruptive aspect.

3.2.3 Document analysis

The document analysis focuses on documentation about a case-specific process, generally defined standards for all processes, and other governance documentation that the researcher or interviewee deems relevant. This analysis also serves as a source of background information for the researcher to understand more of the case's details and other specifics. Since the researcher is reliant on what others decide to share, recreating this information is prone to prejudice. As a result, relevant findings from this documentation are discussed during the interviews, allowing the interviewee to verify or dispute certain elements.

3.2.4 Interviewee selection procedure

Interviewees are contacted primarily based on their involvement during the implementation of the disruptive technology or traditional software. To ensure an unambiguous analysis of the situations, employees in three different roles are requested to participate in semi-structured interviews. Three positions are chosen for interviews: the algorithm's developer or data scientist, a project manager or other professional in a coordinating role, and an end-user of the algorithm.

Whenever multiple employees hold the same position, their engagement and experience with implementing the chosen disruptive technology or traditional software case are considered. Since Yin's analytical approach assesses many perspectives and possible variables, these perspectives contribute to a fuller description of the issue at hand, resulting in more robust conclusions (Yin, R. K.,2012[28]). Section 3.4 details how and which of these methodologies are used and how the interviews are transcribed and categorized using the previously described grounded theory.

The respondents work for three distinct government organizations in the Netherlands. Table 2 summarizes all interviewees, their roles, and their organizations. At organizations A and B, we examined the implementations of a disruptive technology, in this case, algorithms. For the final case study at organization C, an implementation of a software package from an external supplier is studied.

Table 2: Interviewee list

Name interviewee	Organization	Role
Interviewee A	A	Data scientist
Interviewee B	A	Project manager
Interviewee C	A	End-user
Interviewee D	B	Data scientist
Interviewee E	B	Advisor
Interviewee F	B	End-user
Interviewee G	C	Advisor
Interviewee H	C	Project manager
Interviewee I	C	End-user

3.3 Semi-structured interview questions

The semi-structured interview design consists of a couple sections with associated goals and motivation. These objectives are listed to ensure that the study measures what is intended and to maintain a clear and solid line of inquiry. An example is displayed below in table 3. There is an unstructured section for follow-up or other relevant questions and thorough elaboration within the interview design. The interviewees are informed that the interview will be recorded through the interview invitation. The process of transcription, coding, and analysis is aided by recording interviews. The interview questions, as well as the coded elaborations, are included in the appendix.

Table 3: Example interview question with the associated goal

OS-component 3: Processes	
Question	**Goal**
To what extent does process design/coherence of processes influence the implementation of algorithm X?	Process architecture analysis centered on algorithm X

Specific pre-defined questions are irrelevant since the interviewees' roles differ. Furthermore, the questions centered on disruptive technologies are not entirely repeatable in the traditional software situation. For these two reasons, alternative interview questions have been created. In general, these semi-structured interviews are the same, but the relevance of the questions to the interviewee's individual situation and position is assessed. During this assessment, the significance of each question is considered, and if it is not relevant, it is substituted with a question that is relevant to the interviewee's position. These alternative questionnaires are included in the transcripts found in appendix C.

3.4 Analyzing case study evidence

The data gathered from in-depth interviews and document analysis is analyzed. The technique of explanation building is used for this case study research. Explanation building is an analytic methodology focused on the explanation of a specific case, making it a suitable method for this explanatory case study. A multiple-case study aims to develop a theory that is generalizable to each individual case analyzed (Yin, R. K.,2012[28]). Following this strategy lessens analytic issues as a concept of analyzing the data is already made at the outset. As a result, the researcher can work through the data in a more structured way. As mentioned in section 3.1, the grounded theory is applied to arrive at theory and concepts. This analysis is based on the coding procedures defined by (Corbin and Strauss, 1990[29]). This coding process begins with open coding to label thoughts and categorizes them for identification reasons. Then axial coding takes place to construct the connections between the labeled data. Lastly, the categories are thoroughly examined to arrive at concepts for theory. This last part of the grounded theory approach is known as selective coding. The software Atlas.ti was used for coding the interviews.

3.5 Literature review strategy

This study relies heavily on research papers on organizational structure and disruptive technologies. The definitions of some of the important concepts clarified by the literature reviews are summarized at the beginning of this document. Most of the literature consists of academic papers or books. Furthermore, when considered relevant grey literature is used. Grey literature refers to sources that are published outside the academic field. Documents from Dutch governmental advisory bodies, reports published by the Dutch government, white papers from European committees, articles from Harvard Business Review, and a paper from McKinsey were among the grey sources used for this study. Grey literature is considered relevant when one or more of the following conditions are met:

- The source is about the specific context of the Dutch central government.
- The availability of academic sources of a specific subject is limited (e.g., algorithms within (Dutch) central governmental context).
- Due to the topicality of the phenomenon, little academic research has (yet) been conducted. For example, the use of algorithms within the Dutch central government, aligning AI with business, goals, and the applicability of AI legislation.

3.6 Validity

The importance of validity and reliability varies depending on the type of research (Thomas, 2017[30]). This qualitative study and its associated methodologies, including the multiple-case study used in this research, are explanatory in nature. Emphasis is placed on how components of organizational structure contribute during the implementation process of disruptive technology implementations.

A validation procedure reduces the likelihood of bias in the collected data by the researcher. The interviewees of this study are allowed to validate or disprove their answers afterward through e-mail. Lastly, analytic techniques such as explanation building, and theoretical and replications logic are followed and considered in the research design.

3.7 Reliability

Reliability refers to ''The consistency and repeatability of the research procedures used in a case study'' (Yin, R.K., 2012.P240[28]). To achieve inter-rater reliability, which is the expectation of arriving at similar results while collecting data. The use of a semi-structured interview design with pre-determined questions and a fixed sequence increases the reliability of this qualitative research method. The detailed interviews and the findings of the coding procedure are presented in the appendix for repeatability.

Furthermore, multiple areas of the CSP are included within the research design discussed in this methodology chapter. There is less chance of misinterpretation given that definitions have been thoroughly examined. The operationalization of concepts as organizational structure and culture increases the likelihood that the case study results are indicative of the concepts studied during the case studies.

4 Literature review

Existing knowledge and information regarding the implementation of disruptive technologies are studied within this literature review. This section will also clarify the abstract concepts of the main- and sub-questions and will serve as input for qualitative research. The clarification of organizational structure is based on existing definitions and allows for the operationalization of certain concepts. This literature review section is split into two categories. The first segment focuses on disruptive technology. The difference between a disruptive technology and the disruptive innovation theory is explained, and it is examined whether and how disruptive technologies differ from traditional software implementations. Also, it is necessary to evaluate the literature on disruptive technologies within the public sector and government organizations for the scope of the study.

The second segment of the literature review examines organizational structure in detail. It is discussed how specific organizational structure components are involved during the implementation trajectories of disruptive technologies. This chapter covers project management, knowledge management, the impact on processes, the alignment of these disruptive technologies with the organizational goals, and organizational culture. Additionally, the case study will provide an insight into how these factors are involved during the implementation of algorithms within central governmental organizations.

This literature review includes:

Disruptive technology

- The difference between disruptive technologies and disruptive innovations
- How disruptive technologies differ from traditional software
- Impact on processes (AI and the decision-making process)
- Governmental environment and disruptive technologies

Organizational structure

- Relation between organizational structures and IT
- Application of project management on traditional software and disruptive technology
- Knowledge management of disruptive technologies
- Implications on processes of an AI implementation
- Why business- and IT alignment is beneficial for IT implementations
- Contribution of cultural components while implementing AI

4.1 Disruptive technology and innovations

McKinsey & Company published a paper seven years ago describing twelve emerging technologies that have far-reaching implications for three pillars: life, business, and the global economy (McKinsey & Company, 2013[31]). These technologies are called disruptive technologies, as they can drastically alter how we behave in our daily lives (Girasa, 2021[32]). AI is mentioned as one of these disruptive technologies within the McKinsey report. The degree of disruption of these technologies is highly unpredictable ex-ante (Schuelke-Leech, 2018[11]). Disruptive technologies have been implemented within organizations altering the interaction between people and business models (Valter et al., 2018[33]). As a result, human involvement in certain business models can be phased out in the future as they become automated. (Valter et al., 2018[33]) state that disruptive technologies will impact organizational business model innovation as a result of their radical and disruptive nature on how organizations operate. Implementing disruptive technologies involves several levels of inadequacy and complex decision-making, resulting in ambiguous solutions (Dufour and Steane, 2013[36]). (Brennan et al., 2019[37]) argue that these ambiguous solutions result from board members' limited understanding of disruptive technologies and associated risks within organizations. Hence (Bravard, 2015[38]) suggests that at least one technical expert must be appointed to the board of directors to prevent dependence on external IT experts and ensure that the board has adequate oversight of the possibilities of disruptive technologies.

There is a difference between the concept’s disruptive technologies and disruptive innovation. The concept of disruptive innovation stems from the disruption theory of (Christensen et al., 2015[34]). The disruption theory addresses the advantages in terms of innovating capabilities of market entrants and smaller companies on established organizations. Yet more and more established organizations are learning to embrace these principles while implementing disruptive technologies. This includes principles such as iterative software development, creating organizational space for disruptive growth, and customer-centered innovation (Anthony, 2008[35]).

4.1.1 Disruptive technology and traditional software

In addition to the impact of disruptive technologies on the three pillars specified in section 4.1, the characteristics of disruptive technologies are essential for this thesis. Outlining distinct disruptive technology characteristics improves understanding of how organizational structure is involved in the implementation of disruptive technologies. Summarizing these characteristics makes the analysis of how organizational structure components relate to these disruptive technology characteristics more convenient.

Organizations have recently been confronted with the ethical implications of disruptive technologies such as AI. AI should not be trusted in and of itself, as it is a set of techniques that should be used to increase the organization’s trustworthiness. (Ryan, 2020, p. 17[39]) concluded that "proponents of AI ethics should abandon the trustworthy AI paradigm.” Thus, more emphasis should be placed on the reliability of AI-enabled organizations and individuals (Ryan, 2020[39]). A case study in the insurance sector by (Kancevičienė, 2019[40]) discovered a gap between the ethical issues deemed significant in literature and the ethical issues considered relevant by the respondents in this case study. Transparency and data accessibility were identified as two pertinent ethical challenges in the literature and in practice. Transparency in the context of AI is centered on the understandability of AI-based decisions for end-users and other employees. Another challenge is finding the balance between open data access, which contributes to the development of AI applications, and compliance with data owners' rights and GDPR legislation (The Global Partnership on AI, 2020[41]). Testing machine learning (ML) systems poses particular challenges due to the fundamentally different structure and architecture of ML systems compared to traditional software (Zhang et al., 2020[42]). Complex entanglement from hidden feedback loops and a more experimental and iterative approach to developing ML systems are examples of these distinct characteristics of

AI (Amershi et al., 2019[43]). Moreover, professionals face major challenges in testing the quality of AI software and data management (Nascimento et al., 2020[44]). High-quality tools and reviewing procedures are highly available in traditional software engineering; however, these tools and technologies are rarely suitable for the development of systems integrating deep learning (DL) components (Arpteg et al., 2018[45]).

The specification of quality standards, particularly for ML, is an interesting point in the comparison between AI and traditional software, as it is challenging to specify, analyze, and test the quality of ML (Smith and Clifford, 2021[46]). Another area of interest is the development of ML systems. In an extensive ML system, a wide variety of algorithm-specific learning settings and other configurable options can result in a lot of configuration code. According to a paper by (Sculley et al., 2019[47]) on technical debt for ML systems, these configuration activities are widely perceived as an afterthought or unimportant. Yet, critical errors can occur from this configuration code. Furthermore, the multiple-case study by (Nguyen-Duc et al., 2020[48]) revealed that AI developing organizations do not align business metrics on AI development activities. Although the alignment of business and technical activities is needed to maximize the added value of integrating AI systems(Nguyen-Duc et al., 2020[48]). Another study performed in the health care industry found that, due to the uncertain future of ML, stakeholder support is essential for the adoption of ML initiatives (Shaw et al., 2019[49). An overview of the challenges concerning the disruptive technology AI are listed in table 4. These challenges involve sub-challenges that have been recorded as bullet points.

Table 4: Challenges for the disruptive technology: AI

Description	***Source(s)***
Ethical implications of disruptive technologies • Transparency • Accessibility of data • GDPR legislation	(Ryan, 2020) (Kancevičienė, 2019) (Global Partnership on AI, 2020)
Testing of AI • Quality testing • Defining quality criteria • Distinct characteristics compared to traditional software • Availability of tools and review procedures	(Zhang et al., 2020) (Amershi et al., 2019) (Nascimento et al., 2020) (Smith and Clifford, 2021) (Arpteg et al., 2018)
Development of AI • Amount of configuration code • Alignment with business metrics	(Sculley et al., 2019) (Nguyen-Duc et al., 2020)
Implementation of AI • Stakeholder support	(Shaw et al., 2019)

4.1.2 Disruptive technology within the public sector

Governmental organizations worldwide employ AI (Kaplan and Haenlein, 2019[50]). Managing the brightness of traffic lights is an example of how AI can improve the efficiency of governmental processes. In this scenario, AI recognizes the traffic status based on visual data (Kaplan and Haenlein, 2019[50]). The benefits of AI for public sector organizations are enormous, but risks must be managed while democratic principles and human rights are protected (Misuraca and van Noordt, 2020[23]. The European Union (EU) focuses on implementing so-called trusted AI to prevent a proliferation of uncontrollable AI applications. These trusted AI applications must align with European ethical and societal principles (Misuraca and van Noordt, 2020[23]).

The systematic review of (De Vries et al., 2014[51) on public sector innovation specified the organizational and cultural factors involved during the innovation process. Within this systematic review, the following organizational factors on innovation are discussed and prioritized, from most to least impactful; slack of resources, leadership styles, degree of risk aversion, incentives, defining clear goals, conflicts, and organizational structures (De Vries et al., 2014[51]). Furthermore, leaders are elected in certain public-sector organizations, and these leaders will thereafter be in charge of setting the policy direction and allocating resources for innovation (Walker, 2006[52]). The availability of resources and innovation capacities are related, although they are not mutually exclusive and can impact innovation simultaneously (Bhatti et al., 2010[53]). Larger public sector organizations have more capacity to address technological and judicial complexity while innovating (Pallesen, 2004[54]). In contrast, smaller public sector organizations are more concentrated on experimentation while innovating (Bhatti et al., 2010[53]).

Transparent procedures are vital for end-users since it builds trust in the implemented system. Developing trust in disruptive technology demands a higher level of transparency to earn the public's trust in the disruptive technology (Bryson and Winfield, 2017[55]). Starting with low-risk applications in government services could pave the way for future disruptive technologies in government service delivery (Mehr, 2017[56]). This research is primarily concerned with central governmental organizations. The research paper by (Jurisch et al., 2013[57]) compared one hundred and twenty-eight case studies on business process change (BPC) in the public and private sector. As BPC projects in the public sector are more susceptible to political volatility due to the highly politicized environment, central governmental organizations need make an extra effort to establish commitment to their BPC projects, resulting in increased senior management and employee support (Jurisch et al., 2013[57). Section 4.4 elaborates the transformation of business processes in relation to AI.

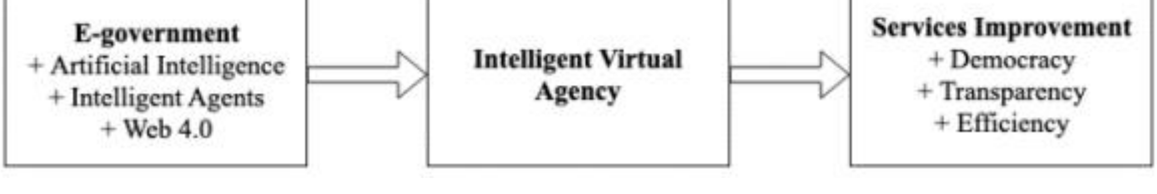
Implementing AI into the public sector comes with its own set of challenges. (Berryhill et al., 2019[58]) state that one of the most challenging aspects of implementing AI is ensuring that systems are trustworthy and human-centered. Moreover, the challenges whilst implementing disruptive technologies are partly caused by aging and an outdated IT infrastructure in the public sector (Desouza, 2018[59]). Furthermore, the vast majority of IT budgets in the public sector are spent on maintenance, and budgets for innovations are still relatively limited

(Desouza, 2018[59]). Aside from the financial aspect, several other factors influence the implementation of disruptive technologies within the public sector. A lack of incentives to innovate within the public sector and impediments in organizational, social, and cultural arrangements are considered bottlenecks for successful innovation since these innovations necessitate significant changes (Albury, 2005[60]).

Additionally, there is a distinction between public and private sector managerial incentives. Managers in the public sector typically receive fewer performance-based bonuses or benefits, influencing their willingness to take risks (Koch and Hauknes, 2005[61]). As mentioned before, another challenge arises in the field of trust and transparency. "For disruptive technologies, such as driverless cars, a certain level of transparency to wider society is needed to build public confidence in the technology" (Bryson and Winfield, 2017, p5[55). According to a study (Toll et al., 2020[63]) on how AI policies are captured in Swedish government documentation, the benefits of AI are captured nearly four times more frequently than the potential risks of implementing AI. AI. The use of AI to improve efficiency is regarded as a non-harmful implementation. Moreover, it is expected that public sector AI projects must contribute to or safeguard the public good (Cath et al., 2017[62]). These governmental organization-specific characteristics contribute to the difficulty of public sector AI programs as transparency and accountability must be considered and the AI application's positive impact on society (Cath et al., 2017[62].

Furthermore, the implementation of AI on central government services is hampered by a scarcity of experts, resources, and citizen-government trust. AI applications within central governments are considered a sort of E-government. "E-government is the application of employing advanced electronic techniques–and web services–to present, exchange, and advance the government's services for citizens and businesses with a goal of improving the productivity while reducing the cost." (Al-Mushayt, 2019, p2[147]). Figure 5 from the paper by Al-Mushayt depicts how E-government can contribute to the services of a central governmental organization. In addition to contributing to the internal process, E-government involves improvements to the service's customers. For example, transparency of government services can be improved because citizens have easier access to explanations about government services and policies (Al-Mushayt, 2019[147]).

Figure 5: Open E-government workflow

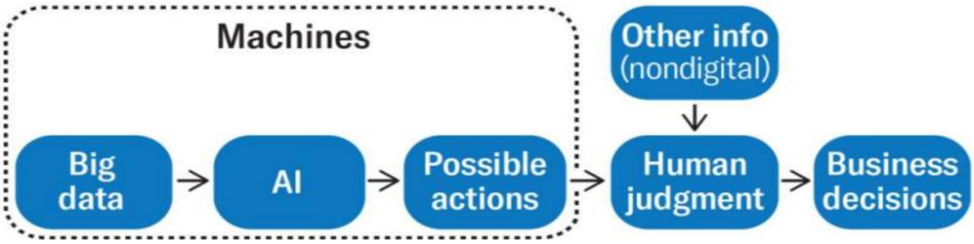


As shown in Figure 5, a virtual agent can control access to specific information. Through AI applications, an intelligent virtual agent provides automated services to citizens. Many helpdesk tasks can be automated with the help of a virtual agent; chatbots are one type of virtual agent (Ali et al., 2019[148]).

4.1.3 Impact of disruptive technology on central governmental organizations

Organizations want to incorporate AI into their processes to benefit from the insights offered by data analysis and automated processes (Davenport and Ronanki, 2018[64]). These organizations strive to shift from data-driven to AI-driven processes, yet automatization should not be the main goal of an AI-driven process (Colson, 2019[65]). Data can lead to informed data-driven decision-making, resulting in enhanced efficiency and the potential to enable new capabilities (Colson, 2019[65]). AI-only decision-making processes are not appropriate for certain public sector processes as it is difficult to hold someone accountable when human rights or legislation are violated due to automated algorithmically prepared decisions (Council of Europe, 2017[7]). The Dutch central government uses only algorithms that always require human judgment (Netherlands Court of Audit 2021[5]). With these future challenges and the legislative concerns mentioned in chapter 1 in mind, it is preferable to retain human judgment within an AI decision-making process within the central governmental organizations. Figure 6 illustrates how AI is being implemented to generate possible actions, which a human actor then assesses before being converted into actual decisions (Colson, 2019[65]). New AI applications will cause fundamental and sometimes challenging changes in workflows, roles, and culture, which leaders must carefully guide their organizations (Fountaine et al., 2019[66]).

Figure 6: Decision-making: AI combined with human judgment



Big data is frequently used as input for AI-based decision-making processes. A rigorous examination is required before implementing big data solutions. Big data differs from traditional data in terms of volume, velocity, and variety (Chen and Hsieh, 2014[67]). Volume relates to the number of data sets, velocity to the speed at which data is generated, and variety to the multitude of possible data types (Kitchin and McArdle, 2016[68]). Data security is the most important feature of big data collection and utilization within central governmental organizations, as people's privacy-sensitive data necessitates information protection and harvesting data for legitimate purposes (Wieringa et al., 2021[69]). Furthermore, big data policy issues are complex, and information policies and laws are evolving, complicating this challenge in the public sector (Bertot and Choi, 2013[70]). Organizations in the Dutch public sector appear to be uninformed that big data solutions provide value when organizational activities and procedures support them and are aligned with organizational goals (Klievink et al., 2016[71]). The idea is that if the applications do not correspond to the organizations' primary activities, they will not benefit from them (Klievink et al., 2016[71]). The importance of aligning organizational activities and goals is extensively discussed in the business and IT alignment section.

4.2 Organizational structure

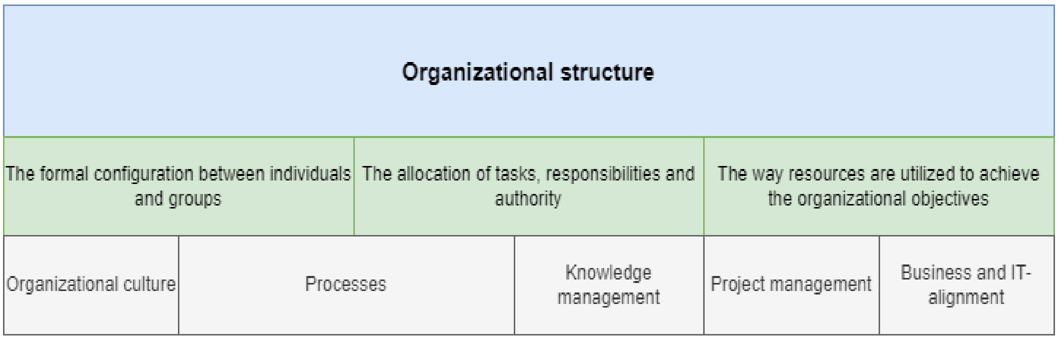
The second concept that needs clarification within our central question is organizational structure. (Lunenburg, 2012, p1[12], Galbraith, 1987[13] and Greenberg, 2011[14]) define organizational structure as the ''formal configuration between individuals and groups regarding the allocation of tasks, responsibilities, and authority within the organization.'' This definition is used from three different papers and plotted by Lunenburg on the Mintzberg framework on organizational structure. Mintzberg's framework is cited later when operationalizing the definition. The definition of organizational structure of (Akbari et al., 2012[15]) is almost identical to Lunenberg, Galbraith, and Greenberg's definition: ''Organizational structure is an officially established system of hierarchy of tasks, duties, responsibilities and affairs of an organization, which supervises how the economical policies of organizations must be defined and the way resources are used to achieve the mission of the company.''

The definition of Lunenburg, Galbraith, and Greenberg, including an addition from the definition of Akbari, is used throughout this research, as the second definition is less related to the central governmental context. Akbari's definition focuses on economic policies and budgeting, and budgeting plays a minor role in the implementation of AI algorithms, which are frequently created bottom-up by own employees (Netherlands Court of Audit 2021[5]). This definition tends to fall outside of the scope of this research. On the other side, Akbari's definition includes the purpose of achieving organizational goals, which is not included in the other definition but is crucial because the studied implementations are examined for alignment with the associated organizational objectives.

We use the following definition: Organizational structure is the ''formal configuration between individuals and groups regarding the allocation of tasks, responsibilities, and authority within the organization. Furthermore, organizational structure is a method that defines how resources are utilized to achieve the organizational objectives." (Lunenburg, 2012, p1[12], Galbraith, 1987[13], Greenberg, 2011[14], Akbari et al., 2012[15]). The definition we use in the thesis of organizational structure illustrates that organizational structure is a comprehensive concept. To understand these components of organizational structure, it is helpful to delineate the parts of the definition and associated components. This definition of organizational structure is selected because it shows organizational structure to be more than a method of organizing functions within an organization. This definition also includes the organization of activities or processes within an organization based on resource allocation.

Operationalizing the definition of organizational structure is essential; continuing to consider organizational structure as an umbrella concept during the study provides too much room for interpretations and may hinder the unambiguity during this research project. This definition is divided into three parts within figure 1, which also groups the components of organizational structure that arise from the existing body of knowledge on organizational structures underneath the elements of the aforementioned definition. This figure schematically presents how the concept of organizational structure is divided into components.

Figure 1: Organizational structure components



1. **The formal configuration between individuals and groups** refers to how an organization is structured, including hierarchy, lines of communication, and organization of work. Mintzberg describes five different ways of structural configuration in his organizational structure model (Mintzberg, 1980[72]). These configuration types address three distinct aspects: a prime coordinating mechanism, the key parts of an organization, and the type of decentralization within the organization. The standardization-focused coordinating mechanism also includes managing the organization's processes, stressing that processes are a component of organizational structuring (Mintzberg, 1979.p294[73]). These aspects of configuration affect how individuals and groups operate within an organization. For example, a configuration aimed at standardizing work has a higher degree of bureaucracy than an ad hoc structure. Mintzberg argues that cultural norms within an organization play a key role in structural design, ‘’particularly on the use of authority and bureaucracy.’’ (Mintzberg, 1979.p294[73]). Based on this example from Mintzberg's theory, it can be deduced that organizational culture is relevant in the structuring of an organization.

2. **The allocation of tasks, responsibilities and authority** is concerned with the flow of tasks and knowledge within groups and the assignment of employees responsible for the execution of specific activities within an organization (Grossi et al., 2007[74]). This delegation of work is contingent upon the employees' knowledge and the flow of knowledge between employees. As a result, knowledge management procedures can be incorporated into organizational structure. The organizational structure within these organizations determines responsibilities between groups; responsibility issues within groups are determined by the way groups are established to accomplish their goals (Grossi et al., 2007[74]). The text below the third bullet point includes an explanation of why processes are included in this section of the definition.

3. **The way resources are utilized to achieve the organizational objectives** refers to coordinating an organization’s strategic and operational procedures to accomplish a given goal. According to (Fountaine et al., 2019[66]), alignment is just as crucial in the case of AI adoption as having knowledgeable employees and the ability to work with a disruptive technology. Aside from the role of alignment in coordinating operational procedures, alignment can also aid in resource allocation in project management. Nedzelský highlights the benefits of alignment between project management and

> resource allocation as ’’project management is tightly bound with company core process, which involves resources through all company.” (Nedzelský, 2020.p2015[75]).

These aforementioned organizational configuration methods from Mintzberg illustrate how an organization can be structured in terms of roles and activities within an organization. However, the disruptive technology we are investigating is implemented bottom-up (Netherlands Court of Audit 2021[5]), resulting in limited influence of hierarchical components. According to the findings of this study's empirical component, hierarchy played no role in the initial implementations of the disruptive technology AI. Roles and responsibilities are not divided or organized, and the focus is on improving a process. The implementation aids process-oriented work in the case of organization A. Thus, the process-oriented theory appears to be more suitable in this study's context. "Process orientation (PO) means that focus is placed on the business processes, which range from customer to customer, instead of emphasizing an organization's functional and hierarchical structures" (Kohlbacher and Reijers, 2013,p245[152]). Hence, processes are involved in two parts of the definition of organizational structure, as a method of structuring functions within an organization and as a method of working within the organization.

Organizational structure enables the diffusion of technological innovations (DeCanio et al., 2000[76]). Performance measures can influence organizational behavior by measuring and defining key performance indicators (KPIs). These measurements are made possible by an organizational structure that adjusts to internal changes in profitability and external changes such as market prices, costs, or legislation (DeCanio et al., 2000[76]). One of these components that can hinder innovation is holding on to existing IT budgets. As mentioned in section 4.1.2, most of the IT budget is spent on maintenance, and the budget for IT innovation is restricted (Desouza, 2018[59]). Furthermore, given the context of this study, financial definitions are deemed less significant because improvements are not quantified, and the costs of implementing disruptive technology are not discussed in any of the interviews.

Another pitfall for organizations in the field of organizational structure is rigidity, i.e., not growing or developing the existing structure in response to the organization's growth or market demands. (Chandler, 2003[77]) studied large industrial growing organizations that continued to structure their activities distinctly or similarly. Furthermore, in his book Strategy and Structure, Chandler argued that keeping up with market developments, resource allocation, and entrepreneurial abilities are key components for an organization's potential to expand. Additionally (Dedahanov et al., 2017[78]) conducted a study on the relation between organizational structure and innovation capabilities. The empirical findings of this study revealed that organizations that do not involve employees in the decision-making process generate less innovative ideas. It was also observed that employees were less willing to use innovative technologies or processes in organizations where procedures and rules were central (Dedahanov et al., 2017[78]). The same study's findings, on the other hand, indicated that the absence of information sharing has no negative impact on innovative behavior. This third finding is relevant to the section discussing knowledge management and its involvement whilst implementing a disruptive technology.

4.2.1 Project management of traditional software and disruptive technologies

Following an IT project management methodology can lead to project completion and satisfaction for project stakeholders while considering the restrictions of scoping, quality requirements, costs, and a schedule (Demir and Kocabaş, 2010[79]). People, process, and technology are important pillars within IT project management as these pillars are all involved within a comprehensive IT project environment. This is supported by the findings of (Carlile, 2004[80]), who found that managing dependencies within projects changes as new circumstances emerge. The necessity of managing the three pillars stated previously can also be recognized in the retrospective of (Nelson, 2007[81]), who listed the most common problems in the field of IT project management. The three most common problems in order of occurrence are a poor estimation or scheduling of the project's scope, resulting in overtime and schedule pressure (Nelson, 2007[81]). Ineffective stakeholder management is the second most prevalent mistake within IT projects.

Failing to understand the needs and expectations of the stakeholders is a common barrier to effective stakeholder management (Zarewa, 2019[82]). Finally, insufficient risk management causes problems, particularly when the complexity of an IT-project increase (Nelson, 2007[81]). Additionally, the Identification and measurement of IT project performance contribute to the success of an IT project (Thomas and Fernández, 2008[83]). This impact is realized when stakeholders agree on the definition of success for the IT project, the measurement of success is consistent, and the outcomes of these measurements are implemented during the project (Thomas and Fernández, 2008[83]).

In 2009, (Keller and Hüsig, 2009[84]) identified a shortage of frameworks for the ex-ante detection of disruptive technologies. The inability to recognize the disruptive technology's potential for an organization is a poor starting point for managing the same disruptive technology. Managing disruptive technologies is challenging as it involves managing unpredictable activities (Zubizarreta et al., 2020[85]). Comparable results are found in the study by (Berente et al., 2021[86]), indicating that managing AI differs from typical IT management. This distinction results from the continually evolving characteristics of disruptive technologies such as AI (Berente et al., 2021[86]).

Moreover, this emerging nature of disruptive technologies impacts organizations' project management portfolios, as organizations feel pressured to adopt disruptive technologies to ensure survival and business sustainability (Zubizarreta et al., 2020[85]). The relationship between disruptive technologies and project management is not one-sided, as AI can automate the process of task delegation for project management (Pop and Boian, 2014[87]). The role of AI in decision-making is discussed in greater detail earlier in this thesis (section 4.1.3). Managing disruptive technologies is considered a challenge based on the findings mentioned in the paragraph above, regardless of which and whether a project management methodology is used at all. There are different approaches to managing software development. Project management methodologies have their applications, advantages, and limitations, depending on the project to which the method is applied (van Casteren, 2017[88]).

4.3 Knowledge and innovation

''Knowledge management is the process of creating value from an organization's intangible assets'' (Liebowitz, 2001. P1[89]). Organizational procedures for knowledge management (KM) can assist organizations with leveraging the internal knowledge of their employees. IT systems focused on knowledge management provide a mechanism to govern knowledge assets and enable the retention of context-specific knowledge from specialists within the organization (Hendriks and Vriens, 1999[90]).

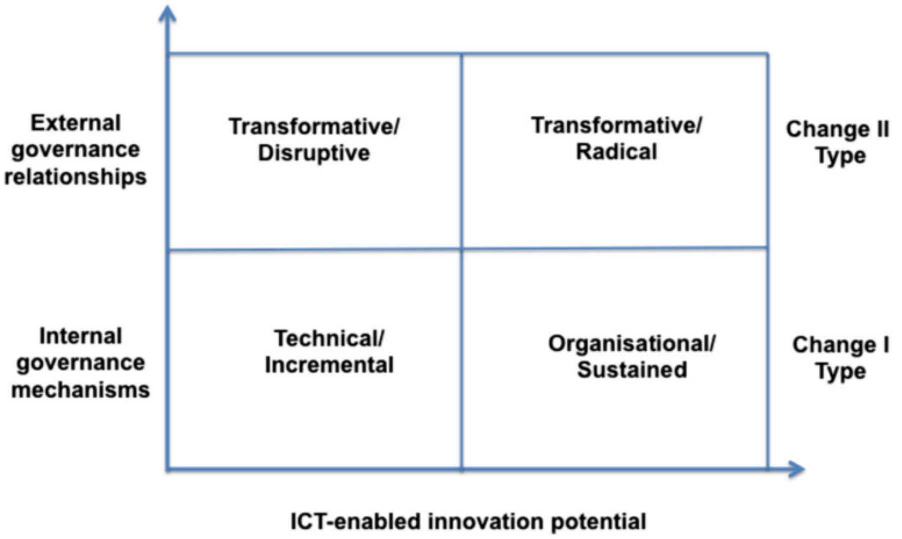
Increasingly, central governmental organizations are making concerted efforts to strengthen their KM procedures with IT applications to increase productivity and transparency within the public domain (United Nations, 2007[91]). Traditional KM practices are becoming less prominent as central KM units and groups are becoming less commonly used and technology becomes much more relevant for knowledge and information sharing (Organization de Coopération et de Développement Economiques (OECD), 2003[92]).

Yet, solely having the infrastructure to share knowledge across an organization in the public sector is insufficient to shape organizational behavior and culture focused on knowledge transfer. A climate of openness and trust is required to support knowledge sharing within an organization (Daglio et al., 2014[93]). Other potential IT-related pitfalls to achieve KM initiatives are poorly designed KM systems, user-unfriendly KM systems, and the security of these KM systems. Organizations with horizontal, flexible structures with fewer hierarchical layers benefit from improved internal communication (Claver-Cortés et al., 2007[94]). These flat organizations are characterized by a decentralized decision-making process where employees participate.

When innovating, the challenge for the organization is to enthuse and educate employees on the changes that the innovation will bring to their work. KM is a critical component of sharing knowledge and expertise to develop new skills and foster innovation. The following two papers highlight that knowledge sharing is relevant in the field of AI. Within a European Commission survey, seventy-two percent of respondents believe that robots replace the employment of humans (European Commission Directorate-General for Communications Networks and TNS Opinion & Social, 2017[95]). To clarify the benefits of AI for public servants' work, it is critical to educate personnel and explain the benefits of AI. ''To reduce these worries, awareness of AI technologies should be stimulated among civil servants. So, they can discover the advantages of AI approaches for their work'' (CAHAI - Ad hoc Committee on Artificial Intelligence, 2021. P13[96).

Another study on the availability of AI training programs for civil servants found that eleven of the eighteen EU countries that participated did not have an AI-specific training program in place for civil servants (Misuraca and van Noordt, 2020[23]). The same survey found that only three countries have established guidelines or principles to strive for or stimulate AI development; these standards provide civil servants with the essential knowledge to operate with AI applications. The potential of AI in terms of change and innovation is plotted on the definitions of change by (Misuraca and Viscusi, 2015[97]) depicted in the framework for assessing ICT-enabled innovation in figure 7 on the following page.

Figure 7: Framework for assessing ICT-enabled innovation for governance



The framework of assessing ICT-enabled innovation for governance emphasizes four possible changes enabled by ICT listed below.

- **Technical/incremental change:** Is defined by the automation of administrative tasks and other productivity improvements. In most cases, incremental change is intended to achieve a long-term goal.

- **Transformative/disruptive change:** ICT components are being used to create new mechanisms for existing services. Cultural traditions and knowledge capabilities have the most significant impact on disruptive change since they necessitate policy considerations (Misuraca and Viscusi, 2015[1236]).

- **Transformative/radical change**: In this case, ICT is being implemented for external use or a radical shift in policy-making. Innovative technologies can be applied to engage employees and share knowledge between organizations.

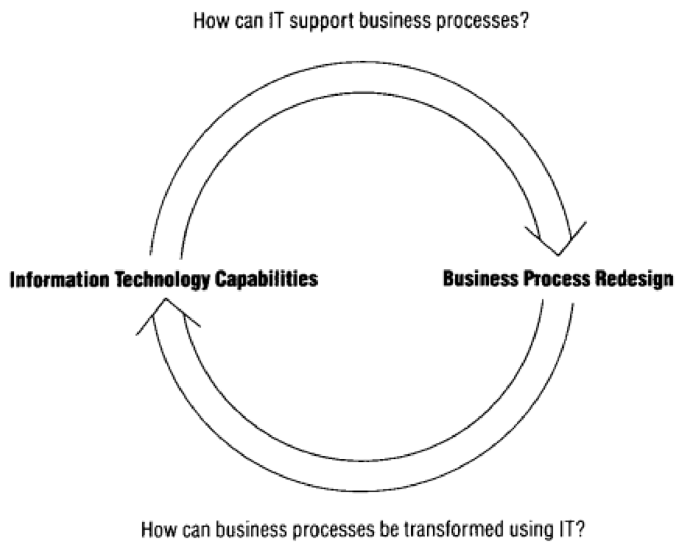
- **Organizational/sustained change:** ICT will support or supplement existing structures to innovate governance mechanisms within an organization. This method is known as a gradual process of innovation, and it is similar to the incremental form of change.

(Misuraca and Viscusi, 2015[97]) argue that the real driver of innovation is culture, which is the most challenging layer to change within an organization. Organizational culture is discussed in more detail in section 4.6 of this thesis. Another noteworthy aspect of this model is that disruptive innovation is associated with public participation and the reshaping of external relationships. Customers, or citizens in the case of the public sector, can be involved in the development of new services to increase public participation. However, (Castelnovo and Simonetta, 2002[98]) discovered that citizens' information and engagement in E-governance projects is uncommon; an examination of the 134 examples analyzed in the Italian public sector revealed that this public participation occurred in only 1 of the 134 cases studied.

4.4 IT as an enabler for process reengineering

''Business process reengineering (BPR) is the analysis and design of workflows and processes within and between organizations.'' (Davenport and Short, 1990, p1 [99]). IT is a key enabler for BPR, as IT determines how business is conducted. There is a recursive relationship between BPR and IT. IT capabilities should assist the business processes within an organization, and business processes should then be implemented following the capabilities that IT can offer. The IT capabilities of an organization affect the ability to redesign business processes, as IT allows for improvements in BPR. Figure 8 clarifies this recursive relation in an illustrative manner.

Figure 8: Recursive relationship between IT capabilities and business process redesign



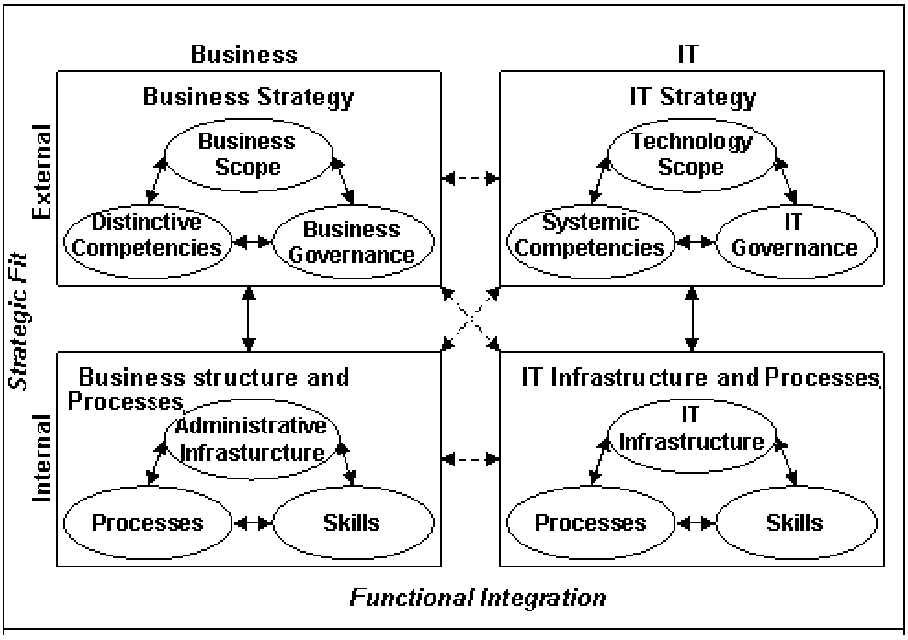
After the underlying technology enables the redesign possibilities, the business has the opportunity to align this new or redesigned business process with the required business goals and strategy (Verhoef and Sneed, 2001[100]). Leadership, process architecture, personnel knowledge, skills, and the alignment of business and IT strategy can contribute to BPR (Ahadi, 2004[101]). Thus, organizations must have a strong leadership style to foster an environment in which the employees involved in the BPR project comprehend the stated goals and are directly engaged throughout the BPR process (Ahadi, 2004[101]). Employees should be assisted through the transition by providing training and reward programs. The application of IT can contribute to the introduction of a new process by integrating project management and process analysis technologies (Attaran, 2004[102]).

AI has at least two distinct roles within BPR; firstly, it serves as an enabler for process redesign by, e.g., increasing the efficiency of a process by automating a sub-step (Hamscher, 1994[103]). Secondly, AI can support the process of optimization via reinforcement learning, which is considered a helpful optimization support technique due to the implementation of a learning agent. A learning agent is a deep learning technique that can be implemented to improve the learning of algorithms to combine rewards and penalties (Silvander, 2019[104]). AI applications can learn from prior experiences by using these learning agents.

4.5. Business & IT alignment

The strategic alignment model (SAM) of (Henderson and Venkatraman, 1990[105]) defines principles to further elucidate the alignment of IT, business strategy, and business goals. The SAM model specifies the alignment between the business and IT domains by addressing the impact between the four domains depicted in figure 9. One concept that is central to this model is alignment. (Luftman et al., 1999, p. 3[106]) define alignment as ''applying IT in an appropriate and timely way, in harmony with business strategies, goals, and needs.'' Functional integration refers to the coordination between the business and IT domains. On the other hand, strategic fit focuses on the alignment of the internal and external domains. Prior studies examined the model's components and applicability in considerable depth. However, one concept requires further clarification, as it can be applied to the subjects covered in this thesis.

Figure 9: Strategic Alignment Model (SAM) [Henderson and Venkatraman, 1990]



This concept of alignment perspectives can guide the process of defining an effective business and IT strategy. Each alignment perspective consists of three components and involves decision-making on functional integration and strategic fit (Ahriz et al., 2018[107]). The three alignment perspective components are the anchor, pivot, and impacted components. The anchor component is the strongest area or domain of an organization and is considered the enabler of change (Ahriz et al., 2018[107]). In contrast, the pivot component defines the weak area, where the improvement is realized through re-alignment. Finally, the impacted component corresponds to the area that will be affected by the re-alignments achieved in the pivot component (Coleman, P., and Papp, R., 2006[108]).

An example of alignment perspectives is found in implementing the IT alignment planning process in the case study by (Peak et al., 2005[109]). The anchor domain in this case study by Peak is the IT infrastructure domain, as this new planning procedure reinforces an already operational module. The system has already undergone process improvements for efficiency, so this robust system is considered an enabler for change. The IT strategy domain is the pivot component since re-alignments are primarily concerned with the efficiency of IT capabilities. This new module is implemented to improve the alignment of IT and the organization's goals. The business strategy is the impacted domain in this scenario. Resources can be managed more efficiently due to re-alignments made within the IT infrastructure domain. With this new system, IT resources can fulfill the critical success factors (CSF) defined per business unit (Peak et al., 2005[109]).

Competitive potential refers to the alignment perspective concerned with the use of disruptive technologies to gain a competitive advantage through product and service improvements. This perspective enables adjustments to the business strategy by exploiting disruptive technologies. The implementation of disruptive technologies intensifies the value creation and alignment process for organizations (Jacobs & Pretorius, 2020[110]), as the complexity of both the business and the technological environment changes at an ever-increasing pace (Gius et al., 2020[111]). This complexity is partly caused by the fact that complete business models are being transformed by new waves of automation based on AI.

Moreover, recent advancements in machine learning algorithms open up new opportunities for process automatization (Jarrahi et al., 2021[112]). Managers will play a critical role in aligning automated processes with business goals as a result of these innovations (Zhang and Liu, 2019[113]). Leaders with a digital view and transformation perception and stable leadership focusing on digital transformation benefit the internal alignment of IT infrastructure and processes (Zhang and Liu, 2019[113]).

Additional alignment challenges arise in the field of IT- and governance frameworks. (Kruger and Rudman, 2013[114]) concluded that overreliance on IT control frameworks leads to misalignment of business processes and the functionalities of implemented software. Additionally (Wu et al., 2015[115]) refer to IT governance mechanisms to enhance IT support for business objectives, as IT governance mechanisms clarify the roles and responsibilities of the stakeholders involved. Changing user requirements from stakeholders should be communicated in understandable language for developers and analysts to minimize the likelihood of miscommunications.

Organizations can apply more business-focused control frameworks such as Prince 2 to regulate IT and business alignment (Kruger and Rudman, 2013[114]). These business and IT-oriented control frameworks can assist in strategic alignment, as the use of a project management methodology can structure the implementation of software. The project goal and scope (Xia and Lee, 2005[116]), as well as software requirements (Hoorn et al., 2007[117]), are subject to change throughout the development and implementation process. Agile methodologies allow the development team to adapt to changing user requirements (Maruping et al., 2009[118]). A relationship between a flexible development process and architectural and software performance was found by (MacCormack et al., 2001[119]). This adaptable development process allows for the implementation of new requirements over a more extended period of time throughout a development cycle.

4.6 Organizational culture

The empirical component of this thesis explains how organizational structure components such as organizational culture contribute to the implementation of both traditional software and disruptive technologies. Thus, a definition of organizational culture is helpful. We define organizational culture as "a system of shared meaning held by an organization's members that distinguish the organization from others (Robbins and Judge, 2018 P545[120]). Organizational culture is built on the employees' shared values and beliefs or perceptions within an organization (Tsai, 2011[123]). The culture and the behavior and attitudes of employees influence whether or not an organization is considered a pleasant place to work (Tsai, 2011[123]). Employees regard organizational goals as important if their shared values align with the organization's values; however, if the employee's values do not align with the organization's values, the goals are regarded as less important (Posner et al., 1985 [149]). Employee attitudes, shared values, and behaviors are influenced by leadership qualities and types of employees in leadership positions within an organization (Kane-Urrabazo, 2006[124]). An organization's management helps shape and preserve its culture. The link between leadership and organizational culture is lower in self-organizing teams or employees because the manager has less influence over how they work (Crowston et al., 2007[150]).

The formal and informal procedures within an organization can differ as informal procedures are also followed for distinct reasons. Organizational design, informal activities, and structures are three pillars determining how processes are organized, either formally or informally (Friedrichs, 2015[125]). It is not a given that existing informal procedures within an organization alter when formal changes are implemented (Gulati and Puranam, 2009[151]). As a result, these informal procedures are less changeable than manager-designed formal procedures. Managers in a control-oriented organizational culture aim to centralize operational decision-making in order to acquire control over uncertainties within a specific process (Zammuto and O'Connor, 1992[121]). On the other hand, the flexibility-oriented culture emphasizes self-directed workers and the classification of process uncertainties so that individuals know what to do when an issue emerges.

Organizational culture and IT implementations are connected in a multitude of ways. The study by (Zammuto and O'Connor, 1992[121]) noticed a connection between the success of advanced technical implementations and organizational culture. Understanding the meanings, norms, and social hierarchies within an organization is helpful throughout the implementation of information systems, and this understanding is needed to minimize norms and rules conflicts (Indeje and Zheng, 2010[122]). Furthermore, prior design choices between a more flexible oriented organization design and a control-oriented design can impede or facilitate advanced technological implementations such as AI (Zammuto and O'Connor, 1992[121]).

A top-down organizational structure is ideal for strict rules and control mechanisms. Furthermore, bureaucracy and work standardization contribute to a high level of formalized rules and regulations. These standardized procedures reduce the unpredictability of process outcomes, as the aim is to arrive at predefined business outcomes through standardization (Münstermann and Weitzel, 2008[126]). On the other hand, bureaucratic organization structures do not suit complex innovation capabilities due to their rigidity (Mintzberg, 1981[127]). Implementing a disruptive technology, such as AI, can alter the way organizations work. These changes have an impact on project management (section 4.2.1), processes (section 4.4), and the alignment of business and IT (section 4.5). Additionally, the implementation of a disruptive technology and organizational culture are related. Ethical, open, and transparent management is advantageous for successful employee AI adaptation (Kaplan and Haenlein, 2019[50]). Furthermore, a trial-and-error culture can enable staff to explore with AI without fear of criticism (Kaplan and Haenlein, 2020[128).

According to the Three C model from (Kaplan and Haenlein, 2019[50]), the application of AI has internal and external repercussions for organizations. Confidence, change, and control are the three Cs in this model. The application of AI necessitates a lot from the managers' leadership style, as it influences employees' perceptions of the fundamental change in their work due to AI. Another internal change driven by the implementation of AI is the necessity for employees to learn how to work with this modern technology. Employees must constantly alter and adjust their capabilities (Kaplan and Haenlein, 2019[50]). The external factors are primarily concerned with the ongoing change for customers and competitors. Another approach to guide this process of transforming workflows is to design an AI fairness checklist and AI ethical guidelines (Madaio et al., 2020[129]). These AI guidelines effectively assist the formalization of ad-hoc processes, especially when the guidelines are aligned with the organization's culture and ex-ante workflows (Madaio et al., 2020[129]).

4.6.1 Organizational culture within governmental organizations

Since the 1980s, governmental organizations have been attempting to change conventional bureaucratic ideals such as control and internal orientation into more flexibility and a greater focus on the citizens that utilize their services (Parker and Bradley, 2000[130]). Furthermore, transparency and accountability are key values in establishing an open government. These open government initiatives aim to gradually improve the relationship between governmental organizations and citizens (Janssen et al., 2017[131]). Gradually fostering transparency will lead to a public orientation toward relevant, easy-to-understand data and contributes to the resolution of social concerns. Ideally, this procedure should occur in a culture of constructive criticism and quality improvement (Bannister and Connolly, 2011[132]).

As more central governmental organizations adopt innovative policy-making and policy-implementation design approaches to alter the way of working within governments, the connection between policy-making, policy implementation, and design becomes urgent to understand (Junginger, 2013[133]). Several factors are involved in the transition from policy on AI to actual innovation, and these factors can either accelerate or slow the process. Most benefits of AI implementations are achieved when the application is developed by a multidisciplinary team (Fountaine et al., 2019[66]). This team composition with employees from various disciplines and all levels of the organization will benefit overall trust in AI and algorithms since the broader recommendations will be recognized. Strong leadership is vital to guide the alignment between organizational culture, structures, and the way of working to promote widespread AI adoption (Fountaine et al., 2019[66]).

Privacy limitations are one of the most significant challenges for governmental enterprises; in the EU, the GDPR will impede AI advancements (Kaplan and Haenlein, 2020[128]). Countries that do not have such privacy regulations have an advantage in rapidly implementing AI, as they are less related to the objective within the EU. These European countries have a culture of technological openness and aim to use innovative technologies while maintaining public values (Wetenschappelijke Raad voor het Regeringsbeleid, 2021[134]). The dominant culture within an organization is the culture that expresses the core values of most of the employees within an organization. The increasing complexity of complex algorithms, such as deep learning, results in a lack of transparency for end-users (Hagras, 2018[135]). ‘’However, for AI to be confidently rolled out by industries and governments, users want greater transparency through explainable AI (XAI) systems'' (Hagras, 2018, p1[135]). A lack of transparency can jeopardize the core values of central governmental organizations.

4.6.2 Subcultures and change

Subcultures within an organization can influence any change process. (Robbins and Judge, 2018, P. 547[120]) define subcultures as " mini cultures within an organization, typically characterized by department designations and geographical separation." Organizational subcultures of trust, cohesion, flexibility, and a broad acceptance to run projects decrease the likelihood of the unwillingness to change (Johansson et al., 2014[136]). Adhering to routines and reacting emotionally to change, on the other hand, are indicators of resistance to change (Johansson et al., 2014[136]). Comparable subcultures that are open to change are reflected in the study of (Lok and Crawford, 1999[137]), examining the relationship between organizational subcultures and commitment. An employee's organizational commitment refers to their attachment to an organization. According to the study, innovative and supportive organizational subcultures favor employee commitment, whereas bureaucratic subcultures have a slightly negative impact on commitment (Lok and Crawford, 1999[137]).

Whereas, as noted in the preceding paragraph, organizational culture has an impact during the implementation of AI, it is also plausible that AI applications cause changes in organizational culture. A study by (Ransbotham et al., 2021[138]) states that enhanced process efficiency can improve staff morale and cooperation after the implementation of AI. According to the same survey, fifty-eight percent of respondents believe that the integrated AI application increases team effectiveness (Ransbotham et al., 2021[138]).

4.7 GDPR and alignment with other legislation

As previously stated, there are GDPR articles focused on the utilization of AI whilst processing data. The GDPR is implemented within the Netherlands by the legislation known as the GDPR implementation Act. The GDPR is enacted to protect individuals' rights regarding the handling of personal data by commercial companies and central governmental organizations. As a result, in the context of the Dutch central government, the GDPR implementation Act is a major input for organizing processes regarding personal data processing and the application of AI and other disruptive technologies that affect the processing of personal data. The Dutch Data Protection Authority (DDPA) is an independent supervisor of the GDPR and the GDPR implementation Act.

An Ai based decision-making system for fraud detection within the Dutch central government led to prejudice driven by the employment of algorithms (Amnesty International, 2021[1]). The collection of data on dual nationalities, which is not in accordance with GDPR regulations, was one of the origins of the childcare benefit scandal mentioned before in the introduction of this thesis. As a result of this illicit data collection, applicants were erroneously accused of childcare benefit fraud (Amnesty International, 2021[1]). Therefore, there is pressure on the Dutch central government to realize the implementation processes of algorithms in accordance with legislation. This pressure is justified by the influence of the central government's AI applications on individuals and businesses, which necessitates the need for strict regulations.

The GDPR is applied in the Netherlands by the aforementioned law, known as the GDPR implementation act. The GDPR implementation Act addresses how data regulations are implemented in practice. Exceptions in the field of automatic decision-making are seen in Article 22. Where Article 22 (Automated individual decision-making, act 22 GDPR, EU, 2018[140]) itself already addresses some exceptions, an article within the GDPR Implementation Act is devoted to the exception to Article 22 of the GDPR. Another three exceptions to the prohibition of automated individual decision-making are provided in Article 40 of the GDPR implementation Act (Uitzonderingen op verbod geautomatiseerde individuele besluitvorming, act 40 GDPR implementation Act, NL, 2021[140]).

The inconsistence between these GDPRs can complicate compliancy due to the possibility of misunderstanding. The European Commission's proposal in 2021 may further complicate the development of AI within the European Union. The European Commission has presented a proposal for the implementation of the Artificial Intelligence Act (AIA), which assures that AI applications marketed in the EU are safe, comply with existing legislation, and respect EU values (European Commission, 2021[141). The existence of strict laws and regulations for AI, on the other hand, provides organizations with guidance when developing, implementing, and maintaining their AI applications. These rules specify what must be documented as well as the requirements that the application must meet.

5 Results

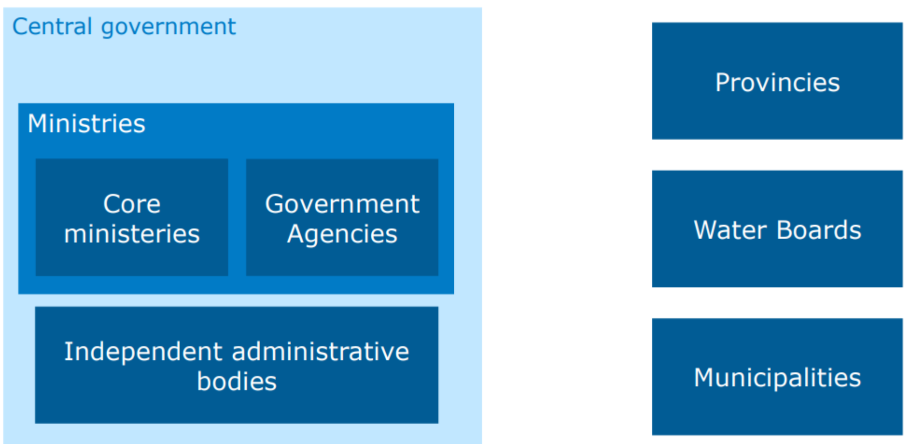
The proposed case study approach is conducted within the Dutch central government. As briefly discussed in chapter three, the qualitative research methods applied during this study include a multiple-case study and document analysis. The embedded design of the case studies guided the researcher through the interviews. This categorization of components enables the researcher to analyze the contribution of the organizational structure components during the literature review and the empirical stage of the study. All interviews are conducted through video meetings on Microsoft Teams. To aid in understanding the results and their interpretation, table 2 from the methodology chapter has been included.

Table 2: Interviewee list

Name interviewee	Organization	Role
Interviewee A	A	Data scientist
Interviewee B	A	Project manager
Interviewee C	A	End-user
Interviewee D	B	Data scientist
Interviewee E	B	Advisor
Interviewee F	B	End-user
Interviewee G	C	Advisor
Interviewee H	C	Project manager
Interviewee I	C	End-user

The three cases are examined in the context of central government organizations in the Netherlands. Clarifying this background aids in explaining and interpreting the study's findings This chapter will delve deeper into this subject by elaborating on the results of case study results. Figure 10 depicts the structure of the Dutch central government. Ministries and related government agencies are part of the Dutch central government. Moreover, independent administrative bodies such as the House of Representatives of the States-General and the Court of Audits operate outside the ministries' direct control. However, these independent administrative bodies are part of the Dutch central government.

Figure 10: Dutch central government context



5.1.1 Case A

The implementation of case one includes an algorithm that generates steering information for specific activities. Numerous teams throughout the Netherlands use this classification algorithm. The algorithm provides detailed information to end-users based on predictions. This information has little or no bearing on the activities of the end-user; Instead, it is regarded as an addition to their existing information sources. The core premise is that the added value is found in the analyses based on the end-user's expertise, which is necessary to transform this data into valuable insights. We define a classification algorithm as ‘’a function that weighs the input features so that the output separates one class into positive values and the other into negative values’’ (Netoff, 2019, p 374[142). These values are based on historical data from other systems. The likelihood of an event occurring was predicted after linear regression was used to correlate the probability of a discrete result given an input variable.

5.1.2 Case B

In the second case study, another categorization algorithm was examined. This classification algorithm returns a set of results to the end-user. This selection is based on pre-defined business roles. ‘’Business rules are the rules that are specified in the system and do not depend on human decisions. It is usually a larger number of simple rules that can be scaled in a sequence’’ (Hypský and Kreslíková, 2017, p101[143]). There were existing business rules in place prior to the implementation of an AI algorithm, yet these business rules would no longer be sufficient. The business rules would become obsolete for the next control. The algorithm's end-user can work more focused, with minimal modification in their working activities. Thus, the algorithm’s output serves as input for the procedure in which the end-user continues to work with the results. The algorithm enables examining a far more immense amount of data than was previously possible.

5.1.3 Case C

The third case study within the Dutch central government involves an implementation of traditional software. An external supplier developed the system, and in this case, the system was not adaptable to the organization's existing processes. This implementation facilitates the information needs for knowledge and training as the system provides employees with a centralized location for all learning-related activities. Employees are able to sign up for a course, a study, or training through this system. This implementation addresses the learning culture within organization C. For example, we examined how system Z aligns with organization C's culture and defined requirements. This alignment proceeded with the supplier's cooperation. Additionally, employees contribute to the development of e-learning courses for system Z.

5.2 Results of interviews

In this section, we will discuss the results of the interviews. Nine interviewees participated in the semi-structured interviews, part of the three case studies performed for this research project. To ensure the interviewees' anonymity, each was assigned a letter from the alphabet. Table 2 in section 5 outlines which letters belong to which organizations and the interviewee's function title. The results are categorized based on the chapters and sections of the literature review and the questionnaire's sections. The implementations of the disruptive technology are discussed first, followed by the organizational structure components. Finally, the third case is discussed, which is the traditional software implementation. An analysis of the results is discussed in the next chapter of this thesis.

5.2.1 Application of algorithms within the Dutch central government

Both implementations of algorithms examined during the case study have a shared purpose. These algorithms attempt to allocate resources for specific tasks as effectively as possible. The implementations of these two algorithms enabled the possibility to automate a process or activity. In both cases, the automated results are not the result of a procedure. As mentioned in the literature review, the application of AI can aid process automation in two ways. The first way is to increase efficiency by automating a process or certain activities within a process (Hamscher, 1994[103]). Both algorithms implemented aim for improved efficiency. However, the second possibility in the field of reinforcement learning via learning agents does not yet apply to both implementations.

According to interviewees A, B, C, D, E, and F, the output of an algorithm is used as the input for another work process. The algorithm's end-users determine what to do with the algorithm's results in terms of taking the outcomes of the algorithm application into account for their judgment on a particular phenomenon. Furthermore, it is noted that the end-users' substantive expertise is required to translate the algorithm's output into actual valuable information.

As stated in the introduction of this thesis, primarily simple algorithms involving human judgment are implemented within Dutch central governmental organizations (Netherlands Court of Audit,2021[5]). Interviews with the data scientist and end-users allow us to examine whether the case study results are consistent with the literature from both viewpoints. Interviewee D emphasizes that the algorithm within the organization is designed in such a way that end-users keep an unbiased perspective within their work and stated the following:

“The end-users of the algorithm do not see the result generated from the algorithm. The end-user receives a selection of the results. They do not see on which specific points they scored high. This allows them to carry out the check without bias.”

Likewise, interviewee E notes that the algorithm’s output can be used as input for the activities of end-users. This output will have no effect on the process outcome and end-user’s activities within this process. The algorithm's output data and input are documented within organization B. Interviewee D indicated that these variables are simple to write down. In both cases, these algorithms were developed and implemented by one or two data scientists.

Case A involves a data scientist who solely developed the first versions of the algorithm in a prototype-like manner. The further development of this algorithm has taken place in a demand-driven way. This system has progressed from a prototype to a complete system because of additional development and pilots. Section 5.2.2, which examines project management in greater depth, explains the demand-driven method.

A variety of tasks were assigned to the two data scientists involved in the algorithm's development and implementation in Case B. According to interviewee E, an advisor within organization B, the phenomenon of a data scientist performing tasks that are not related to their job description was an informal way of working on completing certain activities that would otherwise remain unfinished. Interviewee D stated that the distinction between data scientists and data analysts in the field of tasks and activities within the Dutch central government is less present compared to private sector organizations; for example, a data scientist within the central government is more concerned with modeling and analyzing while data scientists at private sector organizations are more involved in the application of AI.

5.2.2 Project management

According to the research discussed in the literature review, the implementation of disruptive technology is accompanied by complex decision-making that can lead to unclear solutions (Dufour and Steane, 2013[36]). These decisions are complicated due to the limited understanding of disruptive technologies and associated risk for board members (Brennan et al., 2019[37]). Our case study provides comparable results, as one interviewee mentioned:

‘’At that time, the management was involved in an informal way, because working with algorithms was so new, there is a good chance that management gave its approval without knowing exactly the consequences of an algorithm implementation.’’

Failing to understand the needs and expectations of the stakeholders is a common barrier to effective stakeholder management (Zarewa, 2019[82]). As a result, the stakeholders involved lose interest during the process. Especially if this lack of certainty regarding an implementation pertains to the project's scheduling and scoping. Likewise (Nelson, 2007[81]) states that project scheduling is one of the three most prevalent challenges encountered in IT projects.

A project management methodology is not used to coordinate the initial implementation of the algorithms. Interviewee B remarked that it was necessary to prepare some project documentation according to the Prince2 principles for formal approval. Historically, these documental requirements were needed within organization A to acquire a financial mandate for a project by the internal stakeholders. Interviewee A states that the way of working at the start of the development and implementation was demand-driven until the further development was performed in a scrum manner, which is mentioned in the following paragraph. Documentation and procedures progressively formed as the need increased during the transition from a small-scale to a countrywide implementation. Interviewee B has been appointed as project manager for the system's roll-out across the Netherlands. Additionally, local project managers were appointed who worked closely with the system's end-users to plan its roll-out within their team. This national implementation was made possible by utilizing a template that could be customized to meet the specific needs of a given team. Furthermore, interviewee C indicates that no project management methodology was used during the implementation at the team in which he worked. Interviewee B mentioned that scrum principles were followed during the ongoing development of the algorithm within organization A. Interviewee B notes that after the implementation, they worked with a scrum master and developers to divide responsibilities during this subsequent development of the algorithm. Furthermore, interviewee B states the following on the agile-based way of working within organization A:

''We worked in a two-week sprint to make the algorithm more robust, with sprint planning and retrospectives. This scrum approach is no longer applicable because the algorithm has been put into maintenance, and no further development is currently happening.''

The algorithm development and implementation process within organization B was exploratory and considered an innovation project. During this experimental procedure, no project management approach was applied. During the development process, a policymaker was in charge of general coordination, according to interviewee E. This internal client from the business was involved informally during the development and implementation phase. In this case, the internal clients are policymakers within Organization B. Internal auditors performed an audit on the algorithm's development and implementation within organization B, accompanied by interviewee E. This internal analysis is conducted to analyze the initial development and implementation process and its associated decision-making. The algorithm will be rebuilt considering the lessons learned and the results of this internal analysis. This internal analysis indicated that in the field of project management, it is required to work more from a project-based perspective since the pioneering component of original development and implementation does not match with the formalization of the algorithm.

According to interviewee E, improving documentation on decision-making is one of the most important internal audit outcomes. ''The primary outcome of the analysis is focused on documentation. There has been documentation but little reproducible documentation or documentation of previous decision-making. With the audit trail and transparency in mind, it is critical that the documentation of the algorithm is of high quality.'' Moreover, interviewee D states that standard data science methodology principles will be followed to formalize the algorithm's redesign in an organized manner.

The 2021 audit by the Netherlands Court of Audit into the Dutch government's usage of algorithms indicated that most of the algorithms reviewed were developed in a bottom-up manner from the operational level within the organization (Netherlands Court of Audit,2021 [5]). Because data scientists were in charge of the majority of activities during the algorithm development and implementation process in both cases, the results of this study are similar. On the other hand, it is impossible to confirm or deny that due to this bottom-up approach, senior managers and even the CIOs at ministries are unaware of the algorithm's implementation or development process, as stated in the audit by the Netherlands court of audit.

5.2.3 Knowledge management

Within the two analyzed cases, the substantive capabilities for developing and implementing an algorithm are scarce; the two interviewed data scientists imply that there were at most two data analysts or data scientists involved in the development and implementation process. Interviewee D mentioned: ''One of our business consultants came up with the idea, supported by a policymaker in organization B. Then, as there were no others with the necessary knowledge besides the colleague and me, we started working on the algorithm.'' As very few people were involved in the development and implementation of an algorithm, the reproducibility of decisions made during this process is limited.

In addition, interviewee A states a comparable situation at organization A. The data scientist is single-handedly responsible for the development and designed the first few versions of system X. The data scientist's informal fulfillment of tasks during the development and implementation of an algorithm is unfavorable for formalizing processes and knowledge sharing within the organization. The same interviewee also stated that if there were technical issues with the system of which the algorithm is a part, he was exclusively responsible, as no other colleagues were doing such work at the time.

According to interviewee E, organization B aims to be more competence-oriented during upcoming implementations of algorithms. The urge for a more competence-oriented approach originates from the fact that data scientists must perform various tasks that are not part of their job description. Aside from the desire for competency-oriented work, the desire for an ideal team composition based on competencies is also considered for future algorithms implementations.

Working with algorithms from the point of view of the end-users may result in resistance. This resistance may be motivated by the fact that, because of process automation, some activities are being abolished or that the initial manner of work has been modified in the end-user's opinion (European Commission. Directorate General for Communications Networks and TNS Opinion & Social, 2017[95]). This resistance was not expressed strongly during the interviews with end-users, presumably because the algorithm is developed so that the end-user retains control of the process, and the benefits are clearly explained. For example, interviewee B suggests that the end-user should maintain control over their activities. Similarly, interviewee D emphasizes that it is not the aim of the algorithm to steer the employee's decision. Furthermore, according to interviewee C, the information from the system is analyzed from a variety of angles before a definite work plan is established.

To make the advantages of the applied algorithms clear to end-users and other employees participating in the process (Miscuara and van Noordt, 2020[23]), emphasize the necessity of training personnel and explaining the benefits of AI. Interviewees A and B underline the importance of having the message delivered by someone with the same expertise as the end-users when discussing the impact of an algorithms for the end-users within the process where the algorithm is implemented. According to interviewee B, this method of communication ensures that the message is delivered more successfully because the receiver can relate to the person who transmits the message.

5.2.4 Processes

The implementation of an algorithm can automate components of a process; this is also the case for the two algorithm implementations examined in the case study. It should be noted that in the case of organization B, the end-user interacts with the algorithm indirectly. Interviewee F indicates that the process steps concerning the end-user have not changed since the algorithm's implementation. When questioned about this indirect method of algorithm usage, interviewee F responded:

''Indirectly as the employees who actually carry out the control, do not deal directly with the algorithm from the control. In that sense, you are not interacting with the algorithm directly.''

The data scientist involved in this implementation claims that the coherence of existing processes had negligible impact on the algorithm's implementation. The output of the AI prediction model allows for larger-scale checking, although this is not the result of a process but rather the input for the actual control procedure. According to interviewee D, it was difficult for the stakeholders who were involved in the process to evaluate the future process in advance.

''However, it was difficult for clients to foresee what a process based on an algorithm would look like at the time, which was similarly difficult for us as data scientists.''

When asked about the dependencies of the algorithm with other processes, the input processes for data are mentioned by interviewees A, B, D, and E. The algorithm within organization A is heavily reliant on historical data. Interviewee A underlines the necessity of data quality. At the start of the project, it was thought that information from internal data sources would suffice as input for the algorithm. However, it soon became apparent that this internal data was insufficient for making predictions. There have been some modifications in the data reliance of the algorithm within organization A over time. Interviewee B claims that the algorithm is dependent on a single system. However, interviewee A states that data science platforms are being used for input.

Service level agreements (SLAs) have been established within organization B, including contracts with third-party data providers. On the other hand, interviewee D states that the algorithm's involvement in the process has minimal dependencies because they operate with in-house data. Since the output of this algorithm differs from that of the vast majority of other systems within organization B, it is difficult to integrate with other systems in this organization. According to interviewee D, integrating the algorithm output is difficult because the organization has not progressed far enough to integrate the results into formal processes, which is currently the case.

Interestingly, there is another issue with the algorithm within organization A that has to do with the external data providers. Interviewee A states that it is debatable whether or not loading an open-source dataset is still beneficial to the algorithm. Loading this dataset is too time-consuming and provides insufficient value for the algorithm. After discussing the coherence of processes and the input for the algorithm-based processes, the integration of the algorithms into the organization's pre-existing information, architecture was mentioned. There was a rise in demand when all teams of organization A in the Netherlands were able to use the system. Within organization A, integration into the existing process architecture was realized after the initial enthusiasm of working with the algorithm faded off. The implemented algorithm fits the more process-driven way of working within certain teams in organization A. Interviewee C claims the following:

"By examining our existing process and refuting it with data from system X, we were able to make this process process-driven as well.''

Furthermore, interviewee B adds that during the maintenance phase, project management and involvement of policymakers and other stakeholders are no longer required because the system and associated algorithm are widely used throughout the organization.

5.2.4.1 Business and IT alignment

The most frequently mentioned concern during the interviews was the alignment of the implemented algorithm with existing data and AI-related legislation. Developers must adhere to European Union guidelines and the GDPR and GDPR implementation act when developing AI applications. To ensure compliance with the aforementioned legislation, organization B is developing data management and AI regulations. This is critical for organizations operating in the European Union (EU), as the European Commission has proposed the implementation of the Artificial Intelligence Act (AIA), which ensures that AI applications marketed in the EU are safe, compliant with existing legislation, and adhere to European values (European Commission, 2021[141]). Interviewee E mentions the importance of aligning the implemented algorithm with law and regulations.

Within organizations A and B, the initiative to deploy AI originates with a single or a few employees. The system and algorithm were developed by organization A in response to a pre-existing need from the team, which included interviewee A. The prototype was designed to provide steering information; however, there was no pre-defined alignment with organizational goals. Within organization B, the idea to work with an algorithm originated with a business controller and was quickly adopted by a policymaker. According to interviewee D, the working method was still highly experimental at the time.

In the existing literature, we found that organizations in the Dutch public sector appear to be unaware that big data solutions add value when they are backed up by organizational activities and procedures and aligned with organizational goals (Klievink et al. (2016) [71]). The organizational goals have not been quantified or cannot be quantified because the process to which the algorithm is applied did not exist prior to the algorithm's implementation within organization B.

In the case of organization A, no organizational goals on algorithm utilization have been established. A specific phenomenon must be prevented by applying the information. This prevention is not measurable. On the other hand, the objectives of both algorithm implementations can be linked directly to the most efficient use of resources within an organization. Yet, these improvements are either not measurable or not measured. The added value of the implemented algorithms cannot be translated to a strategic level. The end-user recognizes the added value since they can work in a more targeted manner.

5.2.5 Organizational culture

According to (Robbins and Judge, 2018[997]), organizational culture does not have to be uniform. This is possible because subcultures within the organization pursue values other than the dominant value within the organization. Core values are defined as "the primary or dominant values that are accepted throughout the organization." (Robbins and Judge, 2018. P. 545[997]). Subcultures are considered mini cultures within an organization. One of the interview questions attempts to identify the organizational culture concerning the algorithm implementation. On this question interviewee A replied that the culture during the implementation of the process was nonrigid. Interviewee B, who was also involved in this implementation, confirms that the culture while implementing the algorithm was informal. The data scientist and project manager involved made every effort to be accessible to people at all levels of the organization. Consequently, ethical, open, and transparent management is advantageous for successful employee AI adaptation (Kaplan and Haenlein, 2019[120]). Interviewee B provides the following example of open and transparent communication:

‘’We have also traveled around the country to give presentations on the spot and talking to individuals has helped. I believe that if such innovations are kept out of sight, they will not succeed.’’

According to (Mintzberg, 1981[127]), bureaucratic organizational structures do not suit complex innovation capabilities due to their rigidity. A hierarchical structure within an organization can result in numerous procedures and regulations that must be followed when innovating. These formal structures inside organization A have contributed positively to the roll-out of the system and associated algorithm throughout the Netherlands. It was clear which manager supported the system's implementation, as evidenced by the number of employees who used it within a team. Furthermore, interviewee B explained that the hierarchical nature of organization A and the organization's political control are relevant during the implementation. The hierarchical nature of an organization can also assists to arrange commitment, as management's support aided in the adoption of System X by certain teams. Interviewee B describes how hierarchy can make a positive contribution as follows:

‘’We did make use of the formal structure by approaching management if a change in themes was requested. The management is entitled to make this decision, so you make good use of the formal procedures.’’

On the other hand, interviewee A states that the hierarchy had no impact on the algorithm's implementation and that organization A has a flat organizational structure in which it is easy to connect with employees at all levels. Within organization B, interviewees D and E indicate that the hierarchy did not influence the implementation process; the third interviewee of organization B is not questioned about the hierarchy during the implementations because interviewee F was not involved at the time. Interviewee C was a member of the team where the algorithm was implemented at the time and exemplifies yet another facet of organizational culture. Employee age is important during the system’s implementation.

“The younger generation usually likes to work with technologies including this system, on the other hand for the older generation it was a bit more difficult in the beginning. At the moment, both generations are convinced of the added value of the system.”

Most of the employees were involved in the implementation and development of the algorithm. Of the six interviewees in the two algorithm cases, only the consultant and end-user from organization B were not involved in the implementation. In contrast, both are involved in the algorithm’s redesign and optimization. Interviewee E analyzed the initial implementation and highlighted areas for improvement and positive aspects of the implementation. Interviewee F is a member of the team that conducts a yearly process analysis, which includes evaluating the performance of the algorithm. This method of operation is consistent with respondent E's earlier comment, indicating that organization B has a flat organizational structure with widespread support for the algorithm.

5.2.6 Traditional software implementation

The objective of the implementation was discussed in three interviews on the traditional software implementation within organization C. This objective proved to be twofold, as the added value can be recognized not only in the process of the system's end-users but also on the system's functional management side. On both sides, the process has been accelerated by automation. Interviewee H, the project manager for this implementation within organization C, emphasizes a critical aspect of the implementation, namely that identifying and explaining the changes that the implementation entails for the users is vital during the implementation.

According to interviewee H, the implementation had the most impact on the back-office employees within organization C. Throughout the implementation, back-office personnel were part of the project team and contributed to the system's configuration. Interviewee G is involved in the system's implementation in two capacities: as a functional manager in the back-office and as an advisor focused on training and learning activities within organization C. Before the implementation of the system, the procedure for learning activities consisted of numerous manual activities and various administration methods, which complicated the process of learning. This process, as per interviewee G, was as follows:

“We had an Excel-based administration within organization C prior to the existence of system Z. This approach was incredibly intensive and insecure, which is why the need of a learning management system to oversee and administrate these activities arose”

Due to the implementation, fewer activities are required for the back-office learning process. However, interviewee G states that some functional management activities were not expected after implementation. Although interviewee G does not regard these functional management activities as complicated, they consume a significant amount of time when combined with the other system Z-related activities. The coherence of processes throughout the implementation is contingent upon the number of data sources to be merged. The initial processes for administering learning activities have been adapted to the system. According to interviewee H, the most challenging aspect of the implementation was integrating and adapting internal procedures to the often-standardized system of the external software provider. Due to the automation of these activities, there is a more consistent approach to learning inside organization C. Likewise, interviewee G notes that the system is dependent on the suppliers' development, usability, and design processes. A connection to another system is established for the learning activities themselves. Because the HR process has not yet been optimized, this automatic data upload procedure is not automated, and manual activities remain within the back-office process.

Interviewee H, a project team member, believed no project management approach was followed but described how a specific work sequence was executed. Interviewee I was not engaged in the implementation process. Interviewee I is a system end-user whose enrollment and invitation to learning activities are automated. Additionally, interviewee I mentioned that there is little or no documentation available and no defined procedures for working with system Z. Due to the system's self-explanatory nature, documentation and procedures are not required.

The Prince2 project management methodology was employed throughout the implementation process, along with the corresponding project description, project plan, intakes, and descriptions of the full implementation process. The project plan was established in close collaboration with the system's external supplier. So, according to interviewee G, a full explanation of the plan is required for formal approval of a tender project within the Dutch central government; this extensive description is essential so that policymakers can plan; budgets and the project's timeline also play a role in this process. Both interviewees G and H indicate that top management is involved in the implementation process, which is accomplished through milestone presentations and direct communication between the project manager, the project team, and the steering committee.

When asked if using the Prince2 approach assisted in the implementation process, respondent G answered that Prince2 was utilized only to prepare project documentation and had no impact on the system Z implementation process. ''The pace of this project must emerge from the employees of the organization, not from the procedures.'' Within the project team, there was a clear definition of roles and associated tasks appropriate for each member's expertise. As with the algorithm implementation, documentation of the system is not a significant concern, but there is a greater emphasis on documenting the process following Prince2 guidelines. The importance of knowledge management was addressed several times throughout the interviews. When forming the project team, the project-specific team composition was already considered. Capacity in the areas of communication and learning was essential since collaboration with internal stakeholders and testing with end-users were part of the implementation.

The development of E-learning, which can be provided through system Z, is mentioned by all three interviewees. The E-learning module expands the project implementation scope, which means it was unclear how everything related to E-learning would be organized within the organization. The steering committee did an adequate job of coordinating employees to cope with the integration of E-learning into System Z. The most challenging problem in establishing E-learning is that these modules must be developed over a long period. Employees at organization C must deal with this development in addition to their regular work, implying that the E-learning spectrum may take longer to extend.

Interviewee H stated that organizational culture had no impact on the implementation. However, the project team's efforts to improve the initial process during implementation indicate that employees initiated the change and that employees intended for the process to change. Interviewee G establishes the following connection between implementation and organizational culture:

''Since we are a learning-intensive organization, we have established a learning management system within organization C. We value knowledge transfer at organization C, and I believe that a lot of effort is put into sharing knowledge. System Z can support this.''

According to interviewee I, knowledge transfer and personal growth are high priorities within organization C. Internal training courses are now easier to follow due to the implementation. When these shared values regarding knowledge sharing are widely shared across the organization, it may have been a positive factor throughout implementation. Interviewee H also stated that the change was supported by members of the project team, which added to their willingness to improve the situation. If the majority of employees share the value of personal development and knowledge transfer, it can be considered a core value within organization C.

6 Discussion

It is important to recall that the objective of this thesis is to answer the main research question. which allows us to understand how organizational structure components contribute throughout the implementation of the disruptive technology AI within a central governmental organization. Additionally, the answer to SQ4 explains how these components of organizational structure differ between disruptive technology and traditional software implementations. The foundation for our answer is found in the analysis of the findings from the literature review and the empirical part of this research, the case study.

6.0.1 Coding process

As described in the methodology chapter, the interviews were analyzed based on the grounded theory. The codes that emerged during the open coding can be found in appendix B of this thesis. The outcome of the last step within the grounded theory of selective coding can be seen in the table below. Table 5 shows the connections between the labeled data, with associated concepts and sub-themes. The three most common codes within that theme are also included. Because interviews from traditional software implementations were also coded during the open coding, not all of the codes from the interviews are appropriate to our conceptual model. Based on the concepts depicted in table 5, the contribution of organizational structure to the implementation phase within the conceptual model has been formulated. These concepts are based on the findings of the six interviews from the disruptive technology case study.

Table 5: Selective coding list

Concept	Sub-themes	Codes
Project management	Formalization of tasks after implementation	#Algorithm_optimization_in_iterations (2) #Exploratory_implementation_without_methodology (1) #Little_formalization_accelerates_decision-making (1)
	Absence of project management methodology	#No_project_management_method_involved (3) #Prototype_way_of_working (3) #Exploratory_implementation_without_methodology (1)
	Division of roles varier per phase	#Division_of_roles_during_national_implementation (2) #Division_of_roles (2) #Division_of_roles_was_not_clear (1)
Knowledge management	Provide documentation on demand	#No_documentation_strategy (4) #No_documentation_of_algorithm_for_end-user_as_it_is_redundant (3) #Documentation_enables_reproducibility (2)
	Method of communication of added value	#Targeted_coummunication (8) #Algorihm_end-user_not_aware_of_technical_details (3)

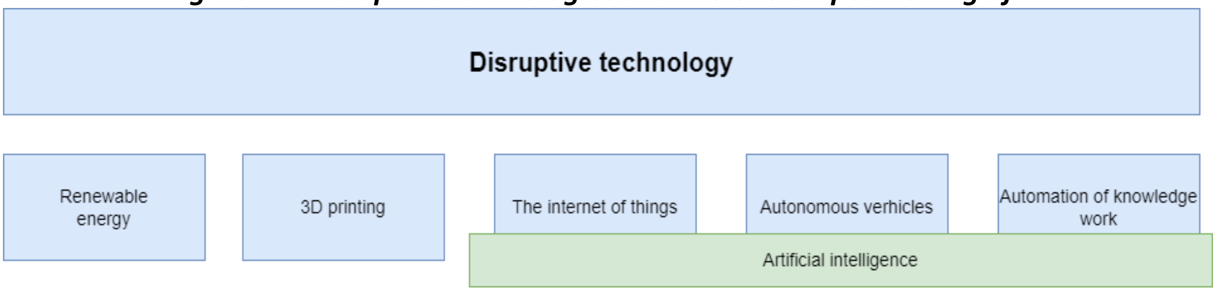
	during implementation	#Awareness_of_expertise_whilst_sharing_knowledge (3)
	No separation of tasks	#All_tasks_assigned_to_one_individual (4) #Dependent_on_one_person (1)
Processes	Algorithm is adapted to process	#Algorithm_output_as_processinput (7) #Algorithm_fits_with_new_way_of_working (4)
	Application designed in such a way that the end-user has no connection with the algorithm	#End-users_have_no_interaction_with_algorithm (2) #Indirect_usage_of_algorithms (2)
	Process design ensures human judgment and no impact on process outcome	#Algorithm_as_small_part_of_a_process (2) #Algorithm_does_not_determine_process_outcome (1) #Algorithm_implementation_had_no_effect_on_process (1)
Business and IT alignment	No alignment on strategic level	#Algorithm_supports_goals_yet_they_are_not_measurable (4) #Consequences_of_algorithm_unclear_to_stakeholders (1)
	Alignment with legislation	#Alignment_with legislation (3) #Impact_of_legislation_whilst_implementing (3)
	Efficiency increasement	#Goal_of_algorithm_implementation (4) #Algorithm_solves_capacity_issue (2)
Organizational culture	Flat organization structure and speed of decision-making	#Benefits_of_short_lines_of_communiction (4) #Benefits_of_flat_organization_structure (2) #Culture_of_pioneering_to_get_work_done (1)
	Societal implications of algorithms	#Build_in_safety (4) #Legislation_defines_the_way_people_work_with_algorithms (3) #Transparency_on_algorithms (2)
	Subculture and implementation process	#Non_rigid_culture (2) #Implementation_cultural_fit (2)

6.1 Answering SQ1

SQ1: What is disruptive technology?

In 2013, McKinsey identified twelve disruptive technologies. In this study, the underlying disruptive technology AI is examined in great detail. More specifically, this thesis focuses on the disruptive technology AI applied within algorithms implemented in a central governmental context. Within McKinsey's paper, AI is seen as a driving technique behind some of the disruptive technologies. Disruptive technology is ‘’a specific technology that can fundamentally change not only established technologies but also the rules and business models of a given market, and often business and society overall.’’ (Oxford reference, 1997[18]). Figure 11 provides an example of five of the twelve disruptive technologies from McKinsey's report. The three technologies on the right were chosen for this illustration because they utilize AI; the other two were selected to illustrate that not all disruptive technologies involve AI.

Figure 11: Disruptive technologies and the overall positioning of AI

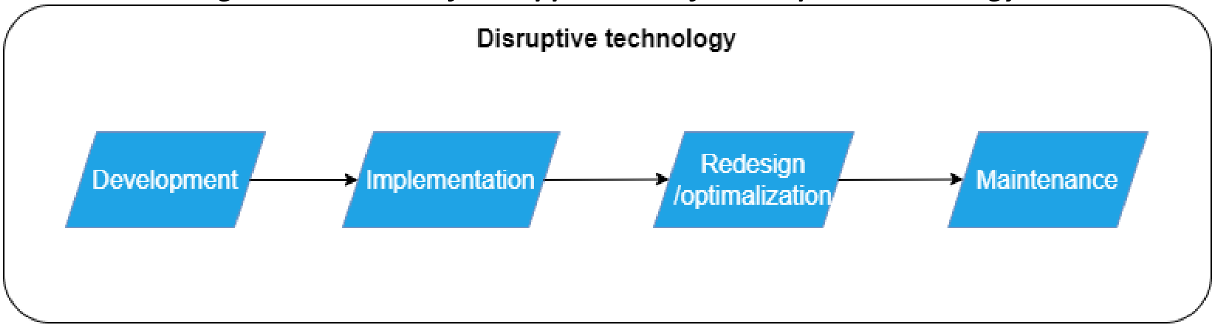


Implementing a disruptive technology presents challenges on various pillars, such as ethics, decision-making, technical complexity, and organizational structure. The concept of organizational structure is explained in more detail in the section that provides an answer to SQ2. Within the literature review, we found that implementing the disruptive technology AI offers the opportunity to support existing decision-making mechanisms within an organization with data, resulting in enhanced efficiency and the potential to enable new capabilities (Colson, 2019[65]).

Transparency and accountability are difficulties that arise when AI is used to automate decision-making (Council of Europe, 2017[7]). Transparency difficulties can be avoided by teaching end-users of AI-based applications the purpose of AI-based decision-making to increase their understanding of when, why, and how AI-based decisions are made as part of the implementation process (Kancevičienė, 2019[40]). The issues that AI deployment entails in terms of accountability can be overcome by organizing the process so that a person refutes the outcomes of an AI system, and human judgment remains leading in AI-based decision-making (Colson, 2019[65]).

Different phases while applying a disruptive technology can be identified based on the interviews. These phases are depicted in figure 12. These are the development phases, during which the data scientist develops a disruptive technology application, followed by the implementation phase, during which the application is deployed within the organization. The disruptive technology is then optimized in both cases, in one case by making the system more robust and implementing it across various teams within the organization, and in the other case by complete redevelopment of the application. Following the redesign/optimization phase, the system enters the maintenance phase, during which no further development occurs.

Figure 12: Phases of the application of a disruptive technology



6.2 Answering SQ2

SQ2: What is organizational structure

This sub-question has been answered based on the current state of the literature on organizational structure. The following composite definition is used throughout this thesis: organizational structure is the ’’formal configuration between individuals and groups regarding the allocation of tasks, responsibilities, and authority within the organization’’ (Lunenburg, 2012, p1[12], Galbraith, 1987[13], Greenberg, 2011[14]). Furthermore, organizational structure is the method that defines how resources are utilized to achieve the organizational objectives (Akbari et al., 2012[15]). To understand these components of organizational structure, it is helpful to delineate the parts of the definition and associated components. The characterization of the concept of organizational structure into five components is based on the existing body of knowledge on organizational structure, as seen in the literature review. The literature review examined five organizational structure components: project management, knowledge management, processes, business and IT alignment, and organizational culture. These components are derived from the definition mentioned above of organizational structure. The bullet points below demonstrate the conversion from part of the definition to organizational structure components.

1. **The formal configuration between individuals and groups** refers to how an organization is structured, including hierarchy, lines of communication, and organization of work. Mintzberg describes five different ways of structural configuration in his organizational structure model (Mintzberg, 1980[72]). These configuration types address three distinct aspects: a prime coordinating mechanism, the key parts of an organization, and the type of decentralization within the organization. The standardization-focused coordinating mechanism also includes managing the organization's processes, stressing that processes are a component of organizational structuring (Mintzberg, 1979.p294[73]). These aspects of configuration affect how individuals and groups operate within an organization. For example, a configuration aimed at standardizing work has a higher degree of bureaucracy than an ad hoc structure. Mintzberg argues that cultural norms within an organization play a

key role in structural design, ''particularly on the use of authority and bureaucracy.'' (Mintzberg, 1979.p294[73]). On the basis of this example from Mintzberg's theory, it can be deduced that organizational culture is relevant in the structuring of an organization.

2. **The allocation of tasks, responsibilities and authority** is concerned with the flow of tasks and knowledge within groups and the assignment of employees responsible for the execution of specific activities within an organization (Grossi et al., 2007[74]). This delegation of work is contingent upon the employees' knowledge and the flow of knowledge between employees. As a result, knowledge management procedures can be incorporated into organizational structure. The organizational structure within these organizations determines responsibilities between groups; responsibility issues within groups are determined by the way groups are established to accomplish their goals (Grossi et al., 2007[74]). The text below the third bullet point includes an explanation of why processes are included in this section of the definition.

3. **The way resources are utilized to achieve the organizational objectives** refers to coordinating an organization's strategic and operational procedures to accomplish a given goal. According to (Fountaine et al., 2019[66]), alignment is just as crucial in the case of AI adoption as having knowledgeable employees and the ability to work with a disruptive technology. Aside from the role of alignment in coordinating operational procedures, alignment can also aid in resource allocation in project management. Nedzelský highlights the benefits of alignment between project management and resource allocation as ''project management is tightly bound with company core process, which involves resources through all company." (Nedzelský, 2020.p2015[75]).

These aforementioned organizational configuration methods from Mintzberg illustrate how an organization can be structured in terms of roles and activities within an organization. However, the disruptive technology we are investigating is implemented bottom-up (Netherlands Court of Audit 2021[5]), resulting in limited influence of hierarchical components. According to the findings of this study's empirical component, hierarchy played no role in the initial implementations of the disruptive technology AI. Roles and responsibilities are not divided or organized, and the focus is on improving a process. The implementation aids process-oriented work in the case of organization A. Thus, the process-oriented theory appears to be more suitable in this study's context. "Process orientation (PO) means that focus is placed on the business processes, which range from customer to customer, instead of emphasizing an organization's functional and hierarchical structures" (Kohlbacher and Reijers, 2013,p245[152]). Hence, processes are involved in two parts of the definition of organizational structure, as a method of structuring functions within an organization and as a method of working within the organization.

6.3 Answering SQ3

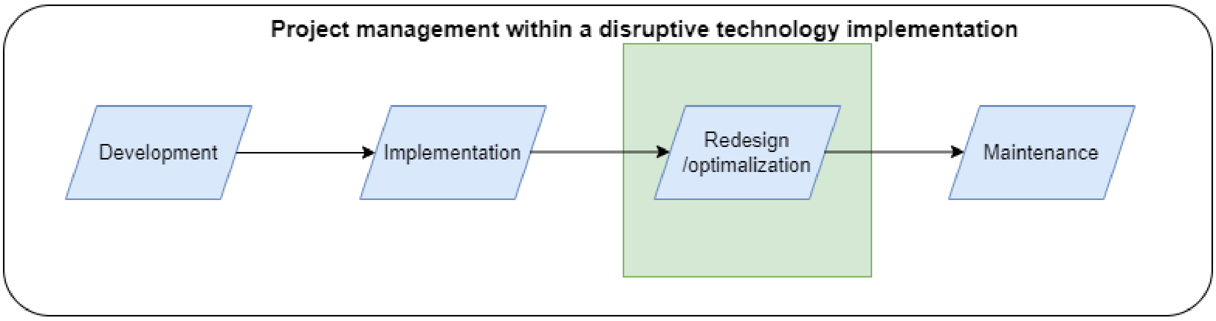
The interviews, document analysis, and literature review revealed how each organizational structure component can contribute to the implementation of a disruptive technology. This contribution is highlighted in practice within the two algorithmic implementations studied in the case study. SQ3 is answered by a summary of these components.

***SQ3:* How are organizational structure components reflected within the implementation of AI?**

6.3.1 Project management

Project management is not central to the development and initial implementation of algorithms. In both cases, project management is incorporated after the initial implementation of the system. Furthermore, it was only after the system's initial implementation and testing that project management emerged stronger. In case A, sub-project leaders, and an overarching project manager were appointed to supervise the implementation from small scale to national. Within case B, team composition and applying a project management methodology are only evaluated after the algorithm's initial development and implementation. This formalization of activities has been established for the redevelopment of the algorithm based on the findings and lessons learned from an internal and external assessment of the initial implementation. Figure 13 illustrates that project management is only involved following the initial implementation; this is based on the moment the project manager is appointed, documentation is prioritized, and a project management methodology is implemented.

Figure 13: Project management during a disruptive technology implementation



During the preparation of project documentation in case A: the overarching project manager prepared little documentation; the emphasis was mainly on creating documentation based on employee inquiries. The urgency of documenting organization B's development process and decision-making was introduced following an internal audit of the initial development and implementation process. During the rebuilding of the algorithm, a higher emphasis is placed on incorporating varied capabilities within the team and documenting decisions and considerations throughout the development and implementation process. The system will be redesigned using a data science methodology. Employees did not work according to a project management approach from the start in case A, but the scrum method was used to increase the system's robustness during the optimalization phase. Currently, this system is under maintenance, and no additional development is planned. Thus, there is no reason to adhere to a project management methodology.

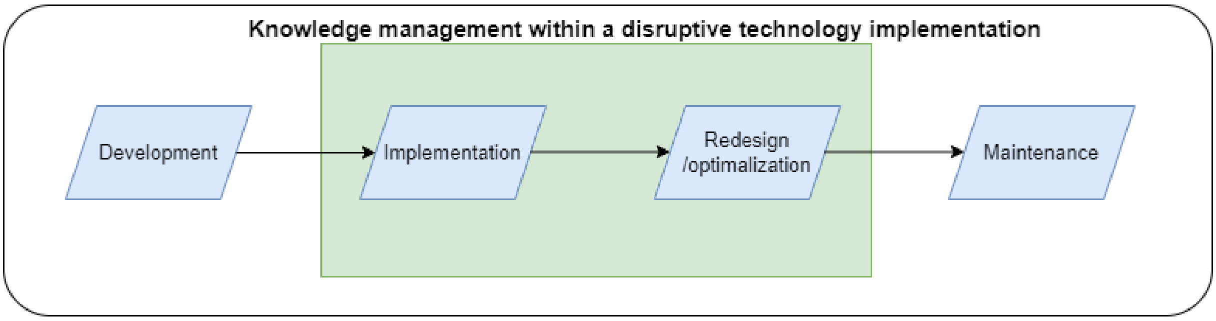
6.3.2 Knowledge management

While the data scientist possesses the majority of knowledge regarding the development and implementation of algorithms, it is clear from both cases studied that the data scientist also performs a variety of other tasks and activities, including communicating with other experts; lawyers, and ethicists, facilitating conversations with policymakers, and making modeling choices. The informal interpretation of these activities can be attributed to a development team's immaturity and necessity; otherwise, a variety of activities would not be undertaken in the case of organization B. It is common within organization A to distribute tasks among a few employees. This is not ideal since this approach depends on a single individual.

The cases demonstrate that the emphasis during the algorithm's development and initial implementation is not on sharing knowledge and information about the tasks associated with the algorithm's development and implementation, resulting in a limited diffusion of relevant knowledge and competencies within the organization. When it comes to educating end-users within organization A on how to work with algorithms, knowledge management becomes apparent in targeted sharing of knowledge for the benefit of implementation.

Allowing a passionate end-user to engage in dialogue with other end-users is beneficial in terms of knowledge transfer, as communication occurs from the same expertise, and the information is transmitted more accurately. Knowledge management is prominent within organization B in the team composition for algorithm redevelopment. The inclusion of knowledge management in the image below reflects that these dialogues with end-users occurred as part of the implementation process within organization A. The contribution of knowledge management in figure 14 is based on this knowledge transfer session during implementation and the team composition based on knowledge and competencies while redesigning the algorithm in case B.

Figure 14: Knowledge management during a disruptive technology implementation

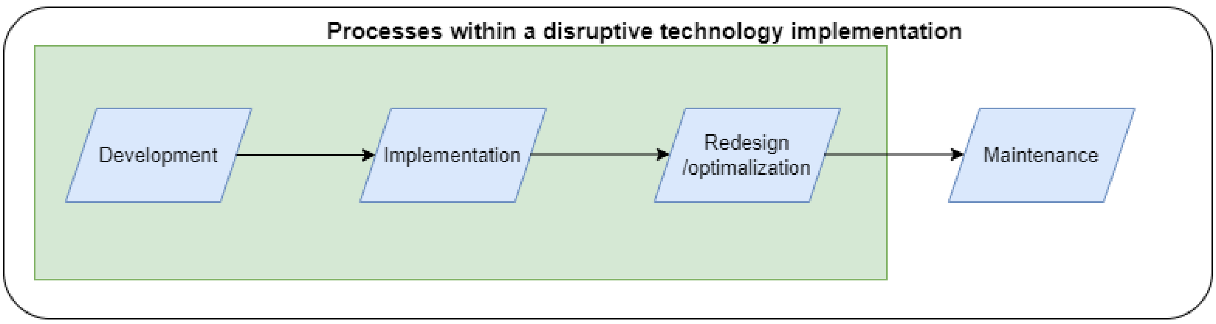


6.3.3 Processes

As described in the literature review of this thesis, organizations may make more informed data-driven decisions by shifting from data-driven to AI-driven processes. Thus, according to (Colson, 2019[65]), the critical phase in this transition from data-driven to AI-driven decision-making is identifying whether decision-making should be left to humans or delegated to AI inside a process. This decision is based on whether humans or AI are more capable of making better decisions in a process. In both of the cases studied, it is apparent that an employee maintains decision-making authority and hence determines the result of the process. To ensure that the decisions of the algorithm's end-users are the most important factor in determining the process's outcomes, the algorithms are constructed in such a way that they match the existing process and human judgment remains dominant. In both cases, the automated process step is built-in at the start of the process and serves solely as input for the employee; their knowledge and activities continue to drive the process's outcomes. The algorithms require data from distinct data sources; therefore, during implementation, the data sources, the algorithm, and the process that precedes must all be configured and set up. The data scientist is responsible for the activities mentioned above. Both studied algorithms are human-centered, which is one of the primary issues outlined in the European Commission's AI vision. Recall that human-centered AI puts a premium on ensuring that an AI system is configured to retain human decision-making capability. Alongside human oversight of the AI application (Berryhill et al., 2019[58]).

The introduction of SLAs within organization B may imply project management activities and a formalization of the process concerning the algorithm's input data. Although interviewee F mentioned the presence of these SLAs, their significance for the algorithm within organization B is limited. According to the data scientist involved, the algorithm is heavily reliant on internal data sources, and prior data issues were primarily confined with internal data. Establishing an SLA is a step toward professionalizing the input processes for algorithms that are more reliant on external data sources. To summarize, using an AI algorithm does not preclude leading human decision-making regarding the outcome of the process in which the algorithm is implemented. Preserving and, in the case of both algorithms studied, guiding human decision-making necessitates the creation of a process that facilitates. During implementation, the emphasis is on integrating data input and output processes; few stakeholders are involved, the data scientist is in charge of nearly all activities. Figure 15 depicts the formalization of processes by SLAs and the contribution of careful consideration of process design while building and implementing algorithms.

Figure 15: Process within a disruptive technology implementation

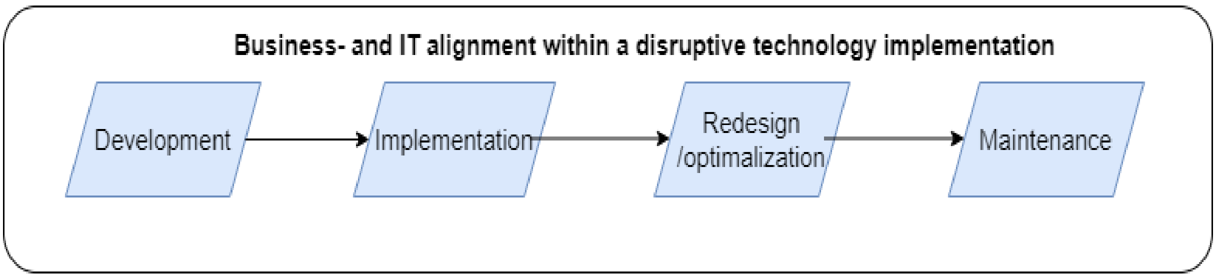


6.3.3.1 Business and IT alignment

According to Henderson and Venkatraman, a lack of alignment between IT and business strategies within an organization contributes to an organization's incapacity to derive maximum value from IT (Xueying Wang et al., 2008[144]). The algorithms' development and implementation in our case study have been done in a demand-driven or prototype-like approach, with no measurable organizational goals in place. There is a contradiction between the explicitly structured working according to an organizational objective and the more prototype-like working approach emerging while implementing disruptive technologies. Because the algorithm implementations studied are developed in a bottom-up manner, top management has little or no influence during the implementations. As a result, the alignment between business and IT in areas such as mission, vision, goals, and strategy, which are critical components of IT alignment are not applicable in these cases. End-users highlight that the algorithm positively contributes to the process in which it is implemented. The added value comes from a more efficient use of resources within the process and being able to work in a more targeted way due to the outcomes from the implemented disruptive technology.

The developers of the algorithm are conscious of the importance of being attuned to the organizational culture. According to interviewee A, the system and algorithm are tailored to the way of working within organization A. The algorithm within organization B is implemented to fit precisely within the desired working method for the end-users to work unbiasedly. Henderson and Venkatraman's model do not mention the alignment between the IT implementation and the legislation governing the implementation. AI legislation is still in its early stages, and it was not yet an important subject at the time. AI legislation did not affect the end-user’s activities during implementation and afterward. However, the data scientist of the systems has to do with conforming to the AI legislation. Interviewee D mentions legislation as an external factor that affected the implementation due to its unambiguity. According to interviewee A, there is little regulation on AI, yet legislation could become a problem shortly if organizations have little or no legal knowledge in the field of AI. Likewise, interviewee E states: ''All new implementations must also comply with the law and regulations, which is a problem since the regulations are still quite ambiguous.'' This applies to the initial implementation and the redesign of the algorithm within organization B. Although the alignment between the algorithm implementations and AI legislation arises throughout the interviews, this has not been incorporated in figure 16, as this figure illustrates the contribution of business and IT alignment, and legislation is not prominent in Henderson and Venkatraman's theory. As a result, the strategic alignment model is not examined in depth in the results section of this thesis.

Figure 16: Business and IT alignment within a disruptive technology implementation



6.3.4 Organizational culture

As seen in the literature review (Mintzberg, 1981[127]) argues that organizational culture can impede complex innovation, owing to rigid bureaucratic structures within organizations that do not align with the experimental way of working observed in the case studies. Our research indicates that few employees are involved in decision-making regarding process design and documentation during the implementation of an algorithm. Within organization A, existent hierarchal procedures assisted the acceleration of the national implementation by acquiring support from management via formal structures.

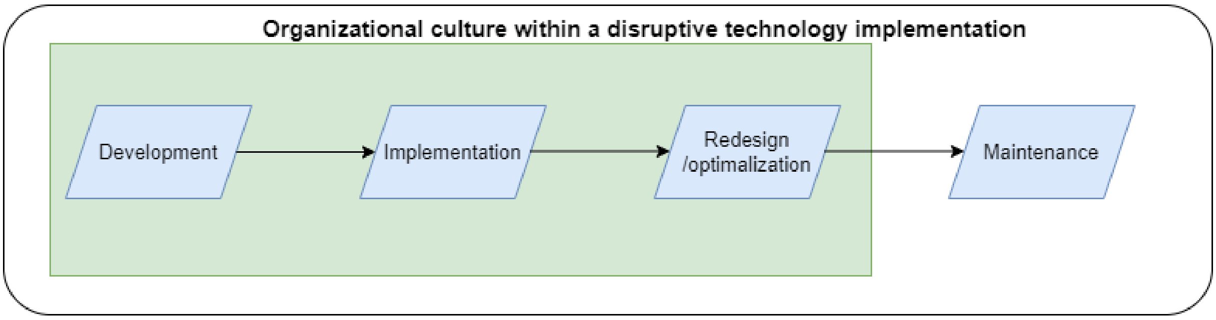
The framework for assessing ICT-enabled innovation for governance developed by (Misuraca and Viscusi, 2015[97]) encompasses four distinct modes of ICT-enabled change. One of these four possible changes enabled by ICT is transformative/disruptive change, which entails the implementation of a previously established process. In this case, the process is significantly altered to accommodate, for example, a service. This ICT-enabled change corresponds with the implementation in organization A; the algorithm provides an alternative perspective on certain activities for end-users. Presentations and documentation about the system with the associated algorithm for end-users were provided throughout the implementation.

The implementation within organization B is more consistent with another method of ICT-enabled change within the framework, namely transformative/radical change. The AI algorithm enables the performance of certain checks that were previously unfeasible without the use of an algorithm. Culture is a driving force behind this radical transformation (Tellis et al., 2009[145]). The importance of culture in the implementation of organization B was not emphasized strongly during the interviews, although a subculture within organization B was regarded as contributing to the development phases and implementation of the algorithm. It is possible to identify a subculture within the examined cases. The application of algorithms within Dutch central governmental organizations has been thoroughly investigated regarding the childcare benefit scandal and the SyRI system controversy. The data scientists are aware of the societal implications of algorithm implementation. Likewise, shared values such as prudence and responsibility are recognized while developing and implementing algorithms; these values are present throughout the development, implementation, and redesign phases.

Interviewee A, for example, states the following: “I develop with the understanding that everything I produce has an impact on society, thus, I strive to develop responsibly.” Likewise, Interviewee D indicates that: “The general opinion on the childcare benefit scandal has influenced the development of algorithms within the Central government. People are extremely cautious when it comes to developing algorithms as a result.” A remark from interviewee D concerning the maturity of the department responsible for the development and implementation of the algorithm’s contrasts with this responsible way of working. “For both our organization and the organization that conducted research into the algorithm's implementation, we could have approached certain issues differently and perhaps should have concluded that things could have been done better and that the department was not ready yet to implement an algorithm.”

Nonetheless, during the interviews with both data scientists, the careful and responsible approach to development was most apparent. These shared values are essential throughout the system's development and implementation. Whenever the algorithm was implemented within organization A, it was validated with local managers to ensure that the system was indeed being used. The formal structure has been used to facilitate implementation in this way. Throughout the implementation, the informal culture among individuals associated with the algorithm within organization B aided in rapid decision-making. Figure 17 displays the contribution of organizational culture within the different phases. Throughout the redesign and optimization process, a greater emphasis has been placed on adhering to the guidelines for developing algorithms, increasing the system's robustness, and learning from previous actions during the algorithm's initial development. In addition to professionalizing the process and taking social impact into account, the conversations with end-users during the implementation phase are also included in figure 17.

Figure 17: Organizational culture within a disruptive technology implementation



6.4 Answering SQ4

The answer to the following question is derived from the enumeration of organizational structure components' involvement; similarly, to the answer on SQ3. The components are addressed one by one and plotted on the algorithm implementations results to map out any differences between the disruptive technology implementation and the traditional software implementation.

SQ4: How do organizational structure components differ between a traditional software implementation and a disruptive technology implementation?

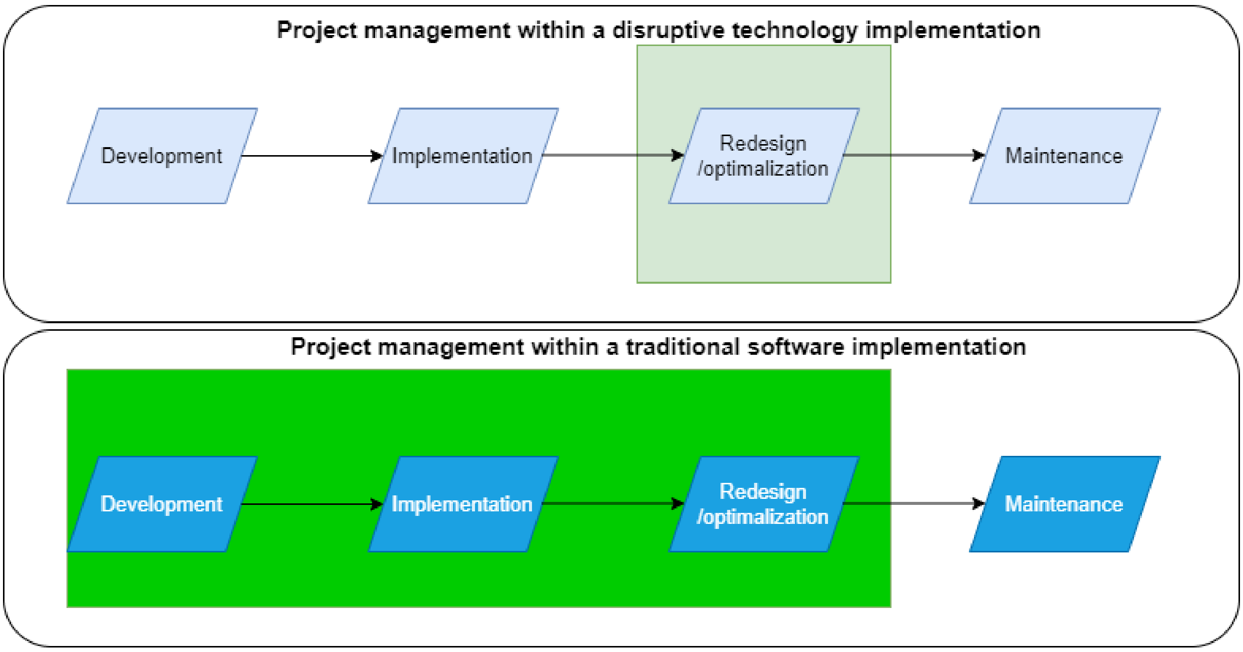
Although our primary focus is on the implementation phase, the other phases discussed during the interviews have also been incorporated in the results and this discussion chapter to accommodate organizational structure components instead of merely indicating that a component of organizational structure is not present in the implementation phase. To provide focus on the implementation phase, the conclusion and answer to the main research question, and all points within the implementation phase of all organizational structure components are grouped the conceptual model and listed in a table at the end of this chapter.

6.4.1 Project management

In contrast to disruptive technology implementations, a project manager was involved in the implementation process from the beginning. The project manager was preoccupied with preparing documentation such as a privacy impact assessment and a project plan. The project manager was also concerned with the establishment of a project team prior to the implementation phase. Within organization C, the project management methodology Prince2 was employed to fulfill the official requirements for scoping and budgeting. During the implementation phase, the project team tested the system with end-users to gather feedback on the new way of working during the traditional software implementation.

The project manager also contributed to the incorporation of other systems and the adaptation of internal processes for implementation. Following the first implementation, the system is further developed in an organized manner. The project manager manages the balance between budget and resources, coordinates, and brings the appropriate parties together, and provides quality assurance by regularly connecting with the internal clients. Within the algorithm cases, a project manager is appointed only after the system's initial implementation. Team composition based on the capabilities of individuals is considered only after the implementation phase. Figure 18 compares the contribution of project management between the disruptive technology implementation and the traditional software implementation and is built on a compilation of both discussions of project management results. It is recognized that project management is more important in traditional software implementations. The primary distinction is the stage at which a project manager is appointed and the extent to which project documentation is delivered. Project management methodologies are used in disruptive technology cases to formalize activities concerning the decision-making of the system or to develop a more robust system in a structured manner.

Figure 18: Comparison of project management between a disruptive technology and traditional software implementation

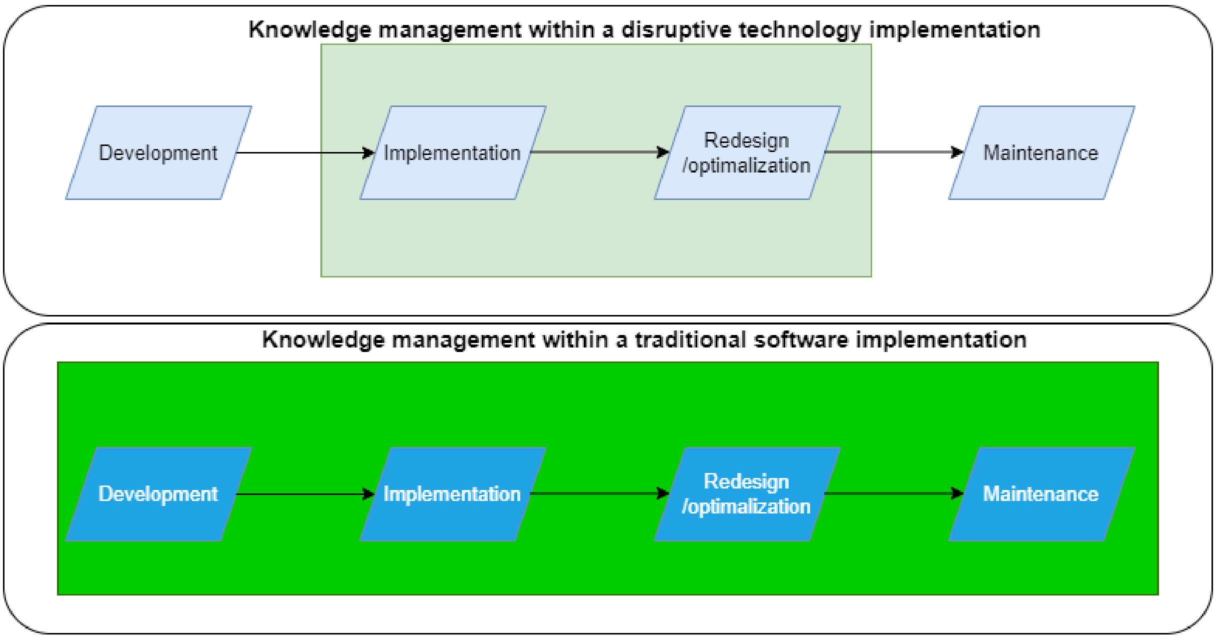


6.4.2 Knowledge management

Because the external supplier handles the majority of the technical aspects of the implementation, the technical knowledge required for development cannot be compared to the development of the algorithms in the cases of the disruptive technology implementations. The traditional software implementation within organization C aims to facilitate learning and centralize knowledge; however, these are the effects of the implemented system and do not relate to the implementation process. The end-users of the system are involved in the system's testing, where knowledge sharing is twofold: end-users may contribute input to the system, and, on the other hand, they can already get acquainted with the systems functioning. Before starting the implementation process within organization C, information was acquired by observing another learning system implementation within the Dutch central government. These experiences have been shared and enabled more informed decision-making for the internal clients.

Before the implementation phase, a project team was formed based on the employee’s future role within the system and competencies such as communication and knowledge of education. This project team was also in charge of gathering knowledge and communication with potential end-users, internal stakeholders, and the external supplier during the implementation phase. Furthermore, there were two-weekly updates on het system throughout the implementation and optimization process. These updates are integrated into a set communication mechanism inside the organization. Figure 19 depicts the function of knowledge management throughout the process; the text above depicts the role of knowledge management in the first three phases. Some IT skills in functional management are necessary for system maintenance; this newly required expertise has become prominent since the implementation of the learning management system.

Figure 19: Comparison of knowledge management between a disruptive technology and traditional software implementation

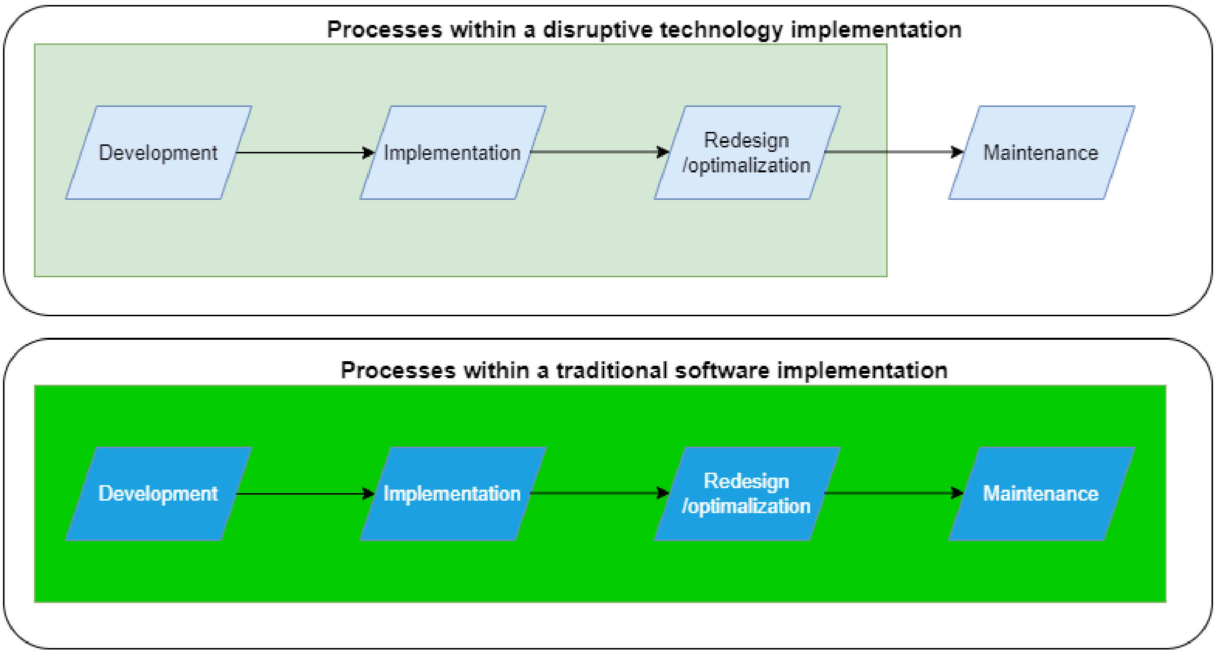


6.4.3 Processes

Organization C's internal processes are adjusted to work with the external supplier's software. This modification is necessary as there are limited possibilities of modification in the system itself, merely some configurations primarily focused on the system's design. Adjusting internal processes, in this case, includes changing some input processes within organization C. The previous learning administration procedure, which included a variety of data processing methods, is altered to a more straightforward administration process, allowing the data to be linked to an external system. Members of the project team worked with the external supplier to implement these changes during the implementation process. In addition, the project manager contributed to the establishment of different technical connections to multiple information sources in organization C.

During the implementation, a learning adviser from organization C was in charge of designing the system based on the internal process and functional requirements. Employees are still working on setting up and growing the variety of E-learnings accessible through the system, which is outside the scope of the initial implementation. In terms of processes, disruptive technology implementations differ from the implementation within organization C. The developer works internally and adapts the system to a current process or the desired working method of the individuals participating in that process. Adapting the strategies to the system is resource-intensive for the internal organization but outweighs the costs of a completely customizable software implementation. It can be seen that processes are prominent during many phases shown in figure 20. When we observe the implementation phase, we can see that changing a process within organization C took years. In contrast, the development and implementation time for the disruptive technology was much shorter, feasibly because the algorithms were developed in-house in a prototype-like manner.

Figure 20: Comparison of processes between a disruptive technology and traditional software implementation

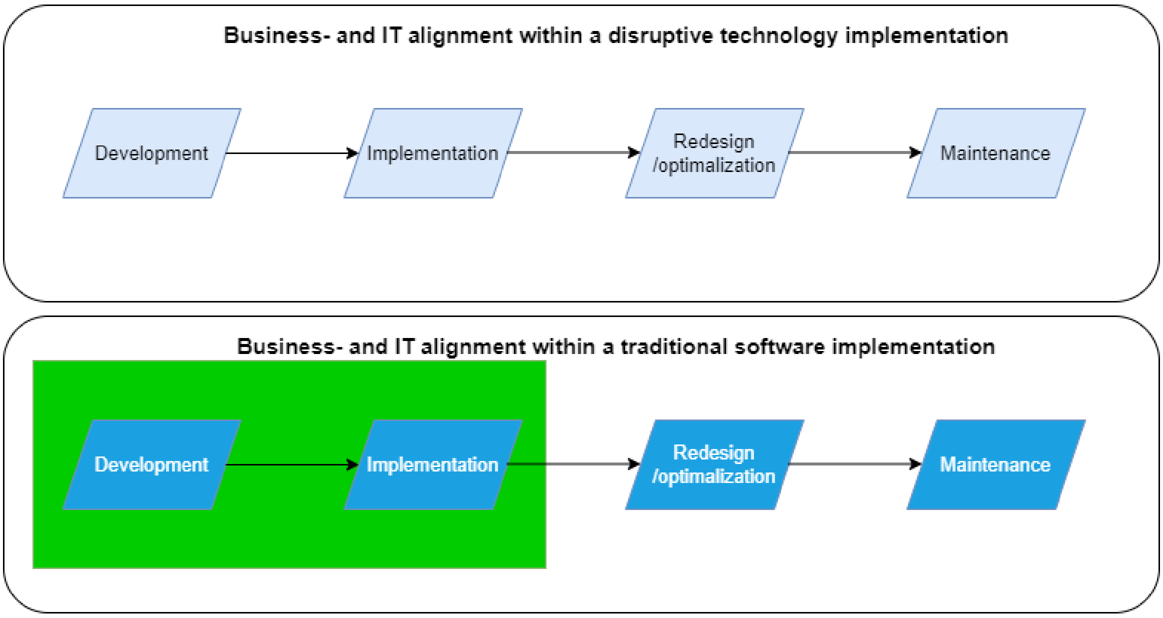


6.4.3.1 Business and IT alignment

All three systems studied have one commonality: they are solutions for efficiently carrying out a specific process. However, since these efficiency improvements were not made measurable from the beginning, it is hard to ascertain whether there has been any change in efficiency. Even though a business consultant coordinates certain activities, there is far too little structure, documentation, and formalization to discuss alignment between business strategies, vision, or other goals, and the disruptive technology implementation within organization B. During the algorithm redesign phase, there is a greater emphasis on formalizing the development and implementation process by documenting decision-making. Within organization C, there is a configuration with existing vision documents in the field of learning. The system contributes to more efficient learning administration and provides a centralized overview of all learning activities.

Within the traditional software case, top management involvement provides the opportunity to refute the IT implementation with the organizational goals at an early stage. Top management is not involved in the development and implementation phases of both the algorithm implementations, although a policymaker an advisor is involved in the system's subsequent roll-out in one case. Alignment at an internal level can be seen in skills within the business structure and the IT infrastructure. The team composition of the project team responsible for the implementation in collaboration with the external supplier shows that skills such as communication, project management, and knowledge about learning were present, which has promoted the roll-out of the initial plan. On the other hand, it is noticeable that the technical skills required for the functional management responsibilities have not yet been adequately accommodated. Figure 21 depicts the contribution of aligning business and IT. No contribution is seen in the disruptive technology cases. Involvement of top management and alignment with vision documentation, on the other hand, indicate that the organization's strategic vision and its implementation are related.

Figure 21: Comparison of business and IT alignment between a disruptive technology and traditional software implementation

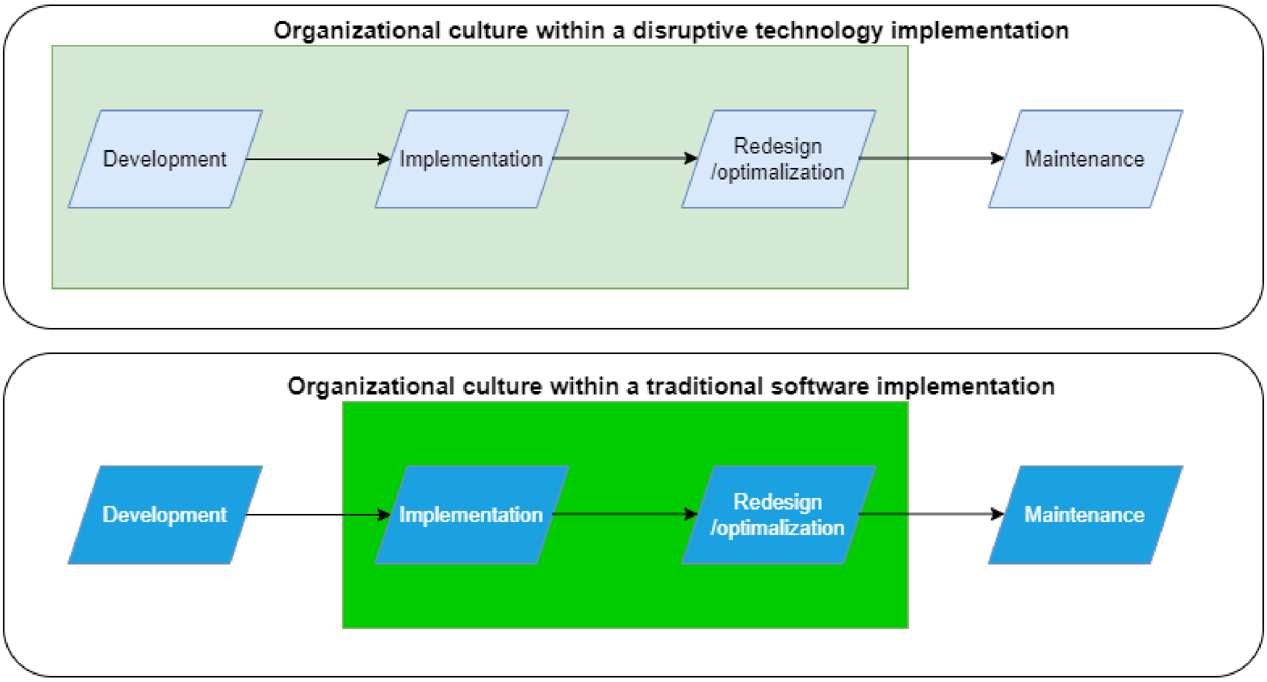


6.4.4 Organizational culture

The organizational culture of organization C was irrelevant during the development phase of the traditional software implementation; the system is mainly standardized and was designed by an external software supplier. Within the implementation phase, there is a disparity in perceptions of the role of organizational culture. For example, interviewee H claims that organizational culture has had little impact on the system's actual implementation. On the other hand, interviewee G indicates that organization C is a learning-intensive organization, and that the system can help improve knowledge sharing inside the organization. According to interviewee I, as part of the learning culture at organization C, there is a strong emphasis on knowledge sharing.

Members of the project team responsible for the implementation share core principles such as motivation in learning and knowledge transfer. Interviewee H claims that, despite the lack of a cultural impact in the implementation, the employees were highly motivated to improve their current work process. This urge was so strong because the project team members were keen to enhance the process in which they were involved. E-learnings incorporation during system optimization depends on employee incentive to design the E-learnings. Setting up E-learning modules is a time-consuming activity that must be done in addition to employees' regular activities at organization C. The influence within the implementation phase can be compared. Shared values have been beneficial for the disruptive technology and traditional software implementation; however, these shared values differ; as for disruptive technology implementations, a demand-driven way of working and societal implications are most prominent. Values such as knowledge sharing, and personal development are commonly found in the traditional software implementation. Figure 22 depicts the phases at which organizational culture contributed to the implementation; in this scenario, organizational culture facilitated the implementation of traditional software.

Figure 22: Comparison of organizational culture between a disruptive technology and traditional software implementation

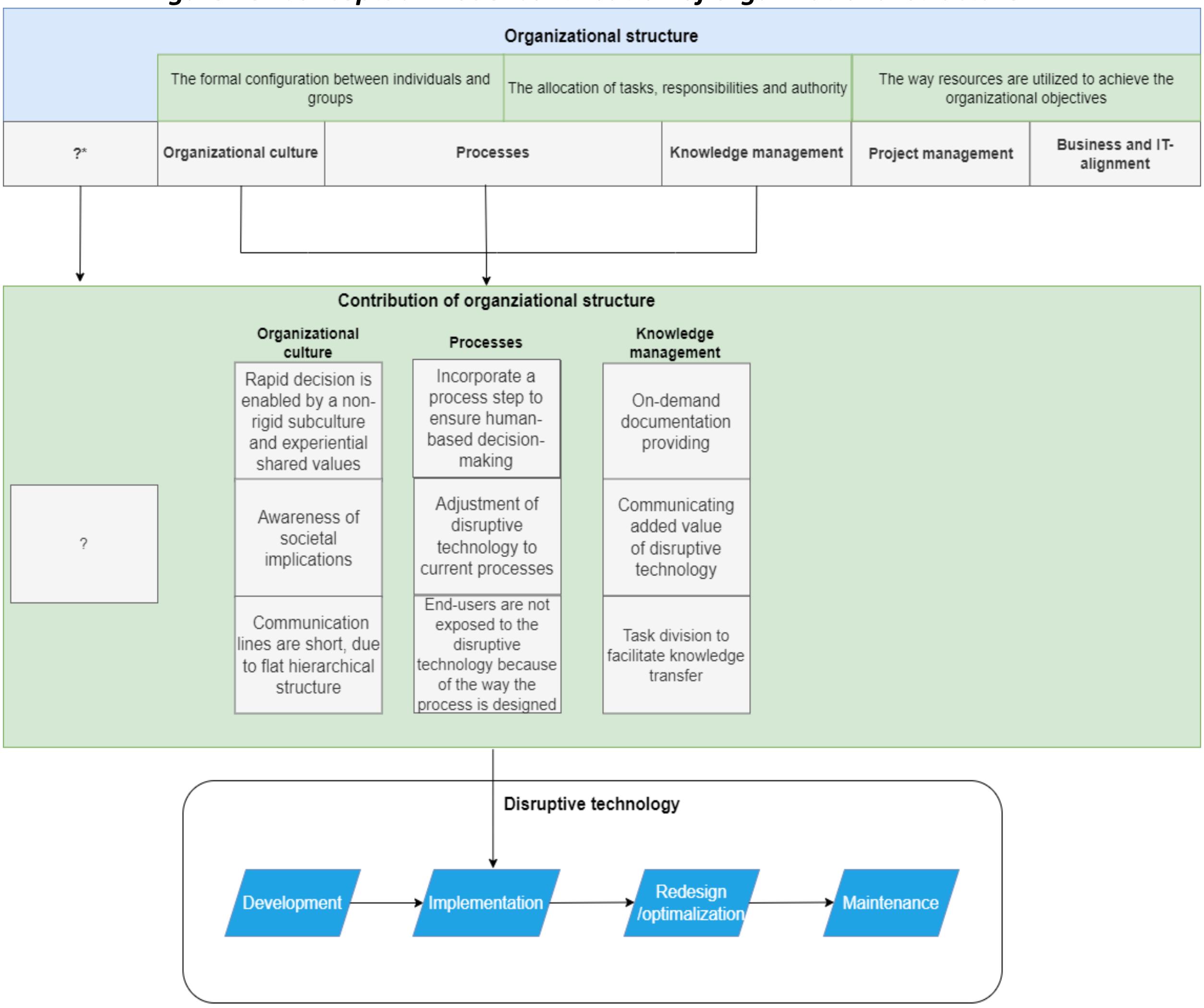


6.5 Answering RQ:

RQ: How can organization structure contribute to the implementation of a disruptive technology within a central government?

Consequently, we come to an answer for our research question. The concepts within the research question have been elaborated and operationalized within the introduction and literature review and answered within each SQ in this chapter. Following that, these operationalized concepts served as the foundation for the empirical component of the research, which was based on a semi-structured interview list in which the five components of organizational structure were leading. The contribution of each component is examined in practice during two case studies of disruptive technology implementations and one case study on a traditional software implementation within the context of a central governmental organization. Figure 23 combines concepts from the existing body of knowledge and the findings of the studied cases to provide a complete overview of the organizational structure component's contribution to a disruptive technology implementation. It can be seen that the organizational structure components knowledge management, organizational culture, and processes contribute to the implementation of a disruptive technology. No contribution is seen for the organizational structure components project management and business and IT alignment.

Figure 23: Conceptual model contribution of organizational structure



The table below details how organizational structure contributes to a disruptive technology implementation. Table 6 also examines the components that do not contribute and the further descriptions, as well as the phase of the disruptive technology application process to which they do apply. The contribution is based on SQ3, which explains how an organizational structure component is reflected in each phase. The question mark within the conceptual model indicates that other unidentified organizational structure components may also contribute to the implementation phase.

Table 6: Contribution of organizational structure component to the implementation of a disruptive technology

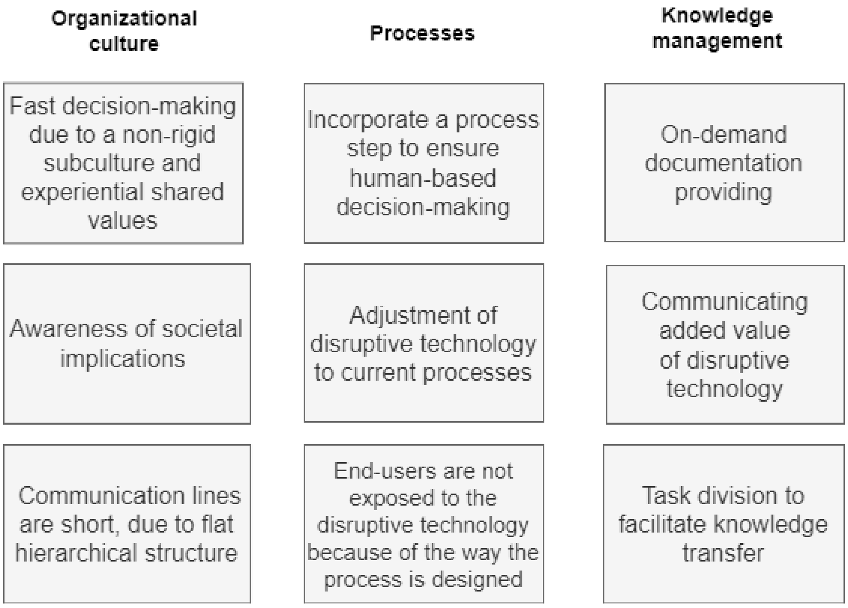
Organizational structure component	*During Implementation yes/no*	*Contribution*
Project management	*No*	Project management is used as a structured way to formalize an immature process and the way of working and is not applicable during the initial implementation. Following a project management or data science methodology is only applied during a further roll-out or redesign of the AI algorithms. The literature indicates that managing disruptive technologies is challenging as it involves managing unpredictable activities (Zubizarreta et al., 2020[85]). Similar results are found in the study of (Berente et al., 2021[86]), indicating that managing AI differs from typical IT project management. This distinction results from the continued evolving characteristics of disruptive technologies such as AI (Berente et al., 2021[86]). We found that while implementing AI, no involvement or contribution of project management is seen in practice. The data scientist is in charge of almost all activities throughout the implementation phase.
Knowledge management	*Yes*	Because central governmental organizations are highly dependent on the technical expertise of the data scientist, activities are frequently allocated to a single function responsible for development and implementation. Sharing knowledge with multiple stakeholders throughout the implementation process and documenting decision-making and considerations lessens this dependency. Knowledge transfer of the added value and how AI-based decision-making functions ensures that end-users recognize the importance of integrating an algorithm within their work process. Working with the algorithm does not require any knowledge of the technical functioning of AI and algorithms, as the end-users are only concerned with the output.

Processes	*Yes*	Maintaining human judgment within a process where an AI algorithm is deployed is a driving force in process design; these findings are comparable with those outlined in the literature review on maintaining human judgment in AI-driven process. Throughout development and implementation, the data scientist arranges the processes such that the decision-making of the end-user of the AI algorithm is not impacted by the predictions and the output of the algorithm. Thus, the implemented algorithm does not dictate the process's outcome. Moreover, transparency and accountability concerns are avoided by directing human judgment within processes. As the data scientist adjusts the algorithm to the current processes, the coherence of existing processes is not perceived as a barrier to implementing AI algorithms. This modification entails incorporating the algorithm's results into a workflow. On the other hand, AI algorithms enable the creation of new processes, as exemplified in case B. During development and implementation, the process and the algorithm are aligned, for example, through testing with end-users.
Business and IT alignment	*No*	Both the AI implementations within the case studies originate from an operational level; therefore, decision-making is not located at the level where the strategy and objectives of an organization are usually determined Although this bottom-up way of developing AI applications accelerates decision-making because few functions are involved, on the other hand, it increases the likelihood that the IT implementation will not be aligned with an organization's strategic goals, mission, and vision.
Organizational culture	*Yes*	A nonrigid subculture with shared values such as experimental work and a can-do mentality enables fast decision-making within the implementation in an informal way. The societal ramifications of AI alert data scientists to the potential consequences of AI misuse and how they operate in the areas of responsibility and transparency during the development and implementation of an algorithm.

7 Conclusion

This research aims to clarify how components of organizational structure support the implementation of disruptive technologies within a central governmental organization. The outcomes of our multiple-case study resulted in an overview of organizational structure components that contribute to the implementation of a disruptive technology seen in table 6 and figure 24. The findings of this study can be used to formalize future implementations of disruptive technology as this study provides central governmental organizations a guideline to organize their disruptive technology implementations in a structured manner, allowing for regulated implementation procedures, to limit the spread of unfettered applications of disruptive technologies.

Figure 24: Contribution of organizational structure during implementation

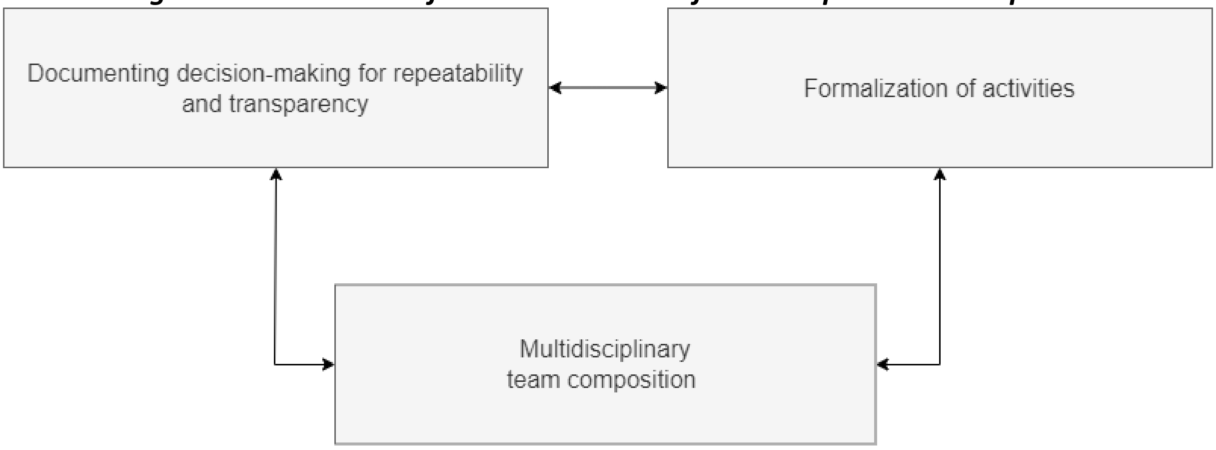


Understanding the contribution of organizational structure components (figure 24) can help stakeholders in a disruptive technology implementation make better decisions because they are aware of the potential contribution of organizational structure. Furthermore, as shown in Figure 25, this study provides recommendations to incorporate during the implementation phase. These recommendations are based on the challenges encountered during the implementation phase. The integration of lessons learned from the initial implementation is visible during the redesign/optimization phase, because decision-making documentation and the use of a project management approach are visible, which was not the case during the initial implementation process.

We found that the organizational structure components project management and business and IT alignment are not emphasized during the initial implementation. Yet, project management is incorporated into the redesign/optimization phase. During this phase, activities and roles are formally defined. Since this formalization of procedures occurs after the initial implementation of a disruptive technology, it is prudent to formalize procedures earlier to benefit from decision-making repeatability and a more structured implementation process due to the formalization of activities and roles at an earlier stage.

Figure 25 illustrates how the recommendations which are implemented following the implementation phase interact with one another. Examples of the connection between these recommendations are provided below figure 25.

Figure 25: Coherence of recommendations for the implementation phase



Early formalization of activities concerning the development and implementation of disruptive technology allows central governmental organizations to work with a multidisciplinary team from the start and work on issues in the field of legislation, transparency, and decision-making reproducibility. Following the initial disruptive technology implementation, employees with multidisciplinary expertise are found to be involved. In both cases, a project manager, business advisor, or ethicist is involved in the redesign or optimization process.

This study verifies the findings of the audit by the (Netherlands Court of Audit, 2021, p37 [5] and reveals that few or no employees from a strategic level within the organization have insight into the implementation of the disruptive technology AI. As few employees are involved in the initial implementation phase, decision-making in this phase is rapid and informal. Repeatability of decision-making can be achieved through formalizing decision-making, which can range from something as simple as documenting design choices within the implementation to more substantial things like creating service level agreements with external parties.

Based on the findings of this research, it is possible to mitigate certain difficulties that central government organizations face while implementing disruptive technologies, as outlined in the introduction of this thesis. Difficulties in the field of societal- and internal implications can be avoided by learning from previous disruptive technology implementations and understanding the contribution of organizational structure during the implementation of disruptive technology in a central governmental context.

7.1 Limitations

The following limitations are identified for this research.

7.1.1 External validity

The case study allows the researcher to investigate finished implementations of the disruptive technology AI. The analysis of a previous phenomenon is referred to as a retrospective case study (Thomas, 2017[30]). While the researcher was able to conduct in-depth examinations of three cases, the limited sample size impedes extrapolation to a larger population. Although generalization is not the primary goal, a case study of another disruptive technology would be beneficial for generalization in the field of disruptive technologies. By applying replication logic in a multiple-case study, two cases of an AI algorithm implementation were chosen in which identical outcomes were predicted. The third case of traditional software implementation was examined for comparability. Based on these different outcomes, it is easier to understand how and why various organizational structure components contribute throughout the implementation process.

Another limitation is that the interviewees who were in charge of the activities during the implementation phase may be biased concerning the activities they performed within this process. To avoid this bias, almost no suggestive questions were asked, and terms such as "failure" and "successful" were avoided. Interviewees validated all transcripts to prevent researcher bias.

This research highlights the contribution of five organizational structure components to the implementation of the disruptive technology AI. To prevent over-generalization in the realm of disruptive technologies, we are aware that the results of organizational structure components' contributions may not be the same for all disruptive technologies. However, we believe that the findings will be relevant to some extent to other disruptive technologies cited in McKinsey's research, given that these disruptive technologies share similar characteristics. All the twelve disruptive technologies discussed in McKinsey's research have far-reaching ramifications for three pillars: life, business, and the global economy (McKinsey & Company, 2013[31]). Other overall characteristics of disruptive technology implementation include the degree of disruption being unknown ex-ante (Schuelke-Leech, 2018[11]) and the process of deploying disruptive technologies, including numerous levels of coordination and complicated decision-making (Dufour and Steane, 2013[36]). Considering the similarities in the characteristics of a disruptive technology implementation, the findings of this study on the contribution of organizational structure components are more likely to apply to other disruptive technologies.

Even though organizational structure has been examined from many viewpoints in the existing body of knowledge, other sections of organizational structure components may also contribute to the implementation of AI within other central governmental organizations. Hierarchy and leadership styles, for example, have been underrepresented in this study. Finances and the expenses of developing and implementing an AI algorithm are not properly considered; however, if a third-party provider develops the AI application, the financial context would be altered.

7.1.2 Scoping

The case studies were limited to implementations within Dutch central governmental organizations; therefore, the results of this research are primarily applicable to central governmental organizations of member states of the EU. Although national exclusions are available owing to the implementation Act in specific countries, the EU typically applies the same legislation to AI and the GDPR. The literature study on organizational structure components is not confined to EU nations, implying that the theories described are more broadly relevant. Countries with conflicting fundamental values in areas such as personal data protection, policy transparency, and accountability for mistakes made will have little in common with the results of this study because these countries have different approaches to implementing AI (Smuha, 2021[146]).

In line with the report of the Netherlands Court of Audit, we focused on algorithms with a prescriptive function and significant impact on "government behavior, or on decisions made about specific cases, citizens, or businesses'' (Netherlands Court of Audit,2021, p13 [5]). Due to the absence of a self-learning algorithm within the Dutch central government, the results cannot be extrapolated to all algorithms. Thus, the results are restricted in their generalizability in the field of algorithms since no attention was given to self-learning and basic algorithms that are less likely to interact with organizational structure components.

The distinction between disruptive technology and disruptive innovation is addressed in the literature review. Despite the similarities between disruptive innovation theory and organizational structure, it receives little attention other than emphasizing the differences between the two concepts to avoid ambiguities. This confusion stems from the fact that ideas of disruptive innovation are linked to organizational structure since the way small businesses are frequently organized makes it easier to innovate in a particular manner.

7.2 Future work

Even though all of the examined organizational structure components are referred to in the literature as components related to structuring a disruptive technology, the results show that the organizational structure components project management and business and IT alignment did not contribute to the implementation process of the disruptive technology AI. Future research should focus on determining why these organizational structure components are not applied during the implementation of a disruptive technology, especially given the indicated need to formalize the way of working after implementation, seen in both the cases of disruptive technology. No research into the applicability of project management methodologies within AI implementations is found. Furthermore, research on the applicability of different project management methodologies and an assessment of the effects of the methodologies in the implementation of a disruptive technology would be valuable.

Second, a comparative academic study of AI implementations in public- and private sectors in the realm of organizational structure is suggested. A comparative analysis can show whether the contribution of organizational structure components varies among sectors. As with the first proposal for future research, it is also intriguing to identify potential variables that explain the contribution of specific organizational structure components.

Finally, identifying mechanisms to formalize a disruptive technology's implementation process can contribute to the final deliverable. The empirical part of this research indicates that the organization of resources and procedures concerning disruptive technology is formalized after the implementation. In addition, project management methodologies are applied, and teams are formed based on required competencies, including employees with ethical or legal backgrounds. Additionally, decision-making is documented, which increases decision transparency and repeatability. Characterizing formalization potential earlier in the process might help avoid or detect manageability concerns.

8 Acknowledgements

Grateful for the input, guidance and support of Werner Heijstek, Peter van Veen, Irene van der Vossen, Alexandra Blank, Gerben Bergwerff, Welmoet de Ruijter, all the interviewee's, friends, and family.

List of abbreviations

AI = Artificial intelligence

AIA= Artificial intelligence Act

BPC = Business process change

BPR = Business process reengineering

CIO = Chief information officer

CSF = Critical success factor

CSP = Case study protocol

DDPA = Dutch Data Protection Authority

DL = Deep learning

EU = European union

GDPR = General data protection regulation

IAMA = Impact Assessment voor Mensenrechten bij de inzet van Algoritmes

IT = Information technology. Information and communication technology (ICT) are used interchangeably within this thesis

KM = Knowledge management

KPI = Key performance indicator

ML = Machine learning

OB = Organizational behavior

RQ= Research question

SAM = Strategic Alignment Model

SLA = Service level agreement

SQ = Sub question

SyRI = System Risk Indication

VR = Virtual reality

XAI = Explainable artificial intelligence

List of definitions

Alignment: "Applying IT in an appropriate and timely way, in harmony with business strategies, goals and needs." (Luftman et al., p3 1999[106])

Artificial intelligence: "Artificial intelligence (AI) refers to systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals'' (European Commission, 2018. P1[3])

Business Process Redesign: "The analysis and design of workflows and processes within and between organizations." (Davenport and Short (1990. p [99])

Business rules: ''are the rules that are specified in the system and do not depend on human decisions. It is usually a larger number of simple rules that can be scaled in a sequence'' (Hypský and Kreslíková, 2017, p101[143]).

Classification algorithm: ''a function that weighs the input features so that the output separates one class into positive values and the other into negative values.'' (Netoff, 2019, p 374[66]).

Disruptive innovation: '' a process by which a product or service initially takes root in simple applications at the bottom of a market—typically by being less expensive and more accessible—and then relentlessly moves upmarket, eventually displacing established competitors.'' (Christensen, 2015[34])

Disruptive technology: ''A specific technology that can fundamentally change not only established technologies but also the rules and business models of a given market, and often business and society overall.'' (Oxford reference, 1997[18])

Embedded unit of analysis: "'A unit lesser than the main unit of analysis, from which case study data is collected.'' (Yin, R. K., 2012. P238[28])

Organizational culture: ''A system of shared meaning held by an organization's members that distinguishes the organization from others.'' (Robbins and Judge, 2018. P. 545[120])

Organizational structure: The ''formal configuration between individuals and groups regarding the allocation of tasks, responsibilities, and authority within the organization'' (Lunenburg, 2012,p1[12], Galbraith, 1987[13], Greenberg, 2011[14]). Furthermore, organizational structure is a method that defines how resources are used to achieve organizational goals. (Akbari et al., 2012[15])

Reliability: ''The consistency and repeatability of the research procedures used in a case study'' (Yin, R. K., 2012. P240[28])

Subcultures: ''Mini cultures within an organization, typically defined by department designations and geographical separation.'' (Robbins and Judge, 2018. P. 547[120])

Validity: The degree to which the instrument measures what it is supposed to be measuring and '' the degree wo which data and findings are accurate reflections of reality'' (Thomas, 2017. P326[30])

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10 Appendices

Appendix A Semi-structured interview questions

Introductie	***Doel***
1. Wat is uw huidige functie? En wat houdt het in qua taken en verantwoordelijkheden?	Vergelijk kunnen maken tussen functies
2. Kunt u het algoritme/de disruptieve technologie X in een notendop uitleggen?	Achtergrondinformatie voor onderzoeker
3. Hoe bent u betrokken bij de implementatie van algoritme X/disruptieve technologie X?	In kaart brengen rol respondent
Document analyse	
4. Hoe en in welke documenten staat de werking van het algoritme beschreven?	Achtergrondinformatie en mogelijkheid om informatie te valideren
5. Zijn het de documenten die ik al eerder aangeleverd heb gekregen, zo niet is het mogelijk om deze alsnog in te zien?	Achtergrondinformatie en mogelijkheid om informatie te valideren
OS-component: Processen	
6. In welk werkproces of voor welk product of dienst speelt dit algoritme een rol? a. Kunt U dit proces beschrijven?	Context rondom algoritme
7. Waarom is er in dit geval gekozen voor een algoritme voor dit specifieke proces?	Toegevoegde waarde algoritme/beweegredenen
8. Is het algoritme afhankelijk van andere processen? Zo ja, hoe vind je dat dit proces is afgestemd op de omringende processen en systemen?	Achterhalen van welke processen het algoritme mogelijk afhankelijk is
9. In hoeverre beïnvloedt proces ontwerp/samenhang van processen de implementatie van algoritme X?	In kaart brengen architectuur van processen rondom algoritme X
OS-component: Business and IT alignment	
10. Aan welk probleem/situatie draagt dit algoritme iets bij binnen dit proces/ wat voegt het algoritme toe op aan het proces?	Beschrijven doel algoritme
11. Hoe wordt erop toegezien dat dit doel ook zal worden bereikt? a. Door wie?	In kaart brengen alignment met gestelde doelen
12. Welke factoren buiten de scope dit project hebben het implementatietraject beïnvloed?	In kaart brengen eventuele onverwachtse invloeden
13. Is er relevante wet-regeling waar jullie aan moeten voldoen m.b.t. algoritmes/disruptieve technologie X? a. Zo ja, hoe beïnvloeden deze wet- en regelgeving de implementatie?	Belang van formele procedures
14. Zijn er procedures of regels opgesteld voor het gebruik van algoritme X/ disruptieve technologie X? a. Zo ja, hoe beïnvloeden deze procedures regelgeving het gebruik van het algoritme?	Belang van formele procedures
15. Hoe worden deze procedures of richtlijnen getoetst tijdens de implementatie en in gebruik name?	Naleven formele procedures en ontstaan informele procedures

16. Zien jullie de mogelijkheid om het algoritme breder in te zetten? a. Zo ja, hoe valt dit te bewerkstelligen op het gebied van processen, systemen, privacy?	Mogelijke schaalbaarheid issues achterhalen
OS-component: Project management	
17. Bestaat er een eenduidige aanpak voor algoritme-implementaties/implementaties van X?	Achterhalen hoe gestructureerd het project is
18. Is er bij de ontwikkeling en implementatie van implementatie X/ontwikkeling X een management/ontwikkelingsmethodiek gebruikt? a. Zo ja welke en heeft deze methode invloed gehad op het project?	Achterhalen of er gewerkt is volgens een (project) managementmethode en of deze methode invloed heeft op het resultaat/ de werkwijze
19. Heeft er een risico analyse/inschatting plaats gevonden bij de ingebruikname van dit algoritme? a. Zo ja, hoe heeft dit invloed gehad op de implementatie van het algoritme?	Wanneer wordt een risicoanalyse nodig geacht en heeft het hebben van wel of geen risicoanalyse invloed op de implementatie
OS-component: Cultuur	
20. Kunt u een algemene beschrijving geven van de structuur van de organisatie rondom dit algoritme?	In kaart brengen projectomgeving en betrokken stakeholders
21. Hoe zou u de organisatiecultuur beschrijven binnen het algoritme project? a. Hebben bepaalde aspecten van deze cultuur effect gehad op de implementatie van algoritme X?	Hebben waarden en normen binnen de organisatie invloed op het project
22. Hoe is de betrokkenheid van opdrachtgevers/ bestuurders voor het project rondom de implementatie van algoritme X/ disruptieve technologie X?	Invloed stakeholders en strategische belangen
23. Is het merkbaar dat dit een implementatietraject is binnen de overheid?	Cultuur overheid
24. Speelt communicatiewijze een rol binnen deze implementatie van algoritme X/disruptieve technologie X a. Hoe heeft U de communicatie rondom dit project ervaren?	Is communicatie een aspect wat een rol speelt binnen de implementatie van een algoritme
OS-component: Kennismanagement	
25. Hebben jullie nagedacht over de benodigde competenties/middelen voor de ontwikkeling en implementatie van het algoritme?	Expertise, kennismanagement, resource allocatie
26. Welke rollen, taken en verantwoordelijkheden zijn er rondom dit algoritme?	In kaart brengen organisatie rondom algoritme
27. Wie zijn de eindgebruikers van de door algoritme ondersteunde applicatie/ geïmplementeerde X van disruptieve technologie X?	In kaart brengen eindgebruikers
28. Wat was de mening van de eindgebruikers van het algoritme voor aanvang van het project? a. Is dit nu anders?	Mening over verandering proces/werkzaamheden en of dit invloed gehad op het traject

Vrije sectie	
29. Welke uitdagingen kwam U tegen gedurende de implementatie van het algoritme? a. Hoe bent u omgegaan met deze uitdagingen?	Achterhalen of er andere aspecten zijn die de implementatie van algoritme X beïnvloeden
Afsluitende vragen	
30. Zijn er nog zaken die ik had moeten vragen volgens U?	Controlevraag
31. Bent u beschikbaar voor eventuele vervolgvragen via de mail? Wat is Uw e-mailadres?	Indien nodig voor verdere validatie of als zaken niet geheel duidelijk zijn voor de onderzoeker

Appendix B Codebook

All Codes

#Added_value_of_implementation_is_a_less_time-consuming_process

#Adoptation_of_management_method_in_second_iteration_to_formalize

#Algorithm_acceptance_varies_per_team

#Algorithm_dependencies

#Algorithm_does_not_determine_process_outcomes

#Algorithm_end-user_not_aware_of_technical_details

#Algorithm_fits_with_new_way_of_working

#Algorithm_guideliness

#Algorithm_impact_for_end-user_is_limited

#Algorithm_implementation_ accelerates_process-driven_process

#Algorithm_implementation_had_no_effect_on_process

#Algorithm_improvements_rely_on_data_quality

#Algorithm_improvements_rely_on_data_volume

#Algorithm_is_modified_after_initial_implementation

#Algorithm_life_cycle

#Algorithm_modified_based_on_culture?

#Algorithm_mostly_depends_on_own_data

#Algorithm_optimization_in_iterations

#Algorithm_ouput_difficult_to_integrate_due_to_datatype

#Algorithm_output_as_processinput

#Algorithm_output_combined_with_other_knowledge_to_arrive_at_concrete_actions

#Algorithm_output_is_unambiguous

#Algorithm_output_part_of_formalized_process

#Algorithm_part_of_new_way_of_working

#Algorithm_should_not_impact_decision_making_of_enduser

#Algorithm_solves_capacity_issue

#Algorithm_supports_goals_yet_they_are_not_measurable

#Algorithms_as_small_part_of_a_process

#Alignment_with_legislation

#Alignment_with_legislation_no_concern_for_enduser

#All_tasks_assigned_to_one_individual

#Ambigous_regulations_hinders_compliance

#Appliction_of_managebibility_methods

#Approval_by_top_management

#Automated_results_are_handled_manually

#Automatization_of_old_activities_saves_time

#Awareness_of_expertise_whilst_sharing_knowledge

#Being_proactive_despite_lots_of_communication

#Benefits_of_clear_agreements_on_project_control

#Benefits_of_flat_organization_structure

#Benefits_of_short_lines_of_communication #Board_supports_algorithm_implementation

#Build_in_safety

#Build-in_mechanism_to_reduce_bias

#Central_overview_usefull_for_end-users

#Change_in_algorithm_input

#Change_processes_based_on_supliers_proces

#Changes_in_scope_can_complicate_the_implementation_process

#Classification_algorithm

#Clear_division_of_roles

#Commitment_of_stakeholder_accelrates_development_and_implementation

#Communication_goal_of_algorithms

#Competence-oriented_development_and_implementations

#Complexity_of_project_was_low_due_to_involvement_supplier

#Configuration_of_system_as_teamwork

#Configuration_with_needs

#Conflict_between_legislations

#Consequences_of_algorithm_development_arised_during_the_process

#Consequences_of_algorithms_unclear_to_stakeholders

#Considerations_of _outsourcing_whilst_developing_algorithms

#Coordinating_role_as_projectmanager

#Coordination_between_business_and_operation-as_KSF

#Culture_had_no_impact_on_implementation

#Culture_of_knowledge_sharing

#Culture_of_pioneering_to_get_work_done

#Data_input_from_internal_source

#Define_measurements_of_algorithm_usage_for_progress

#Defintion_of_algorithm_is_unclear

#Demand_driven_dataa_usage

#Demand_driven_way_of_working

#Dependent_on _one_person

#Development_accelerated_as_current_system_is_not_sufficient

#Development_structure

#Distinction_between_data_functions_within_Dutch_government_is_not_clear

#Division_of_knowledge_was_not_clear

#Division_of_roles

#Division_of_roles_based_on_stage_of_project

#Division_of_roles_during_national_implementation

#Division_of_roles_was_not_clear

#Documentation_enables_knowledge_management

#Documentation_enables_reproducibility

#Documentation_improvements_on_logging_decisions

#Documentation_strategy

#Effects_of_algorithm_implementation

#End_user_remains_in_control_in_decision-making

#End_user_remains_unbiased_during_process

#End-user_concerned_with_GDPR_legislation

#End-user_did_not_mention_a_management_methodology

#End-user_document_every_process_step

#End-user_involed_during_testing_of_the_system

#End-user_not_concerned_with_AI_legislation #End-users_algorithm_awareness

#end-users_decisions_are_leading

#End-users_have_no_interactions_with_algorithm

#End-users_involved_within_implementation_of_system

#Ethical_consideration_before_implementation

#Evaluating_implementation_of_algorithms

#Existing_process_and_system_issues

#Existing_process_did_not_play_a_role_whilst_implementing

#Experimenting_with_new_system

#Expertise_on_communiction_assisted_project_communication

#Exploratory_implementation_without_methodology

#External_factor_causes_cautious_way_of_working

#Extra_process_step_after_implementation

#Factors_limiting_usage_of_implemented_system

#Fear_of_algorithms

#Field_of_work_requires_staying_up_to_date_with_new_knowledge

#Formal_project_management_by_conventional_method

#Formalization_of_way_of_working

#From_multiple_to_one_way_of_working_after_implementation

#Functional_management_after_implementation

#Goal_driven_data_usage

#Goal_of_algorithm_implementations

#Hierachy_as_validationmechanism

#Hierarchy_no_role_during_implementation_of_algorithm

#High_costs_of_customizable_software

#Highly_involved_steering_group

#Human_judgement

#Hype_accelerates_implementation

#Impact_of_external_factors_on_working_with_algorithms

#Impact_of_implementation

#Impact_of_legislation

#Implementation_assists_culture_of_learning

#Implementation_assists_knowledge_management

#Implementation_cultural_fit

#Implementation_is_complimentary

#Implementation_is_usefull_yet_no_solution_for_everyday_activities

#Implementation_most_impact_on_back-office

#Implementation_to_aid_knowledge_sharing

#Implemented_system_leads_to_new_tasks

#Important_to_examine_consequences_of_implementation_for_employees_beforehand

#Improving_algorithm_is_time_consuming

#Inaccuracy_in_inital_process_led_to_implementation

#Inconvienience_after_implementation_as_end-user

#Indirect_usage_of_algorithms

#Influence_of_hierarchy_on_implementation

#Informal_communication

#Input_issue_leads_to_manual_upload

#Input_management_by_SLA's

#Input_requirements

#Integration_with_other_systems_in_second_iteration

#Invole_end-user_to_improve_system

#Irrelevant_possibilities_of_system_due_to_job_title

#Knowledge_management

#Knowledge_on_process_more_important_than_algorithm

#Knowledge_sharing_by_relatability

#Knowledge_sharing_effects

#Knowledge_sharing_resource_intensive

#Knowledge_sharing_strategy

#Lack_of_contol

#Lack_of_data_agreements

#Legislation_defines_the_way_people_work_with_algorithms

#Legislation_speeds_up_documentation_of_algorithms

#Limited_in_specialization_without_core_business

#Link_between_hierarchy_on_system

#Little_formalization_accelerates_decision_making

#Lot_of_tasks_leads_to_capacity_issues

#Managing_expectations_on_automatization

#Managing_resources

#Measuring_algorithm_efficiency

#Measurrability_of_algorithm_implementation

#Missing_specfic_knowledge

#Multi-diciplinairy_assesment_of_algorithm_performance

#Multidisciplinary_communication

#Necessary_technical_skills_and_function_do_not_match

#New_activities_cost_time

#New_way_of_working_requires_new_skills

#No_distinct_core_business_leads_to_task_differentiation

#No_documentation_of_algoirthm_for_end-user_as_it_redundant

#No_established_procedures_of_system_usage

#No_impact_external_factors_whilst_implementing_system

#No_initial_documentation_strategy

#No_project_management_method_involved

#No_strict_division_of_responsibilities

#No_strict_procedures_for_system_usage

#Non_rigid_culture

#Not_meassuring_end-users_opinions

#Obligate_project_management_due_to_organizational_structure

#Old_process_automated_less_manual_activities

#One_hierarchical_layer

#Organic_growth_based_on_demand

#Organic_growth_of_algorithm

#Organizational_fit_implementation #Organizational_structure_aligned_with_culture

#Poor_data_quality_causes_delay

#Positive_end_user_opinion_on_working_with_algorithm

#Possibility_to_innovate_with_algorithms_caused_by_obsolete_business_rules

#Preconditions_of_implementation_succes

#Prince2_and_formal_documentation_was_delivered

#Prince2_did_not_the_implementation_in_itself

#Prince2_impacts_documentation

#Prince2_methodology_for_implementation_project

#Problem_increased_by_increased_usage_of_system

#Process_can_exist_due_to_algorithm

#Process_coherence_depends_on_amount_of_sources

#Process_is_time_reliant

#Process_maturity

#Process_redisgn_part_of_bigger_picture

#Process_requires_certain_skills

#Processmaturity

#Projectmanager_involved_in_team_composition

#Projects-within_the_central_government_require_a_clear_plan
#Projectteam_direct_communication_with_management
#Projectteam_worked_hard_related_to_culture?

#Prototype_way_of_working

#Protoyping_way_of_developing_algorithms

#Reduce_reliance_on_one_indivual_for_most_tasks_around_algorithm

#Resistance_to_change

#Resistance_to_change_based_on_age

#Resource_effective_development_of_algorithms

#Ressistance_to_change

#Roles_and_tasks_division

#Sceptical_perseption_of_algorithm_before_implementation

#Scrum_for_further_development_of_algorithms

#Selection_of_projectmanager_based_on_knowledge

#Self-explanatory_system_makes_consultation_of_documentation_obsolete_for_end-user

#Self-learning_algorithm

#Short_lines_of_communication_beneficial_for_pace_of_implementation

#Simple_design_ensures_higher_use

#Slow_down_the_process_to_improve_the_process

#Small_project_on_central_government_perspective

#Small_projectteam_is_vunerable

#Societal_impact

#Societal_impact_of_governmental_organizations

#Standardization_to_increase_implementation_speed

#Standardizing_way_of_working

#Steps_in_ressistance_to_change

#Striving_for_consitency_with_life-cycle_management

#Strong_culture_of_learning

#Suppliers_documentation_not_convienience_in_use

#Suprised_by_fast_implementation_of_algorithm
#Switching_project_management_method_for_optimalization
#System_adapted_to_internal_processes?

#System_automated_activities_of_end-users

#System_development_in_consultation_with_supplier

#Targeted_communication

#Targeted_communication(region)

#Task_assigned_to_one_person

#Tasks_are_divided_differently_due_to_implementation

#Team_composition_for_second_iteration_algorithm

#Technical_challenge_to_increase_value_fo_users

#Technical_changes_due_to_legislation

#Tender_procedure_unique_of_governmental_organizations

#Time_trade-off

#Top_management_involed_whilst_implementing

#Trade-off_quality_fast_results

#Transparancy_on_algorithms

#Umabigous_way_of_working_will_be_implemented_in_the_future

#Unambigous_communicaation_as_future_challenge

#Unawareness_of_consequences_of_algorithms_accelerate_implementation

#Unclear_consequences_of_implementing_algorithms

#Use_formal_procedures_as_benefit

#Vulnerability_due_to_assigning_tasks_to_one_individual

#Way_of_working_depends_on_type_of_algorithm_implementation

#Way_of_working_did_not_alter_after_implementation_algorithm

#Workaround_to_solve_problems

#Working_ethical

#Yearly_assesment_of_algorithm_performance

Table 5: Selective coding list

Concept	Sub-themes	Codes
Project management	Formalization of tasks after implementation	#Algorithm_optimization_in_iterations (2) #Exploratory_implementation_without_methodology (1) #Little_formalization_accelerates_decision-making (1)
	Absence of project management methodology	#No_project_management_method_involved (3) #Prototype_way_of_working (3) #Exploratory_implementation_without_methodology (1)
	Division of roles varier per phase	#Division_of_roles_during_national_implementation (2) #Division_of_roles (2) #Division_of_roles_was_not_clear (1)
Knowledge management	Provide documentation on demand	#No_documentation_strategy (4) #No_documentation_of_algorithm_for_end-user_as_it_is_redundant (3) #Documentation_enables_reproducibility (2)
	Method of communication of added value during implementation	#Targeted_coummuncation (8) #Algorihm_end-user_not_aware_of_technical_details (3) #Awareness_of_expertise_whilst_sharing_knowledge (3)
	No separation of tasks	#All_tasks_assigned_to_one_individual (4) #Dependent_on_one_person (1)
Processes	Algorithm is adapted to process	#Algorithm_output_as_processinput (7) #Algorithm_fits_with_new_way_of_working (4)
	Application designed in such a way that the end-user has no connection with the algorithm	#End-users_have_no_interaction_with_algorithm (2) #Indirect_usage_of_algorithms (2)
	Process design ensures human judgment and	#Algorithm_as_small_part_of_a_process (2) #Algorihm_does_not_determine_process_outcome (1) #Algorithm_implementation_had_no_effect_on_process (1)

	no impact on process outcome	
Business and IT alignment	No alignment on strategic level	#Algorithm_supports_goals_yet_they_are_not_measurable (4) #Consequences_of_algorithm_unclear_to_stakeholders (1)
	Alignment with legislation	#Alignment_with legislation (3) #Impact_of_legislation_whilst_implementing (3)
	Efficiency increasement	#Goal_of_algorithm_implementation (4) #Algorithm_solves_capacity_issue (2)
Organizational culture	Flat organization structure and speed of decision-making	#Benefits_of_short_lines_of_communiction (4) #Benefits_of_flat_organization_structure (2) #Culture_of_pioneering_to_get_work_done (1)
	Societal implications of algorithms	#Build_in_safety (4) #Legislation_defines_the_way_people_work_with_algorithms (3) #Transparancy_on_algorithms (2)
	Subculture and implementation process	#Non_rigid_culture (2) #Implementation_cultural_fit (2)

Appendix C Interview transcripts

Interview A

What is your current position? And what does it entail in terms of tasks and responsibilities?

My current position is data scientist, so in principle I am a developer of all kinds of solutions that are based on data. At organization A I mainly do the bigger projects, not the analysis tasks. I do the work that involve processing large or complex data. I develop with the understanding that everything I produce has an impact on society, thus I strive to develop responsibly. I also have communication with professionals with a legal background within organization A in order to execute my tasks as responsibly as possible.

Do you focus on the more challenging data science positions because you have a lot of experience and/or connections?

No, I have always done such work, I was one of the first data scientists at organization A. When I first started there were few people who also did this work and the impact of what we did was not that great until that system X became more known. With the rise of system X, we also received some more criticism from society, which is also good since you as an organization can benefit from it. As an organization, we naturally want to do excellent work at our profession, which necessitates the use of new people's knowledge. As a data scientist it is difficult to talk about professional knowledge with a lawyer or ethicist, we have found that it is useful to leave that to people with the knowledge in the legal and ethical field. We have an ethicist who is now taking care of these conversations and tasks.

There are aspects to the use of algorithms that are legal. As there is not much legislation for algorithm usage, however these aspects can still be problematic in the near future. The employee who knows a lot about ethics can then play an important role in preventing legal problems.

Can you explain the algorithm behind system X in a nutshell?

System X has been developed to generate management information for specific activities. This algorithm provides information about geographical information, risk indications and historical data about Y. The calculation is based on geographical elements and depends on how the users of the algorithm are geographically organized. We ask these users for which key point they want to use system X. Based on their preferences we create a training data set that has variables based on the geographical information, the risk indication and data about Y. In addition, we also work with the data from external provider Z.

How exactly does the algorithm work?

It is a classification algorithm, then you generally have to deal with features that are used as input to predict certain things and on the other hand, the target variables. Target variables will indicate what you want to predict. The features are the kinds of data I just mentioned, so the data form external party Z and historical data. The target is something you want to predict. We have historical data, of two years, which is used as input to start measuring the target. We use logistic regression for the classification, which is a statistical method to relate the target.

The model is used to determine the pattern between the features and the target, which is then plotted against the present situation so that forecasts may be made on a geographical level.

After these predictions, the technical process is completed and the work process which depends on system X starts. Then an information specialist goes to refute the results of the system with his own knowledge, as it is possible that an algorithm does not predict correctly for various reasons. Good decisions requires both the knowledge of the information specialist and the output information of system X.

Is there a self-learning algorithm involved in system X?

In general, you use the term self learning if you have created a model and continuously provide this model with new data. What we do with system X is that we train the model all over again, the previous model is deleted and then the new model is used as a replacement. This happens weekly. Each time we generate a new forecast, we build a new model.

How exactly are you involved in the implementation of system X and/or this algorithms of system X?

I was the one who developed and designed the first few versions of system X. Meanwhile, a number of people are working and contributing to the further roll-out of system X. Most of the tasks are still with me at the present, which is common inside company A. Currently system X is more of a complete application, rather than a prototype that I developed on my own. If I stop working on System X, it can be maintained and kept in use. In the past, all tasks were assigned to one individual, this is typical in organization A.

Currently, we have dozens of data scientists on staff. My goal is to bring these data scientists together in the field of organization so that we can better coordinate knowledge sharing and have more influence on critical projects.

What problem/situation does this algorithm contribute to within this process/what does the algorithm add to system X?

System X assists in the above-mentioned work procedure. It is true that they do not solely rely on System X for this work process; other information sources are utilized as well. The goal is to use System X's forecasts to benefit the work process of the end-users.

Does system X depend on other processes? For the input for example?

The system is, without a doubt, heavily reliant on data. As a result, the data we utilize must be of good quality. We have departments inside the organization that oversee data quality. Furthermore, we rely on the platforms on which we operate; I used to execute everything on my own server; now, we utilize data science platforms on which we rely on.

Does system X also depend on the linking of external data suppliers?

From open-source data of party Z, which offers the data to us every once in a while. If there is a new dataset, we will load it. The question is whether loading this dataset will still be useful, since the dataset does not offer much added value for system X. It yields few benefits and necessitates a significant amount of effort.

To what extent does the complexity of the processes of the external suppliers/data sources influence the implementation of System X?

The idea at the time was that it would only be based on internal data and at some point, there was a need for more data as internal data was insufficient to make certain predictions about new phenomena. This is no longer relevant at this time.

Is there an unambiguous description for algorithm implementations/implements such as system X, which is accessible to everyone involved?

We do have internal reports and we also publish a lot about how system X works online. How the algorithm works is described in several places, in fact someone who does thorough online research could replicate the system.

Is publishing a lot of information online a conscious decision?

Yes, we have a certain responsibility as an organization towards society, publishing exactly how we work with algorithms takes away people's fear. We indicate the input and output of system X and clarify for what reason we use the system. For example, if there is a WOB request, there are procedures to which we must adhere. In my opinion I would like everyone to understand how the system functions.

Has a management methodology been followed during the development and implementation of system X?

At the start there was a demand for a methodology for a certain roll-out from the business, they wanted better management information. In the early days I noticed that every analyst had his own way of working. At the time, there were no strict agreements about the use of data, nor was this checked. My idea was to interpret the results in a way as if it were forecasting models. Following this change, the analysts were no longer able to make different interpretations of the data, and the data became critical when developing new forecasting models.

And did you manage to create a uniform way of developing/implementing?

Yes, but this way of working was not project based or grounded on sprints or agile principles. The way of working has evolved more in a demand-driven way. First pilots were run and eventually a national pilot and a national roll-out. The roll-out of system X went quite organically and was demand-driven.

Which factors (external factors) outside the scope of this project have influenced the implementation process?

What exactly do you mean by external factors?

Well, factors that are out of your control or out of your reach.

There was some criticism towards system X within organization A. Organization A is an old and viscous (slow) organization, so you have people who have been working here for 30 or 40 years. These people work for years according to a certain routine. Suddenly someone comes with a new way of working, which is not very well received and that is fine in itself. We never intended to force working with system X, but we have indicated if you want to work with system X that you must also commit to it.

Is the commitment a mutual agreement or is it somewhat documented?

Validation is difficult, but if the decision is made to work with system X, I want that person to involve his or her supervisor. At the time, we did validate this with their manager. We do not take the commissioning of system X lightly; it is quite a bit of work to be able to implement the system. If the manager agreed with how we envisioned working, we started rolling out system X. We did this way of implementation for the first few years, until we were commissioned to roll out system X across the country. If there are managers who still do not want to work with system X, that is possible, but then we will make everything technically in order, a kind of standard roll-out. So that it is available when they want to work with the system.

And as a result, you have made it easier to take the first step toward working with the system X?

Luckily, I did not have to do that solely, fortunately. People from the operation helped with that. We made a lot of documentation at the time. PowerPoint presentations for the manager, manuals for the users. Formats for consultations on the outcomes of system X.

Do procedures or laws and regulations affect the use of System X?

Of course, there are laws stating that no automatic decision-making is permitted, and that data may only be used for a limited time. We have also ensured that the data we use for System X can not be linked to specific people. We also use a considerably less data than what is possible. All of these points are related to the proportionality of the system.

Is the limited use of data to keep working with the system manageable?
We use the information required by the end users to keep it proportionate. We only use data that is required to accomplish a specific goal and we limit ourselves when it comes to data usage. When you start balancing on the edge of what is justifiable, all it takes is one small thing to go wrong for it to become an issue. It is now much less likely that we are doing something wrong with System X from a legal perspective.

Does the organization's or hierarchy's layering around the project have an impact on System X's implementation?

Not really. Within organization A we actually have a flat organizational structure. There is a hierarchy behind which one can hide if something needs to be done that they do not want to do. The hierarchy is then used as a justification for not doing something. In general, it is not difficult to inform others about new plans within organization A. Interaction with different members of the organization is quick and easy.

If I understand it correctly, hierarchy did not obstruct the implementation of system X.

No indeed, it has not.

What was the organizational structure of system X's implementation process?

There was a template for a specific information-driven work process before system X was developed. My work environment was already quite busy, creating a new way of working. This does not apply to all other teams; some teams prefer to work in their own way without being guided. Within the template, we have used system X as a catalyst, which has long been accompanied by more data. Many tasks were initially assigned to me, but when we wanted to use the template, a project leader was brought in and began discussions with the end users of the system. An end-user who knew a lot about system X was also introduced, since he had participated in many pilots and could inform other end-users. Our own manager has also assisted, discussing the benefits of system X with other managers. At some point we discuss what was required for a successful roll-out across multiple teams with some senior employees. Following that, the organization around system X became a little more formal, and there were project leaders who had committed to system X for a longer period of time. Currently there is also a product owner who is in contact with the business, as well as IT experts who can implement technical matters. The structure is a lot more well-organized today.

Are these roles, tasks and functions also documented?

There is an intranet page where the organization's activities around System X are described, but it is not the same as having a project document where everyone has formally agreed to their responsibilities.

How would you describe the culture regarding System X's project right now?

The culture is not rigid, and updates are made whenever needed, such as a front-end update. I have less time to work on system X as I am also working on another large project. At the moment, the majority of the work entails the manageability of the system.

Are these manageability tasks being documented?

The changes are logged, but it is not the case that there are many templates available to document these manageability tasks.

Would it not fit within the organization around System X to document everything?

The impact of making a wrong decision based on system X is minor; however, if it had an impact on an individual level, it would be different. When it relates to a person's impact, it is critical to report any potential errors in order to minimize the risk.

Has the relatively low risk influenced the somewhat less structured culture around system X?

In reality, yes. We have tried to use as little sensitive information as possible. If reasonably sensitive information is used, we have organized it in such a way that it can never be traced back to a specific individual.

How would you describe the involvement of the management or internal client at the start of the implementation of system X? Was there an internal client at all?

Initially there was no internal client, system X was developed more as a kind of prototype. This prototype was intended to provide the steering information as I mentioned earlier. At one point when System X was in operation, it was supported from by a supervisor.

Has the involvement of a manager helped you personally/the project?

It is useful to have a line of communication if things become stagnant; having a contact can help you overcome difficulties.

Did the form of communication influence the implementation of System X?

Yes, it did matter. We have shared a lot of information to get things done. Certainly, to enthuse the older guard, since there were people who thought that their role would be automated, which is of course not true. System X is always intended to facilitate, and a lot of work has been done to clearly communicate the purpose of system X. Still, it is a challenge, because if one has already decided that system X is bad for their own position then it is difficult to change someone's mind.

How did you personally feel about having to explain and persuade people about System X?

Myself, the senior end-use and project leader I was just talking about, explained the benefits and operation of system X in more detail from their own expertise. It did help to communicate from one's own expertise, the senior end user played an important role in this.

There were some sceptics in the beginning; how do you think system X is perceived now?

To be honest, I see a lot of teams using System X, and there are a lot of success stories there. However, there are teams that use system X on paper but do not follow the cycle to improve by collaborating regarding system X in practice. The teams that use system X have a solid information position. Working successfully with system X necessitates that it should be facilitated to the teams by their team leaders.

What issues did you face during the implementation of System X throughout the Netherlands?

Trying to explain system X was difficult; at one point, we had a kind of roadshow where we provided additional explanation on location. This, of course, takes a significant amount of time. In terms of technical implementation, system X ran on a single server. If something went wrong, I was the one who had to fix it as soon as possible. It was difficult at the time because I did not have colleagues who could take over. If something went wrong, there would be no system X to use. With the national roll-out, the number of forecasting models increased significantly, which necessitates more processing power.

Is the situation today any different?

I currently have a direct colleague that allows us to alternate the maintenance on a weekly basis.

Would you say that because algorithms were used, this project deviates from an implementation without disruptive technology?

In some respects, system X is similar to other systems that have no algorithms in place. The distinction of system X is that it was created and adjusted to the culture of organization A. We have considered an ideal working method. It is highly adapted to Dutch culture, which alternative systems lack, and thus are unlikely to be used on a large scale.

And did the mere inclusion of algorithms make the project stand out?

If the work process of system X is followed, the end users are not necessarily aware of the use of algorithms, but they are presented management information. This data is even specified in such a way that a process or way of working can be derived from it.

So, if I understand correctly, technology is not the driving force, but rather how a particular technique is applied?

Yes, that is correct.

Interview B

What is your current position? And what does it entail in terms of tasks and responsibilities?

I am primarily a team leader within the information organization of organization A. This means that I am responsible for a team that is involved in making information products. Our team is ICT-oriented and is focused on making data easily presentable to all kinds of employees. I also have other roles, including developing data science within organization A. I am the product owner of the data science platform. This platform aims to provide programmers and data scientists with the right tools to work with. In addition, I was also project leader for the roll-out of system X.

Have you also been the project leader of the national roll-out of System X?

Yes, for the national roll-out of system X. There were also sub-project leaders for each area who ensured that system X was implemented in their area. I was indeed the national roll-out's overarching and coordinating project leader.

Were you assigned that position as you were already involved in the local deployment and development of System X?

Yes, that was rational. You have already spoken with Interviewee 1, who is a member of my team. Interviewee one is the developer of System X. As the first pilot found place within our area, it was organic for me to fill the role.

Can you explain the algorithm behind system X in a nutshell?

Of course, I am not a data scientist; interviewee one will be able to explain the technical aspect more thoroughly. In general, I understand how the algorithm works. The algorithm utilizes historical data from specific events. The events relevant to the algorithm are common events for which a huge amount of data is available. This historical data is collected by System X and plotted against any other variables. The algorithm then searches for the most important or determining variables in the past. As a result, the algorithm weights these variables to predict the likelihood of an event occurring. There is also logistic regression at work, but you should have heard something about that from interviewee one.

That is right, I ask these questions to find out how different people are seeing a particular concept.

How does this algorithm contribute to a problem within this process/what does the algorithm add to system X?

The algorithm's primary goal is to improve capacity planning. That may sound a bit odd. As we do not have unlimited resources, it is necessary to allocate the resources available as best as possible. System X assists in estimating the required personnel when making capacity plans.

Is it measurable how much system X contributes to these capacity plans?

Not so with System X. System X supports in the process of better planning capacity; however, it is not measurable and cannot be made measurable.

Is it not possible to make a measurable improvement in capacity planning as this process is dependent on several factors?

Indeed, it is dependent on a range of factors. Suppose that system X's prediction prevents a specific event. Something that did not happen can not be quantified.

Does system X depend on other processes? For the input for example?

System X relies heavily on the input of historical data. System x's input is reliant on a detailed collection of historical events. So, we depend on other processes for input, yet system X's predictions are only a small part of the overall intelligence process.

How does this intelligence process work?

This process consists of multiple systems, which are used to predict events in the future. There are various systems inside organization A that are each employed for a specific purpose. For input, System X is reliant on a single system.

What happens with system X's output? Do the forecasts simply end up with the end user or are they used as input for another system?

The end users use the output of system X for briefings. System X provides management information, and it is therefore not the intention that the system itself is used during a briefing, but rather that the predictions are the input for an information report that is discussed during the briefing.

If I understand correctly, is the end user responsible for how the predictions are presented to direct colleagues?

Yes, that is right. It is critical that the forecast be substantiated to gain valuable information. Employees are the source of this knowledge. The prediction is not sufficient on its own. We have considered adding it to System X, as it does not explain why the probability of a specific event is high. However, we believed it would be better if the end user had control over this and could discover for himself why the likelihood of occurrence of phenomenon X is high.

To what extent does the complexity of the processes of the external suppliers/data sources influence the implementation of System X?

When you look at the implementation of system X, you can see distinct pattern movements. These are phases of persons wanting to work with System X. Initially, many people wanted to work with System X as soon as possible. After the hype faded away, system X was integrated into the existing processes, which worked well. As the predictions do not alter frequently, you will find that attention is fading.

Could you say that system X is now considered a mature application?

Yes.

Has a management methodology been used in the development and implementation of system X?

There is a strategy for the national project, and guidelines for the use of system X have been developed. A lot of documentation, such as manuals, has been created about how system X functions. We have given the teams that work with system X the freedom to use the system in whatever way they consider suitable. It is impossible to prescribe a single way of working because actual events differ.

Has an unambiguous working method been determined during the implementation for the roll-out of system X?

Only generally, each team was given the opportunity to choose specific themes that they considered relevant. It is possible to select specific themes within System X. The implementation and selection of themes has been influenced by the local issues,

Are the effects of these local issues reflected mostly in system X configuration?

No, System X is built in such a way that it is easy to customize based on a team's needs.

Which factors (external factors) outside the scope of this project have influenced the implementation process?

The level of acceptance of system X differs by team. The willingness to learn new techniques varied, which also played a key role. It is also clear that the hierarchical nature of organization A, as well as the organization's political control, are relevant. During the implementation of system X, it was also noticeable that hierarchy had an effect, you could identify whether a certain policymaker supported the implementation of system X since his or her influence is considerable.

Is the fact that a lot of documentation has been written about system X a conscious choice to aid teams as much as possible?

No, this has grown over time. We started with a short instruction, but when we found out that there was a need for information, we made a manual, work instructions and frequently asked questions.

How detailed have you made these guidelines?

Since they are guidelines and tools, it has not been determined that work should be done in a particular manner. We explain the possibilities of system X and how the system can be used.

Have you heard from others that this documentation has made the transition to working with System X simpler?

Yes, we only provided what was requested in terms of documentation. System X began as a minor project and has expanded to become a national system. What was intriguing about this approach was that it evolved from a small-scale existent demand. Everything that has been added in the field of procedures and guidelines has gradually emerged. The frequently asked questions are one of the most used features.

Has a management methodology been employed throughout the system's actual roll-out?

No, but I was obliged to undertake several steps. This obligation stems from the old structure, when for example, a project plan had to be delivered, according to Prince 2. That still exists, but I prefer agile concepts to traditional project management methods. Nevertheless, to obtain budget and priority, it was necessary to adhere to some aspects of the conventional techniques.

Is it true that as the project progressed, you were able to use the agile method more commonly?

I was able to add my own touch on the procedure. I thought it was essential to establish effective communication and frequent interaction between project leaders. I did set a few goals since otherwise nothing would be measurable. Based on these targets, it was possible to determine who was working on the system X implementation. The goals were to provide themes and training for working with System X.

Were methodologies applied during development?

No, the development team was small, and interviewee one did most of the work. Following that, we continued to develop system X in a scrum team for some time, making it more robust so that it could be managed more efficiently. At the present, further development has come to a standstill.

Were agile concepts used to guide the process of making the system more robust?

While making the system more robust, we worked neatly with two-week sprints and a sprint planning. Also, with retrospectives and a division of roles with a scrum master and developers. This is no longer the case since the system is now solely being maintained.

You indicated that organization A is quite hierarchical. Has this affected the implementation of System X?

The hierarchy has occasionally assisted us in achieving our goal of having all teams work with System X. In this effort, the support of management aided in the adoption of System X by certain teams.

How did the System X proposal end up with national management? Did you play a part in that?

It was not a very significant role in and of itself; rather, it was a demand for commitment to the long-term development of System X.

What was your role at the beginning of the process? What was the role distribution like back then?

I was not involved at the start; the question arose when an employee approached interviewee one with a specific information request. When the system demonstrated its effectiveness, it was adopted and tested on a smaller scale. A positive review was written by a national club that monitors innovations. Because of the national interest, the development of System X was accelerated. Then interviewee one became a member of my team.

How would you describe the organizational culture centered on system X?

Around system X, the culture still very informal. I still speak with interviewee one almost every day. We have always tried to be accessible to people at all levels of the organization.

You did establish some sort of managerial mandate; was this also done informally?

Yes. there are formal bodies that you must go through, that is the case in almost all large organizations. We have presented to steering groups or management teams. We did make use of the formal structure by approaching management if a change in themes was requested. The management is entitled to make this decision, so you make good use of the formal procedures.

Did the way of communicating, as well as being easily accessible for questions and documentation, contribute throughout the implementation of system X?

Certainly, I think it has helped to communicate clearly and openly about the possibilities and expectations of System X. However, we also indicated what system X is not intended for. We have also traveled around the country to give presentations on the spot and talking to individuals has helped. I believe that if such innovations are kept out of sight, they will not succeed. It can be difficult to explain something sophisticated, such as an algorithm, yet doing it simply and transparently can aid during implementation.

Have you played a significant role in making technology understandable as a project leader?

As a project manager, you organize rather than telling the matter, which is left to individuals with practical knowledge, so that the message is conveyed more effectively. Interviewee one then told the technical story, and another colleague explained how it worked in practice. That was a valuable lesson for me: if you want to implement anything, bring someone with you to whom the receiver of the message can relate.

How would you describe the involvement of top management involvement regarding system X?

Project management and management engagement are no longer required; system X is now widely used.

What were the first users' opinions at the start of System X's implementation?

Skeptical, many people needed to be persuaded of the merits of system X. We also noticed numerous extremes, with some people being quite eager and others being very skeptical. I believe it has now converged to the point where utilizing system X is considered standard. System X is now a useful application.

What challenges did you encounter during the implementation of System X throughout the Netherlands?

Explaining the technique and transparency that we just discussed. Realistic and open communication about System X, as well as the technology behind it, contributed to the overall awareness about system X.

Why is explaining the technology so urgent?

Since this concern has always existed, if you just present the outcome, people will stay doubtful. If you show that system X does perform the same work, but much faster and with more data, it will be evident what system X contributes.

Did you miss a certain kind of question during this interview?

We have already covered a huge scope in terms of technology, implementation, and culture. Money is another interesting topic. We have decided to develop system X ourselves, thus it will only cost us our own resources. There were many who said that buying external software was a bad idea since it cost thousands of euros per license and was not necessarily better than an internal solution. We have also researched self-development and other alternatives.

Interview C

What is your current position? And what does it entail in terms of tasks and responsibilities?

Within organization A, I work as an operational expert and have a managing position. In addition, I aid other employees. As part of my job, I am also involved in matters concerning social unrest or politically sensitive topics. I work in the organizational layer between policymakers and operational employees.

How exactly are you involved in the implementation of System X/the algorithm?

We have started to work in a process-driven manner within organization A. By examining our existing process and refuting it with data from system X, we were able to make this process process-driven as well. This method of working enables us to more accurately estimate the number of personnel that can be deployed but working with system X also enables us to foresee a specific phenomenon. With the aid of these forecasts, it is possible to adopt a number of highly focused steps aimed at combating phenomenon X. Additionally, the system is used in a process in which organization A collaborates with two additional governmental bodies.

So, in fact, there is a process that revolves around system X?

Yes, the system is actually used and offers the possibility to implement the aforementioned measures.

What was the chronological order of events; was it the process-driven method of working first, or was it working with system X first?

These are separate issues; of course, the system has been in place for a few years. With a previous team, I discovered that the system's predictions were accurate to within seventy to eighty percent of the actual situation, allowing for improved teamwork.

Are you aware that the system is based on an algorithm, and are you able to explain the algorithm in a nutshell?

Yes, I am aware that the algorithm is dependent on certain input data, which includes historical data from a variety of sources. Predictions are made based on this data that we as end users can use. We have no control over the algorithm, but the policymakers can customize certain components of system X to meet the needs of our team.

Were you already working within this team when system X was implemented?

No, at the time I was working in another team, where I experienced the implementation of system X. The system was then introduced as a handy tool, after which system X was used more and more, because it was recognized that the system had added value. Later on, interaction with two other government agencies also came into the process. The system is still in good use as the predictions from the system are being worked on. The results from the system are shared with the employees, during this meeting the knowledge from the employees is linked to the results of the system. Three different roles are present at this meeting.

Were presentations given by the system makers during implementation?
No, and no manuals were provided; instead, we as end users were able to experiment with the system. Additionally, the system is designed in such a way that we, as end users, are unable to alter anything. The team leader has some control over which main points are processed within the system.

How does this algorithm contribute to a problem within this process/what does the algorithm add to system X?

Due to the hectic nature of our work, our team is extremely focused on process-driven work. We have a finite number of people, and the system contributes to the most efficient use of our resources.

Is the system aligned with the objectives of organization A?
The system helps us to work in a process-driven way, since we can deploy employees based on the predictions from the system. Before system X existed, we had less background information at our disposal, the system displays the prediction visually, which also reinforces the urgency of certain phenomena in a visual way.

Has the introduction of this system/algorithm altered your work in comparison to the previous situation?
No, the system provides additional information, but for me the work has not been changed by the system.

Does the system you work with (algorithm) depend on other processes for input, for example?
That part is not up to us as the end user. For us, it is one of the systems we work with within organization A. We link multiple sources of information and knowledge of employees and make a concrete plan based on that. The process to which system X contributes is comprehensive.

To what extent does the complexity of the processes influence the implementation of System X?

The processes are reasonably well-organized; as long as everyone involved remains focused on their own process, everything should go smoothly. Throughout this process, we connect disparate areas of expertise.

Is this system different to you in comparison to the other systems you work with?
Yes, the system generates predictions, whereas other systems are primarily concerned with the past. The system is intuitive and straightforward. It is enjoyable to use because it is so simple.

What is the organizational structure concerning this algorithm or system X?
Within organization A, several teams work with the system, and we have weekly management consultations with these teams. The system is really used by multiple roles, it is certainly not a one-man show for that matter.

Is there a standardized method for working with System X?
The system is used by various roles within the organization and assists in a variety of processes. The system is a tool that enables us to concentrate effectively on specific issues. We have been able to improve our processes in part due to this system and a critical examination of our own processes.

How much are you aware of the legal regulations governing the use of artificial intelligence in decision-making in your daily work?
Not at all, the system is designed in such a way that legislation does not apply to our interactions with it.

How is the output of the system monitored/interpreted?
We use the system's output and compare it to our own historical data. When these perspectives are combined, an accurate representation of the current situation emerges.

Can you provide a high-level description of the organizational structure concerning this algorithm or system X?
Three different roles are involved in working with system X, there is an interaction between the knowledge and expertise of these stakeholders. If someone drops out, there is always someone available to step in.

What is the involvement of clients/administrators with regard to system X?
There are no internal clients. We simply work with the system. We are not concerned with systemic issues such as filling the system.

Was project management involved in the implementation of the system within organization A?
No, that was not the case during our team's implementation.

Does project management play a role while working with the system?
No, the system is part of one of the processes we use. These processes and those involved within the processes are part of a certain structure, but project management does not apply to these processes.

How would you characterize the organizational culture regarding System X?
There are of course different generations within organization A. The younger generation usually likes to work with technologies including this system, on the other hand for the older generation it was a bit more difficult in the beginning. At the moment, both generations are convinced of the added value of the system.

What was the end user's opinion of the system/algorithm beforehand?
Skeptical, yet frequently are the personnel of organization A. This progressively changed for the better with the introduction of system X. Because the system has shown to be effective, individuals feel optimistic about working with it.

What was your opinion about the system/algorithm beforehand?
I immediately recognized the system's added value. The system's simplicity also had a significant role in the system's adaption within organization A. The system is straightforward and effective.

Thus, did the system's simplicity prove beneficial throughout implementation?
Yes, the few steps required to work with the system helped during the initial stages of working with System X.

What challenges did you encounter during the implementation of System X?

During the initial phase there was only a difference of opinion between different generations within organization A about the system, yet this was not really a big obstacle.

Interview D

What is your current position? And what does it entail in terms of tasks and responsibilities?

I work as data scientist. The distinction between a data scientist and a data analyst in the context of the national government is that a data scientist does work with more advanced data. Data scientists are more likely to work with mathematical and/or predictive models. However, the distinction between the two functions within the government is very thin; when it comes to external parties, data scientists are much more involved with AI and modelling. As government data scientists, we are more concerned with both analyzing and modelling. We also frequently provide advice when it comes to purchasing external data science products.

Why is this distinction of roles employed within the context of the Dutch central government?

I am speaking from my experiences at Organization B as well as what I have seen at another government organization. We, as Organization B, are working on a wide range of topics, so it is hard for us to specialize in a single subject since we work with so many. We do not even have a distinct core business, since we operate on a variety of themes, that is the main difference.

Can you explain the algorithm behind system Y in a nutshell?

The requests of phenomenon X are reviewed by system Y. The first year that system Y was employed, it consisted of a few simple business rules, which were so simplistic that system Y would eventually be obsolete. Within organization B, there was also thoughts doing something involving algorithms. We saw this as an opportunity to expand system Y and begin working with data besides simple business rules. Algorithms also provide the ability to predict.

Was working with algorithms merely an experimental process, or was the applicability thoroughly investigated as well?

It was still highly experimental at the time, and as far as I remember, it was the first algorithm in production within organization B. Much remained unknown, but it was evident from the start that providence of explanation on the algorithm was crucial. When the data team's intention regarding the algorithm was not yet clear, it was already brought into production. Since the policymakers and the employees who carry out actual inspections embraced the idea, the implementation proceed so quickly.

We did not have a clear understanding of all the repercussions of bringing an algorithm into production, which accelerated the decision to put it into production. Meanwhile we realized the significance of ethical concerns, as well as detailing the algorithm, modelling options, and measurements. At the time, simple business principles were insufficient, and the algorithm was deemed to offer value.

What was your role during the implementation of system Y?

I actually did everything within this implementation when we were not very mature as a data team. My first assignment was to work on an algorithm with a colleague who had also just arrived. I did the data preparation, discussions with policymakers, modelling, and production of the algorithm.

How did the idea of implementing an algorithm emerged?

One of our business consultants came up with the idea, which was supported by someone from policy. Then, as there were no others with the necessary knowledge besides me and the colleague, we started working on the algorithm.

What information is available about the algorithm?

Variables as input and factors as output that are relevant to the predictions can be clearly documented. I was able to do the data preparation based on previous knowledge, which means that there has been little consultation with policymakers about data usage. We were able to document variables well. For metrics, this process was different as neither we nor the policy realized that it was necessary to record metrics.

Was it not necessary then to define metrics?

Not at the time, but research was conducted into how the process unfolded and why certain decisions were made. We were surprised that the algorithm was put to use so quickly; we gradually learned what it required to use an algorithm. For both our organization and the organization that conducted research into the algorithm's implementation, we could have approached certain issues differently and perhaps should have concluded that things could have been done better and that the department was actually not ready yet to implement an algorithm. This has also been formally concluded by both an external analysis and our own findings.

What is the cause for the algorithm's rapid implementation?

There was no alternative at the time, the business rules of that time were no longer sufficient, and certainly not for future inspections.

What problem/situation does this algorithm contribute to within this process/what does the algorithm add to system Y?

In general, algorithms offer the possibility to see statistical relationships that a human cannot see. Many more variables can be calculated. The insights from this, focused on statistical relevance, provide more knowledge about certain factors to the business. The model thus offers the possibility to check on a larger scale, but this is not the end of a process, but the input for an actual check. With this check you are dependent on other factors such as capacity and the intensity of the check. In short, the added value comes from being able to evaluate much more data.

Could you say that, under the current business rules, the new check is better compared to the original one?

The computational power of the model made it possible to look much more comprehensive at the controls. In the meantime, the model has been adjusted, and the quality of the training data has been examined. Currently another process step is used as input for the model, then in the initial situation.

How is the algorithm trained?

The algorithm is supervised, so it is not a self-learning model. Data is added and retrained every time and then the output is generated.

Do you notice that the algorithm's output is steadily improving?

What we see gradually emerging is drift. Drift in data science models actually means that the population may be changing. Behavior can be modified if one knows that it is being monitored. Part of the solution is looking critically at the data. Other colleagues will rebuild the model with new data in the future and examine the model's procedure critically.

Is the algorithm dependent on other processes?

In terms of data input, the algorithm is reliant on at least two distinct sources. We actually collect the other data as part of the standard European processes. In general, there are not many dependencies because we mostly work with our own data.

Is the output from the algorithm used again as input for another system or process?

The algorithm's output is stored as CSV or Excel file and exits the system. Since we work with different data than most of our systems, the results are difficult to integrate with other systems. This is difficult since the organization is not yet far enough with the integration of the results in formal processes. It is possible to make connections using our data solutions, but this depends on whether the algorithm will be used in the long run. We recently received confirmation that the algorithm will be used for a longer period of time, allowing us to consider integration with other systems. Other IT professionals will then be able to see how the algorithm can be neatly assured within the existing IT landscape.

To what extent has the coherence of current processes influence the implementation of the algorithm?

Coherence of processes did not really influence the implementation, but it is true that the way of working was quite vulnerable at the time. This vulnerability stems from the fact that both one person does input and monitoring of the algorithms.

Is there a uniform approach for algorithm implementations within organization B?

We are now working on this, but we are subject to different guidelines. Our algorithm has also been researched internally. This research has also revealed a number of guidelines that will lead to a more unambiguous approach for the implementation of algorithms.

Do all guidelines come from the internal investigation?

No, these guidelines are based on the general audit office, good governance principles, the Dutch Data Protection Authority, and European guidelines. What I have noticed is that different Dutch central government organizations have their own unique combination of the aforementioned guidelines. Nonetheless, this combination results in the same kind of guidelines.

The end users of the algorithms do not see the end result generated from the algorithm. The end users receive a selection of the results. They do not see on which specific points they scored high. This allows them to carry out the check without bias.

Is this way of working designed consciously?

Not initially, but later it was decided that we want to keep this way of working, so that every check takes place as unbiased as possible. It is not the intention that the algorithm guides the decision of the employee.

Are there procedures and/or rules in place to ensure that work is completed in the ways you describe?

Yes, the conscious choice to show the employee and selection of the results has been documented.

Has the use of algorithms in organization B been subjected to any additional rules or procedures?

Another colleague can elaborate on that, but I can summarize the main points. It is preferable to obtain the substantive instructions and procedures from an end-user.

Which factors (external factors) outside the scope of this project have influenced the implementation process?

That is a difficult question to answer because there are numerous factors over which I have no control. The legislation is difficult because there is a conflict between European legislation and the findings of the audit by the internal audit service of the central government. As the data was collected specifically for the check, issues like purpose limitation(doelbinding) were never an issue. We are also concentrating on a single aspect of data usage. We considered whether there was any potential for discrimination within the model early on, and we really do not believe there are any. We are apprehensive about using other data in the algorithms. The general opinion of the childcare benefit scandal has influenced the development of algorithms within the central government. People are extremely cautious when it comes to developing algorithms as a result. When working on certain specific themes, it is critical that the conclusions are correct.

Has a management methodology been used in the development and implementation of the algorithm?

No, however we want to do the re-development of system Y in a structured way. Standard guidelines within data science methods will be followed during the design.

Has the organization B's hierarchical structure had an impact on the algorithm's implementation?

No, the contacts with different layers within the organization were very informal during the implementation. At that time, the management was involved in an informal way, because working with algorithms was so new, there is a good chance that management gave its approval without knowing exactly the consequences of an algorithm implementation.

What was the organizational structure (roles/tasks) like throughout the algorithm's implementation process?

About eight colleagues in total, including a few persons of the implementation and policy, I find that quite limited. At the moment, three or four data scientists and one colleague from the data government and the CIO office are already present during a similar process. So now there are already five from our own department involved.

How is the division of roles for the specific algorithm at the moment?

More colleagues will be participating in the rebuild of system Y, and more will be documented.

How would you describe the organizational culture during the algorithm implementation process?

Everyone involved already knew each other, which contributes to the informal character. The implementation was also pioneering, so little was formalized. This makes the whole very informal, so that decisions could be made quickly and briefly. In organization B, of course, a government organization with many different organizational levels and hierarchy.

How would you describe the involvement of top management involvement regarding system Y?

The policymakers are the clients, and they are also in charge of designing and coordinating the process surrounding the algorithm. This coordination was also rather informal in the early phase. During the rebuilding, it will be more professionally organized with a defined division of roles.

Do you believe that having a defined role/load balancing is crucial to the progress of the algorithm?

Not necessarily for this specific project, but we have demonstrated that the method of operation has worked fairly well. However, fairly well is no longer sufficient, and we want to professionalize it. The approach is still one of the few in use, and I believe it should serve as a model for future implementations. Now that it is evident that improvements are feasible, it is time to address them rather than continue working informally.

Do these refinements also affect end-users?

To the best of my knowledge, end users do not have a strong opinion on the subject. The policymakers were clearly enthused about the new style of working. However, it was difficult for clients them to foresee what a process based on an algorithm would look like at the time, which was similarly difficult for us as data scientists.

The policymakers have truly become ambassadors for this way of working, and they decide to continue rebuilding the algorithms by using acquired knowledge from internal and external evaluations. We all want to continue working on this algorithm.

Has the method of communication contributed to the enthusiasm of the policymakers?

Throughout the process, we maintained open lines of communication with the policymakers. We worked hard as a team to answer the difficult questions while the algorithm was being studied. The fact that we managed this properly has brought us closer together as a team.

What challenges did you encounter during the implementation of System Y?

Actually, the issue emerged gradually; at first, I just saw potential. Prior to that, the most difficult hurdle was generating enthusiasm and attracting the idea to us so that we could get started. The most difficult part of the process was managing all of the challenges associated with the implementation of an algorithm.

Interview E

What is your current position? And what does it entail in terms of tasks and responsibilities?

I have been working as an advisor within organization B for almost a year now, focusing on analytics and governance. This touches on the topics of the thesis, processes, management styles, systems and also culture. At the moment there is still a lot in the making, yet I am focussed on the long term of, for example, algorithm Y.

Even though the focus is future oriented, I notice that we are often busy with the issues of the day surrounding algorithms and social developments such as the childcare benefit scandal There is a lot of focus on the usage of algorithms within the Dutch central government, which means that we are aware that we as a governmental organization need to be more proactive with regard to working with data and the realization of data-driven products.

What was your role during the implementation of algorithm Y?

During the implementation of this algorithm, I was not involved. Before I started working at organization B, the algorithm had already been developed. However, I am working on an analysis of algorithm Y. The evaluation is conducted to examine everything carried out related to algorithm Y.

This analysis will reveal what went well and what could be improved regarding the usage of algorithms within organization B. Algorithm Y was chosen for this study since it is already in use, making it easier to test, as the entire implementation process has already been completed.

What are you going to do with the results of this analysis of algorithm Y?

The analysis was carried out by several people, including myself and two internal auditors. The results of this internal review are plotted not only on the algorithm, but also on the wider context. Based on our knowledge, we made recommendations for the algorithm's next iteration. We did not focus on the substantive solution since it does not fit within our roles. It is critical, in my opinion, not to put yourself in the role of the data analyst/data scientist.

What kinds of findings have emerged from the internal analysis?

Because the algorithm was implemented in a prototype-like manner, I did not find the results of the internal review to be shocking or unexpected. The primary outcome of the analysis is focused on documentation. There has been documentation, but little reproducible documentation or documentation of previous decision-making. With the audit trial and transparency in mind, it is critical that the documentation of the algorithm is of high quality.

Until now, I have noticed a conflict between delivering quality and delivering results wherever I have worked. In addition to quality and results, there is workforce/resources; however, this pillar is less significant in governmental context because larger budgets are used.

Can you explain the algorithm behind system Y in a nutshell?

Algorithm Y is a classification algorithm, which is a piece of software created using a decision tree to predict the outcome of a certain check. The algorithm identifies specific points that an end-user can use as input for his or her work. The algorithm is merely a tool.

What problem/situation does this algorithm contribute to within this process?

The algorithm is primarily intended to use the existing capacity for checks as efficiently as possible. Random samples are useful from a statistical point of view, but often do not yield concrete results. The algorithm provides us with more guidance to perform checks in a more efficient manner.

Can the effectiveness of this improvement be measured?

The algorithm was subjected to a year-on-year comparison, but a historical data analysis was difficult due to a lack of available historical data. The decision was made to automate in the absence of historical data. The current measurement is the benchmark. Samples can also be measured, but they are frequently impractical due to the amount of time required.

Is the algorithm dependent on other processes within organization B?

For input, we rely on a number of third-party data providers. Organization B has signed service level agreements (SLAs) with these suppliers. Following that, there is a relation to another party. Algorithm Y is part of a value stream that also includes interviewee D. The algorithm itself is only a minor component of this process.

How did the value stream influence algorithm Y's implementation?

Those involved maintained short lines of communication during the implementation. It is not unusual for an algorithm to take a year from conception to production; however, within organization B, this process went much faster.

Since algorithm Y is part of a larger process, there are dependencies that are not always obvious to everyone. Data scientists were in charge of things like testing and reviewing, as well as assigning responsibilities at the time. The data scientist did this in an informal manner because otherwise tasks would have been neglected.

Was this the first algorithm used in production at Organization B?

It is the first algorithm that I am aware of being used within the organization. In any case, the algorithm was one of the first developed in the department where we work. As the definition of an algorithm varies, it is difficult to identify the first algorithm.

Is this algorithm being optimized?

Yes, the algorithm is being restructured in terms of lifecycle management. However, this approach is not yet applied consistently within Organization B for managing algorithms.

To what extent has the coherence of current processes influence the implementation of the algorithm?

The most important factor is data quality. At the start of the algorithm development process, the main cause of delay was poor data quality. It is also not always clear who to consult about one specific topic. Despite the fact that the lines were short, they were unsure of where to go. We are a fairly large organization, so processes must be established. It is more challenging to identify someone with specific knowledge in large organizations.

Were the SLAs you mentioned earlier, in place at the start of the implementation?

I am not sure, but the delay was caused by data under our control at the time. Now that enough data has been collected, the algorithm is able to learn.

Is there a uniform approach for algorithm implementations within organization B?

No, not yet; I am currently working on an algorithm-related approach within organization B. Since few algorithms have been implemented within organization B, the appropriate approach for each case is examined.

Is having an unambiguous approach not yet efficient for organization B?

There comes a point when it is absolutely necessary to have an unambiguous approach, and it must be done whether it is efficient or not. The upcoming European AI legislation will also require a lot of information about algorithms to be defined. We are currently working on AI regulations and data management within Organization B.

Furthermore, the political character within organization B and working on a gigantic number of subjects also make it difficult to realize an unambiguous way of working.

Which factors (external factors) outside the scope of this project have influenced the implementation process?

The laws and regulations governing information security, personal data, and, in the future, working with algorithms had also influenced my role in this process. The transition from law to policy to implementation is extremely difficult. The illegibility of the laws makes policy formulation and implementation of specific processes extremely difficult.

So, the most significant challenge occurred during management and not during implementation?

During life cycle management, it is critical that the legacy is aligned with the law and regulations. All new implementations must also comply with the law and regulations, which is a problem since the regulations are still quite ambiguous. Personally, I am urging people to keep track of their decisions and work. For many people, documenting is a chore. In the field of algorithm documentation, keeping a record of choices and thoughts is fundamentally the most important.

Has the documentation of these options decisions and work occurred for algorithm Y as well? For example, retrospectively?

We are currently working on the second iteration of algorithm Y, in which a lot more is being documented. We now document everything for reproducibility; documentation facilitates in the transfer of people's knowledge to a knowledge base. We want to reduce our reliance on one or a few people in order to ensure continuity. With this algorithm, it is obvious that the quality of activities centred on Algorithm Y can be improved even further.

Has a management methodology been used in the development and implementation of the algorithm?

In this case, the implementation process was quite exploratory, but the project was coordinated by someone from the business. It has also been approached as an innovation project. In the future, we will concentrate on reaching clear agreements about the process's continuation. Clear agreements allow for problem-based steering and facilitation.

Has the organization B's hierarchical structure had an impact on the algorithm's implementation?

That does not appear to be the case in my opinion. I can see short lines between people, but they are not executed on if they are not recognized. Organization B appears to be a fairly flat organization, with the algorithm being supported across the board.

What was the organizational structure (roles/tasks) like throughout the algorithm's implementation process?

Then there were data analysts/scientists, the business client, and two other organizations involved in the value stream. I am not sure if the second iteration will be different, but I do know that a desirable team composition for algorithm development is being considered. We want to be more competence-oriented in the future because data analysts/scientists did a lot at the time, even things that were not part of their job description.

Was the implementation process of algorithm Y bottom-up or top-down?

The process went well in consultation, the collaboration with the business was well organized from the start. This algorithm is really an example of a well-coordinated project. Neither bottom-up nor top-down

How would you describe the organizational culture during the algorithm implementation process?

They were quite pioneering, with a lot of trust in one another. With a can-do attitude that was focused upon what is possible. That is my impression, but since I afterward had spoken to those involved about the algorithms, it is really best to ask interviewee D.

How would you describe the involvement of top management involvement regarding algorithm Y?

I am not sure, but I know the clients are back to work on the algorithm.

And how much time are you still devoting to algorithm Y?

Not so much for this algorithm. The reason I got involved with this algorithm is that I view the post-process as a spectator as a sort of auditor. This analysis is not intended to be an audit, but rather a learning experience. Consider how the lessons learned can be put into practice.

How would you describe the opinion of the end users about working with an algorithm?

I spoke with one end user, who was enthusiastic about working with the algorithm. The algorithm's results were well received by the end user. End users do not understand the algorithm's technical operation, but this is not required in order to work with it. The work of the end users has not changed significantly; however, I did notice more resistance to an algorithm at a previous employer. It is critical to make the essence of an algorithm clear to users in order to avoid resistance.

Did the communication style help end users understand the essence of the algorithm?

I believe that the fact that the algorithm was implemented so quickly by a team with short lines of communication and a dialogue between business and execution played a major role. The extent to which an employee is bound by procedures also influences the overall picture of an algorithm.

What do you consider to be the most difficult challenge in implementing the algorithm Y?

Building in delays, to be able to organize things around the algorithm in a neater way. The speed is dictated by the time frame as the algorithm must be running when checking. Entering into discussions with those involved in order to get a process in order involves a lot of work.

Interview F

What is your current position? And what does it entail in terms of tasks and responsibilities?

I am currently working on complex reports. We first assess the report and determine whether the report should be handled by our team. When the report is of such significance, we will create a dossier and, if necessary, take further action.

What steps do you perform within this process?

I handle the incoming reports and prepare the first reports. I am also involved in further processes, so I am very involved in this process.

What is the algorithm's relationship to the process in which you are involved?

The algorithm is not involved in this process as it is in the control of phenomenon X. As far as I know, the algorithm is exclusively employed to control phenomenon X. The process in which I am currently involved is distinct from the algorithm.

The algorithm is only used to select a risk from a list that may then be used as input for a specific control. The algorithm is not used to finish the control.

The algorithm is self-learning, which means that it makes a selection of certain risks. After the output, a new control is started by an employee within organization B, so actually the algorithm is only a small part of the entire process.

Would you say your work has changed since the algorithm's introduction?

The control has basically always remained the same. Activities that are performed by the employees within organization B have remained the same, the checks are carried out in an unambiguous manner.

The beauty of this control is that the interaction between the controlling and the controlled is very personal. The algorithm merely adds the risk selection, but it is not actually the basis for the control.

Is that algorithm selection then the input for the actual control process?

I am not aware with the technical aspects; you should speak with interviewee D about these technical configurations. I am aware that it is a self-learning algorithm in which the results of the check are reflected back to improve the system's performance. Every year, we additionally assess the algorithm to ensure that it is operating as efficiently as feasible.

Who is engaged in the algorithm's evaluation?

The algorithm is being evaluated by a group of employees within organization B involved with the control of phenomenon X people. These employees are involved in all phases of the control and implementation. Moreover, employees from policy and data are involved as well, in order to have all viewpoints.

How exactly are you involved in the implementation of this algorithm?

I was not involved in the algorithm's implementation. I started working at organization B when the algorithm had just been operating for a year, so I did not get to see how it was implemented.

You indicated in the email that you work indirectly with an algorithm. Can you elaborate on that?

Indirectly as the employees who actually carry out the control, do not deal directly with the algorithm from the control. In that sense, you are not interacting with the algorithm directly.

Since the algorithm makes a selection, it does influence the process right? For example, is it not possible to check all requests?

Processing and checking all requests are not possible due to the large number of requests. Hence the algorithm is implemented. The algorithm works because of certain indications and therefore prepares the risks on that basis.

I do not know if the algorithm still works exactly with the same data, but it certainly was when I did the checks. However, indications seen in the selection of the algorithm do not determine whether something is actually wrong, it remains an indication.

So, the indications from the algorithm do determine that an employee will look after the application?

Yes, these indications determine that the application will be examined and therefore these applications are included in the sample. The reason an application falls within the sample is not clear to us, so as a controller you start at zero without bias.

The reason an application falls within the sample is not known to the inspectors. After the selection from the sample, a manual check takes place.

To which problem/situation does this algorithm contribute something within this process/what does the algorithm add?

The added value is the selection of the large number of requests. The algorithm is self-learning and needs a few more years to work better and better. Making the selection is necessary because of the large number of applications.

Do you know what the process was like before the algorithm was implemented?

The check was different in the first year, then a selection was made on the basis of certain risk categories and the actual control was carried out partly on that basis. I was not involved in the implementation and the control is still very new. We have only been working with the algorithm for two years.

Is there documentation available to the end user that describes how to utilize the algorithm?

Not with the algorithm itself, that is up to another department. From the implementation we receive the information about phenomenon X that is it. The way of working is no different since the algorithm, as I said every step of the check as well as the process remains the same. Additional documentation on the algorithm is not necessary for the end-users within this process.

To what extent has the coherence of current processes influence the implementation of the algorithm?

The complete picture is considered when evaluating the application. The data is drawn from a variety of data sources. This many input sources are required to perform the check successfully; it is a time-consuming check.

Nobody in the implementation sees the algorithm, and we are not aware of it. The algorithm operates in the background and is only relevant during the selecting process.

Is there an unambiguous approach for the control of which the algorithm is indirectly part of?

The control is the same every year. There is one fixed process for implementation. The only thing that can change is very small details, which come up through feedback or experience.

Are there external factors influencing the work during the control?

The major challenge is time; the control is time-bound and relies on holidays and other activities. During the check, the only thing you frequently rely on is time. Additionally, we are also dependent on laws and regulations and any advice from external advisory parties. As soon as laws and regulations change, we must adjust our work process.

Does the selection based on the algorithm contribute anything in terms of time savings?

It depends on the control. This is the first check/control I have worked on, so I do not know exactly how other samples work. I think it does affect the results. Since we do not know what the alternative is, it is a difficult question.

It is not possible to check everything, even if we had to check a few percentages, we would not succeed, hence the sample. Where the algorithm makes a positive contribution is in making the selection smaller. Because we work very precisely and there is customization for each check, it is a very intensive control.

How much do you notice about legal regulations surrounding the use of AI in decision-making in your daily work?

That is not something about which we are concerned. The GDPR, on the other hand, and specific legislation directed at phenomena X.

Is the selection from the algorithm representative of the actual situation or is a translation still necessary?

The selection is sufficient, so we do not have to translate anything anymore. The results of this selection cannot be interpreted in several ways. It is data based on facts, which we as controllers do not have to do anything with.

Is there a difference in the time it takes to complete the checks?

The execution of the check varies greatly in terms of time. The difference in time depends on the size and complexity of the application.

Can you give a general description of the organizational structure around this algorithm?

Interviewee D and others from that department are responsible for the data. I was personally responsible for carrying out the actual check.

Who are all involved in the evaluation of the control?

Everyone involved in the process. From the policy, technical side, the executors of the audit and specialists in the field of phenomenon X. The audit is truly tailor-made and human work. The control is complex, with established process steps, but there is the possibility for customization per step due to the aforementioned complexity.

Can you provide an overview of the corporate culture regarding this algorithm?

The employees involved in this check are likeable people; due to the complexity, we personally contact applicants. We consider the applications in much detail and do everything we can to assist them. We also document every step of the process.

What was your opinion about the algorithm before starting to work with the algorithm?

Because of the complexity of the control, there was a lot of emphasis on the substantive knowledge that was necessary when I started working for organization B. Overall the focus was not on the algorithm but on the substantive process.

What is your current opinion on working with algorithms?

I am positive about working with algorithms, when the results are such useful for control, it has added value. Working with an algorithm offers the possibility of more targeted checks and tailor-made solutions for those cases.

Fortunately, we also carry out an evaluation of the algorithm and the process every year. The beauty of this algorithm is that the algorithm does not determine the outcome of the check. Even after the selection, the applicant has the opportunity to determine the outcome.

Were there any difficulties in working with algorithms?

No, we do not notice that there is an algorithm underlying the selection that we work with during the execution of the check.

Interview G

What is your current position? And what does it entail in terms of tasks and responsibilities?

I work as an advisor within organization C, primarily focused on training and learning activities. I am responsible for the requests of learning activities within organization C and have been working on the system Z implementation. I am currently working on improving and expanding system Z's capabilities.

How exactly are you involved in the implementation of System Z?

We had an Excel-based administration within organization C prior to the existence of system Z. This approach was incredibly intensive and insecure, which is why the need of a learning management system to oversee and administrate these activities arose. Then, with the help of colleagues, I started searching for options, and we examined the systems used by other government agencies.

Together with the project leader and the supplier of the system, I was responsible for the design of the system based on our process and functional requirements. At the moment I am still working as administrator of system Z. The project manager has examined the system's connections with other systems to ensure that certain data is automatically loaded into the system. We are still working on setting up one of these connections.

Can you explain the system Z in a nutshell?

System Z is the learning platform for organization C and offers the possibility to sign up for a variety of training courses. In addition, certificates and training courses are also kept. It is a central place for finding, booking and managing everyone’s learning activities.

Was the Excel you talked about part of the previous learning process within organization C?

We used Excel to register employees when they registered up for a course at the time. The enrolment process is now fully automated. Previously, administration activities were mainly manual, and more actions were needed throughout the process.

To which problem/situation does this system contribute?

The added value comes from the fact that certain tasks, such as registering for events, can now be completed by the employee. Managers can now use the system to give their approval for specific training courses.

Before the system there was a procedure that consisted of many manual tasks. Notifications and adding certificates are now also automated. On the one hand, the new system saves time, but as the system offers other possibilities (development or e-learnings), more time is needed. In addition, a piece of functional management is also necessary, which also takes time.

What kinds of activities have arisen as a result of system Z's implementation?

The functional management of system Z, including handling e-mail with questions about the system. The functional management for the system has not yet been optimally set up; I am currently more or less responsible for the functional management. Furthermore, we now have the option of developing our own E-learning modules.

Is the system reliant on other processes?

A large part of the learning offer in the system is extracted from another system. This system is used throughout the government and offers learning activities that has been tendered government-wide.

We have to consider the suppliers' development processes, usability, and design changes, as well as the fact that for instance the supplier had recently migrate their data to a new data hosting party. After such changes or updates we have to verify that system Z is still operational.

And what about the data of the users of the system as input for example?

The intention is that this HR-data should be automatically uploaded from another system. However, there are issues, and this will not occur automatically at this time. Every fourteen days, I manually upload the users' data into the system.

It is unfortunate that this automatic upload has not been accomplished after a year, as it has consequences for new employees. We have to manually enter the new employees, because otherwise, this will only happen every two weeks.

What happens to the output or information from the system?

After completing a course employees receive an evaluation form and certificates with their hours of attendance. Additionally, they can add these certificates and other things to their portfolio. The evaluation forms are processed, and the findings are summarized and forwarded to the teachers. With the growing number of E-learning options, even more will be possible in the future. We are still figuring out how we will organize everything in relation to E-learning.

Is there a uniform approach for such implementations as System Z?

Part of the implementation can take place uniformly, but we discussed how the implementation fits in with our process, both administratively and with our own facilities, with the project leader and supplier of system Z. We are not currently utilizing all of the capabilities provided by system Z due to functional management and capacity constraints. There is a lot more that can be done with system Z. We did not quite foreseen that certain activities would be necessary after the implementation.

The supplier of the system provides support through a service portal in which we can make notifications, report problems we have and ask questions. Recently we can also take notice of the questions that the other participants ask in their service portals.

Which factors (external factors) outside the scope of this project have influenced the implementation process?

I have not come across any external factors. The biggest issues are that system Z's financial administrative functions can not be used completely for our financial administration of all our learning activities. This is because we still have a separate process if use is made of the offer of so called “external training” institutes whose offer is not included in our system Z.

Has a management methodology been used in the development and implementation of system Z?

No, I do not think so. The supplier, on the other hand, has worked with a specific sequence. I am not sure, but you should ask the project leader. The project is not yet completed. We have worked towards a go-live moment, even though this moment has been postponed.

Have procedures or rules for the use of System Z been established?

No.

So, no manuals for system Z have been made?

We have no written documentation for the end-users of the system.

Did the system's self-explanatory nature made end-user manuals and documentation obsolete?

Yes, although certain substantive elements have been clarified in documentation, however working with the system speaks for itself. The system is self-explanatory; it is essentially a learning activity catalogue.

Has documentation been made for you as an employee with tasks for system Z?

The supplier can provide you with some documentation and for the back-office we have a self-compiled manual with guidelines for adding a course, for example. The supplier offers a digital user manual in the back-office environment. This manual however is insufficient and is not really convenient to use

The supplier, who normally resolves technical concerns, is also partly responsible for functional management. It will be beneficial to have someone with technical knowledge on board in the future.

Does the organizational hierarchy have an impact on the implementation trajectory of System Z’s? implementation? For example, the mentor-mentee model?

Within organization C we work with an annual financial request for employee training and studies. The directors and similar positions then provide the training requirements for a department. Based on the number of employees, a budget is available, and the courses are approved or rejected. Registration for paid training courses is in consultation with a manager, as we work with a fixed budget. The authorization process for the courses that cost money therefore runs through the mangers. The system is adapted to that

Can you give a general description of the structure of the organization around system Z? Focused on roles, tasks, and responsibilities.

Yes, I and the project leader shared the tasks internally; at the time, there was also another employee involved who was in charge of coordinating with management on the project. Therefore, we informed the then-director of the situation and involved him in the demos and presentations. We were also given instructions on how to add certain information to the system as a group.

How would you describe the involvement of top management/internal client regarding system Z?

There was involvement of top management regarding system Z. They have given approval for the implementation and the associated investment. We have kept them informed during the implementation process by giving presentations etc.

What I remember is that during the implementation process there was some confusion among management about the financial component as a whole. Because many people assume that everything was solved with an automated process. Some colleagues have participated in the final acceptance test.

How would you describe the culture within organization C, focused on the goal of system Z?

Since we are a learning-intensive organization, we have established a learning management system within Organization C. We value knowledge transfer at Organization C, and I believe that a lot of effort is put into sharing knowledge. System Z can support this. We can also utilize the technology to measure employee interest in certain events.

Does communication have had an important role during the implementation of system Z?

Yes, communication was important during the implementation of system Z and still is. Updates and changes are included in a general periodic weekly update to inform the users of system Z. However, there is a clear challenge for us in the field of communication. This is because it is unclear to employees when it comes to communication channels concerning the learning activities within our organization, they co-exist and can be confusing. We still have to find a solution so that an unambiguous communication channel is created.

Has this situation been going on for a long time?

Applying for training courses is tied to a specific time frame, which implies that such issues arise. Although the problem is not new, it is becoming more widespread as more people use it. As previous courses may now be consulted via system Z, the variety of learning activities has expanded.

What was the opinion of the end users of the system/before the project started?

To be honest, we can do a better job of research on it. The majority of time is spent developing the system Z offering of courses and study material. In the future, have to find out what the experiences of end-users are by evaluating the system

Is polling the end users' opinion something that is not happening now due to a lack of resources?

The main cause is the lack of capacity/time, this is not a priority at the moment. The functional management of system Z is not a difficult undertaking, but the variety of other activities next to system Z requires lots of time. The inventorying of training courses, for example, is a time-consuming operation.

It would be good to survey the users of system Z once in the future, in order to find out the points for improvement from the end users. I can imagine that there are certain things that are inconvenient for end users now, for example there is a situation with course dates that do not match in our system with the actual data form the training institute. Fixing such problems can take a long time.

What challenges did you encounter during the implementation of System Z?

The biggest challenge lies still in the automation of the HR upload in our system, the linking of different systems. Increasing the number of E-learnings and connecting certification to it, is something that still needs to be looked at. If we can achieve this, we can enhance the quality and value. These are the challenges that will arise in the future; putting up an E-learning can be slowed since building an E-learning is something employees must do in addition to their regular work.

Do you think there is anything else I should have inquired about?

No.

Interview H

What is your current position? And what does it entail in terms of tasks and responsibilities?

I am an external project manager and I work for a number of clients as a project manager or consultant. I am also the project leader for organization C for several projects and thus also for the implementation of system Z.

How does a project from Organization C end up with you?

Usually, you enter a customer through a certain expertise, so I also entered organization C five years ago. If the organization knows you and you have done good work as an external party, there is a greater chance that you will also be asked for other projects that match your expertise. If you have a lot of knowledge about something, you will come higher in the tender procedure of a central governmental organization.

How are you involved in the implementation of System Z?

Within organization C I still had hours left for other projects. Then I was asked if I had time to act as project leader for the implementation of system Z. After several conversations, I came in to take on this assignment. I have a lot of experience with some aspects of this project, such as drawing up a privacy impact assessment, SaaS, and links with other systems. These privacy impact assessments are mandatory to prepare.

What tasks did you perform within the implementation of system Z?

As a project manager you are mainly concerned with the procedural components of a project. Think of putting together a team and drawing up a project plan. There had already been initial research, so I did not have much to contribute. We still had to make a few database management decisions with the SaaS solution. In terms of the actual design, we examined the current processes as well as what we hoped to accomplish with the implementation of system Z.

In fact, organization C desired to automate in particular, for the previous learning process, everything was kept up to date in different ways, for example, Excel was extensive used for the lists for learning administration. The aim was to create an overview page for the employees. I also had to manage the balance between time, money, and quality.

The system was set up by the employees of organization C in collaboration with the supplier. I bring the parties together, the service provider of organization C, the external supplier, and the employees of organization C itself.

Could you explain system Z in a nutshell?

From a user perspective, it is a website where you can follow or register a learning activity. It is also possible to obtain certifications for certain learning activities within system Z. on other hand for the employees who are involved in the content and functional management of system Z, some activities have been automated.

To which problem/situation does this system contribute?

As I previously stated, System Z provides the employee with a clear overview. However, the added value for the back office is in automating the administrative process. Previously, different administrations existed within Organization C.

Why was there such a high demand for automated processes?

There was no overview due to that large amount of Excel sheets and the organization of the back office took up a lot of time and had become unclear.

Is the system reliant on other processes for input for example?

Part of the input is therefore automated; you want to be able to offer the integration of external portals with other course offerings via a dashboard. We are currently also working on integrating E-learning.

For the range of E-learning you are dependent on employees for the content of the system. An area for improvement is the range of E-learning courses, but it is better to talk to the administrators of the platform about the actual content of system Z.

To what extent does process design/coherence of processes influence the implementation of system Z?

The coherence of processes is determined by the number of sources of information that you want to link together. Within organization C there were many own processes, which were developed in-house. The challenge lay in integrating these processes within the often-standardized system of the external supplier. It was necessary to adapt the processes to the system because the system cannot be adapted to the process. The system only offers the possibility to configure.

In addition, it is also difficult for employees to complete functional management tasks if they have not been trained for this at all. Now someone from the back office is the functional manager and that can be quite difficult.

So, organization C's processes were modified so that they could be configured with system Z?

Yes, of course. This is needed, though, if you have a system that cannot be customized. According to the initial plan, only system configuration was possible. A system that can be entirely customized was not chosen. This is because of the expenditures and the quantity of maintenance. Customizing a system is challenging in terms of expenses and management, and it may cause a lot of problems for organizations.

Is there an unambiguous approach for implementations such as system Z within organization C?

Most projects are built on Prince2 and include a project description. People claim that they work in an agile and scrum-like manner, but in my opinion, this is not the case. If you use the scrum approach, you will also need to divide the budget over multiple periods of times.

System Z was implemented using old-fashioned project management, but who knows, other parties involved may have experienced it differently. For the implementation of system Z, a project plan was made together with the supplier from start to finish. With Prince2 entails components as a project plan, an official intake, and a description of the entire process. Officials within central governmental organization want to be able to plan, and it is critical to establish the project's budget and timeframe.

Because the external supplier handled the system installation, the project's complexity was manageable. Because project teams are small, the loss of a single person has an immediate influence on the project's duration.

Which factors outside the scope of this project have influenced the implementation process?

The most significant change was the implementation of extra features focused on E-learnings, which was probably not in the project plan, therefore it is an expansion of the scope. The project plan did not specify that we would use our own database, so this is also a divergence from the project plan. Lastly the supplier shifted data centers shortly after the go-live, causing several modifications in our system.

What challenges did you encounter during the implementation of System Z?

Because the project involves third-party partners, there may be difficulties. Because it was a relatively small project and I also knew a lot of people, communication with these parties was rather fast and with short lines.

Did Prince2 contribute to the implementation process of system Z?

No, that is more of a methodology matter. For project documentation, Prince2 is utilized. In terms of performance, Prince2 made no contribution to the implementation process. The pace of this project must emerge from the employees of organization C, not from the procedures.

Have procedures or rules been established for the use of system Z?

No, there is not really a need to prepare extensive procedures and documentation as it is a fairly simple system. For system Z there is single sign on, and the procedures can really be summarized in five lines. This has really been a mini project for the government, which is why procedures and regulations are not that important in this case.

Does the hierarchy surrounding the project influence the implementation of System Z?

No, the project was too little to entail hierarchy. The team of organization C has completed a significant amount of work, which has been reported to the steering group. These interactions had limited meaning in terms of content because there was little choice in terms of designing the system.

Can you give a general description of the structure of the organization around system Z?

The organization surrounding this project consists of the project team and the supplier, the steering group was right above the project team in terms of hierarchy. The steering group consisted of two people, who were all those involved in the project. The project has a lot of impact for the back office, but overall, it is not a project with a huge impact within organization C.

How was the involvement of clients/administrators for the project concerning the implementation of system Z?

Informal, yet critical. The steering committee group was very involved and critical, yet it was not required to point out anything as the project progressed successfully. When it came to E-learning, the steering group worked tirelessly to organize employees.

Has the organizational culture had an impact on the implementation of System Z?

No, I do not believe so. The employees who work at Organization C are a certain type of person who is very punctual, which can occasionally clash in the field of IT. IT is often less static, which can cause conflicts. However, in terms of commitment and desire to tackle the problem, it went really well; the employees wanted to change things for the better individually, therefore the project went more easily. As an outsider, I thought it was an excellent culture within Organization C.

Is the form of communication important in the implementation of system Z?

Communication proceeded smoothly, in my experience, during the system Z implementation process. One of the team members works in the field of communication, which aided in getting the information through and ensuring that the testing of system Z proceeded smoothly.

Because System Z is a very simple system, communication can be done rather simply via intranet and e-mail; you customize the communication to the complexity of the project and the influence on the majority of employees. It is critical to examine the consequences of the system on the employees' work with the organization's employees.

What was the end-user opinion of system Z?
As an external employee I was not able to speak directly to an end-user within organization C. During the implementation, testing was done with end users.

Is it noticeable to you that this is an implementation process within the government?
The main difference between commercial companies and government organizations is the way in which a project is created. The major difference lies in the procedures and tenders, as a result of which the choice is determined within the national government organizations. This does not apply to the implementation of system Z. Preconditions for privacy and security apply in both cases, so that is not the big difference. The tender procedures are often a long process.

Interview I

What impact does System Z have on your current position and tasks?

I am only involved as a user of system Z. When I started working for organization C, I was involved in the development of an E-learning module, which was still in in the pilot stage. At the moment, I only use system Z to enroll on the knowledge sessions held within organization C, and I also listen to podcasts and scroll through the modules.

Can you explain the system Z in a nutshell?

In a nutshell, System Z is a catalog of currently offered courses, workshops, and training courses.

Do you know whether system Z has been developed internally or externally?

System Z was developed in collaboration with a third party. The actual content is from Organization C, and it was developed in collaboration with an external party..

Were you involved in setting up that E-learning module during the implementation phase of System Z?

I am not sure what phase of development System Z was in during the development of this E-learning module. I am aware that prior to the release of this E-learning module, we experimented with another platform. I do not exactly know the background of system Z.

Is there any information available on how to use System Z? For instance, when the system went live?

No, however a generic e-mail was sent with information regarding how to register for system Z at the go-live. In addition, I have not consulted any documentation myself.

Was any documentation necessary at the time? Or, in terms of usability, is the system such self-explanatory that no further documentation is required?

The use of system Z is fairly self-explanatory.

What problem/situation does this system contribute to for you as an end user?

I did not encounter a major issue or anything of the sort for which system Z is truly the solution. System Z, on the other hand, is a useful tool for mapping out the possibilities of courses within organization C. There are, however, some points that have become more difficult since the introduction of system Z. With system Z, you must register via the portal for the sessions, whereas previously, the invitation was already added to your calendar within Outlook. As an end user, I found it more convenient when the sessions were automatically scheduled.

Do you have any idea why this extra step was added to the process?

It is beneficial for the organization to have an overview of which employees have followed what courses. My assumption is that the system also links this attendance to these courses and the registration for Permanent Education (PE) points. A centralized registration of PE points benefits both the organization and the end user. It is irrelevant to me because I do not have any PE obligations yet.

In your opinion, what problem/situation does this system contribute to for the organization?

Having a centralized view of all available courses. It is a useful platform for management to gather information about how specific courses are visited and the number of requests per course.

Is the overarching goal to schedule these courses more effectively?

As an end user, I am not sure if more effective course planning is the ultimate goal, but if I were a manager, I do think it would be a good addition.

Does system Z offer the possibility of knowledge management? For example, does the system provide an overview of the organization's knowledge?

No, that connection does not exist.

Are you dependent on other systems and/or processes when using system Z?

As an employee, you must always seek approval from your mentor before attending major courses, but this is not the case for a knowledge session. If I want to follow a course, I consult with my mentor to see if the course is in line with my current development. During the annual discussions, you discuss the development with the mentor, and possibly following courses is also discussed.

Since I am currently attending in a very large course(study), it does not make sense for me to enroll in a number of other courses.

Is the output from the system, in this case the overview of PE points, used for other processes?

Personally, I have no experience with this, nor do I have any idea of the exact role a mentor has within system Z. So, I do not know whether a mentor has an overview of the courses his or her mentees follow.

Is there an unambiguous approach for working with system Z? For example, are there any instructions?

There are instructions. However, I did not consult any documentation.

Have procedures or rules been established for the use of system Z?

I did not notice any rules or procedures directly relating to System Z

Do you apply the data from system Z to one of your activities?

No. I have never used system Z to gather info from specific sessions in the past, as the presentation of information is generally sent via email afterwards.

Do you use System Z on a frequent basis?

No, I use the system once every three weeks. It is more of a complementary system.

Is it because you can find this information elsewhere that you do not use the system as frequently?

Yes, that could be the case. However, that much more is possible with the system than I am currently doing.

What is the organization like around system Z?

The registration and deregistration of new users is handled by functional administrators, and there is also a team focused on training and courses within organization C. This team will most likely be in charge of the course program of system Z.

You mentioned the role of mentors within the organization. why was it chosen to work with mentors within organization C?

Working with mentors allows you to discuss people's development in more detail. The mentor mentee model makes it possible to give personal attention to employees.

What is the significance of learning within Organization C?

I believe that learning new things keeps work interesting, and that it is critical to be interested in the field in which Organization C operates. Curiosity is accompanied by a desire to continue learning, so it is important for organizations to provide these training opportunities to bind personnel.

Because the field in which we work is constantly changing, staying current with current developments is critical if you want to do a good job.

How would you describe the culture within organization C, focused on the goal of system Z?

Within organization C, there is a strong emphasis on gaining knowledge, and there is plenty of room for attending training and courses. Unquestionably, a learning culture exists. Several events are planned to encourage learning and personal development.

Does communication have a role in the use of system Z?

Yes, there is a lot of communication, but it is important that you actively look for the possibilities yourself. A point of criticism of system Z is that the catalog of system Z is not filtered, there are so many results that the overview is a bit lost. As an end user, I therefore have no idea which courses are really relevant for me personally.

What were your view on System Z before you started using it?

I thought it would be useful to have a central overview of all courses and training, I mainly use it for the knowledge sessions and some other basics.

Is your view of System Z different now than it was before you started using it?

No, my own opinion has not changed. It is a useful system, but I do not need it in my day-to-day work.

Was there any personal resistance to this change of working method regarding learning and training?

Some things are inconvenient, for example, when you register for a course, an invitation to the Outlook agenda is no longer sent instantly. In theory, this is not a significant deal; the only issue is that the time on your calendar isn't immediately reserved. This was previously promptly booked in your agenda. You now must actively go through a few steps yourself, so from a user standpoint, little has gotten easier in this specific case.

Is the presence of these extra actions the most difficult challenge for an end user when using System Z?

Yes, I think so, especially because the time in the agenda is not immediately reserved, it is possible that something is planned at that time.

So, the confirmation and link for the agenda are the output from the system you are dealing with?

Yes, an agenda item is indeed sent with the confirmation, but this does not happen immediately.

How does system Z contribute to the culture of learning within organization C?

System Z is mentioned in almost all forms of communication. The fact that System Z, and hence the subsequent education and courses, are stimulated in this manner helps to the learning culture within organization C.