# Cultural Factors Influencing the Data Science Challenge in a Municipality

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**ABSTRACT,**
***Dutch municipalities as public organizations do have a challenge on more data-driven policies and strategies. Although they have access to a lot of data, its use depends on the values and skills of employees in the public administration, CPO/CISO officers, policy-makers and politicians. Based on the research model, 15 exploratory interviews were conducted with the various stakeholder groups to identify critical factors in terms of data science, open strategy and organizational culture. Also, the research examined if optimal data-driven cultural factors are available in the municipal organization through a questionnaire with 27 respondents. There is evidence that the cross-sections in a municipality are interpreting data science challenges and topics differently. These different cultural characteristics could result in certain biases and heuristics in the importance of data-drivenness, use and interpretation of data. Thus far, only a few studies investigated the factors influencing the data science challenge in a municipal organization. This research specified four stakeholder groups, not on the people who will use the data daily in the future. In addition, it was impossible to get in contact with every member of the organization. The child welfare fraud scandal, which has come to light by Pieter Omtzigt, shows the interpretability and the importance of the good use of data. The findings demonstrate the differences and prioritization in factors among the influencing systems in a municipal organization. Municipal organizations could benefit from knowing these discrepancies along with introducing and eventually implementing a particular data-driven culture.***

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**Keywords**
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# 1. INTRODUCTION

Data science is one of the most promising subjects and trends of the last few years. Data science can be a foundation for artificial intelligence and predicting analysis (Duan, 2019). Nowadays, a lot of organizations have already implemented some sort of business intelligence tools. However, most of the time the full ability of (open) data in many organizations is not being used, or people are skeptical about the value of data use itself. Most importantly, data could also be presented and interpreted differently. That is why the value of data is often seen in multiple perspectives of several employee fields within an organization.

Data sharing could be seen through at least three perspectives: interpersonal, intra-organizational and inter-organizational (Yang, 2011). All perspectives are important to take into account when it comes to data communication and interpretation. Overall, there is an increase of complexity in terms of attending several clashing ideas, structures, demands, considerations, and cultural components in a public organization. Those elements support the move from 'old public administration' to a hybrid organization (Christensen, 2010). Challenging themes, e.g. performance dialogues in hybrid organizations, are a source of conflict in organizations. A conflict that can be solved by inter-organizational dialogues (Rajala, 2019). The municipality is to the utmost extent an intra-organizational organization, with overlapping factors and issues with the inter-organizational perspective (Liguori, 2012). The focus of this study will be from an intra-organizational perspective.

The structure of a governmental institution, like the municipality of Rheden, is simply classified into three characteristics: legislative, executive, and juridical. However, the largest group of employees within a governmental organization is not mentioned in this structure (NIMD, 2008). All agencies are having an overlapping relationship with the separated functions/characteristics (Straus, 1984). In a municipality, the organization could be split up into four influencing systems. Firstly the legislative which is the municipal council, secondly the executive, which is the mayor and aldermen, thirdly the juridical which are the legal experts including CPO (Corporate Privacy Officers) and CISO (Corporate Information Security Officer). Lastly, the agencies with varying power and relationships with each of these actors (Straus, 1984) All stakeholder groups have different values, interpretations, and cultural characteristics. Differences in factors causing the variations of interpersonal, intra-organizational and inter-organizational levels are important factors to identify. Successful information sharing across the organization supports effective systems for analysis, improved accuracy, timeliness of decisions, and promotes policymakers and practitioners with more confidence in their outcomes (Yang, 2011).

# 2. AIM OF THE RESEARCH

The objective of the research is to come up with an overview of the factors which are influencing the value of data use. In addition, the differences and similarities in the evaluation of data-driven policy and strategies will be visible to the different stakeholders within a municipality. On the assumption that certain biases and heuristics in the division of powers will be brought to light. The effect of the research will hopefully be an increase in communication, effectiveness, and mutual understanding among the cross-sections of the organization.

## 2.1 Central Research Question

In sum, the municipality of Rheden faces a huge challenge. Currently, they are busy preparing the technical and organizational capacity for data-driven projects. The next stage they will face is implementing the tested and prepared approach. This will probably clash with the cross-sections of the different levels in the culture. Knowing the cause of the influencing factors for every specific level in the organization will contribute to an easier, faster, and successful implementation. That is why the Research Question of this thesis is as follows:

*"Which factors are influencing the challenge of improving data science practices at the cross-sections of different levels, given the current culture of the municipality of Rheden?"*

## 2.2 Sub-questions

To help answer the main research question, sub-questions are made. The reason for that is to force the principal researcher to provide the reader with an as specific (and accurate) answer as possible.

1. *What are the values of data-driven strategizing in organizational culture and behavior?*
2. *What are the values in the analytical thinking of different stakeholders like political parties, policymakers, law-controlling employees and executing public administration employees?*
3. *What are the different cultural characteristics of stakeholders in a municipal organization?*
4. *What is the fit or misfit across these value systems?*
5. *How can these fit or misfit be managed by the management of a municipality?*
6. *What are the experiences of 'best practices' in managing cultural dilemmas in other public or semipublic frontrunner organizations?*

# 3. THEORY

## 3.1 Theoretical Background

### *3.1.1 Data science*

Private organizations are already using much more data in their day-to-day work (Johansen, 2016). Nowadays, public organizations are just beginning to change the current culture to a data-driven one, just like the municipality of Rheden. Perfect examples according to Klievink (2016) are companies such as Facebook, Google and Twitter. They have created their business model around data. Overall, public organizations are lagging in terms of implementing a data-driven culture. In addition, data could help the municipality of Rheden, improve its efficiency, effectiveness and transparency (Klievink, 2016). Besides, well-defined information sharing is important for addressing, for example, policy issues (Yang, 2011). Without a clear data understanding and not knowing critical factors in the organization, successful implementation of a new culture will be very hard. Moreover, citizens will have no clue about the arguments behind decisions made in the municipal city council when there is no good data transparency. The trend in the scaling-up process to an open strategy and digital ecosystem could be distributed into four stages. The first stage in an organization is the right IT structure and fundamentals. In building the capabilities three core challenges stand out: data quality, data integration and data security (Grover, 2018). The second stage is the transparency in the new developments in the data-driven approach and culture. The third stage pertains to the early inclusiveness of the future participants and users. And the fourth and last stage is approachable participation for members of the whole organization. Onboarding must be a warm welcome. In addition, building trust as a data board is essential (Kerstens, 2020). The research found the high potential of open (local) government data, which is a trend in national governments. Research has shown that the community demands a transparent organizational network (Bearfield, 2017). This is relevant because citizens are the most important stakeholders of a

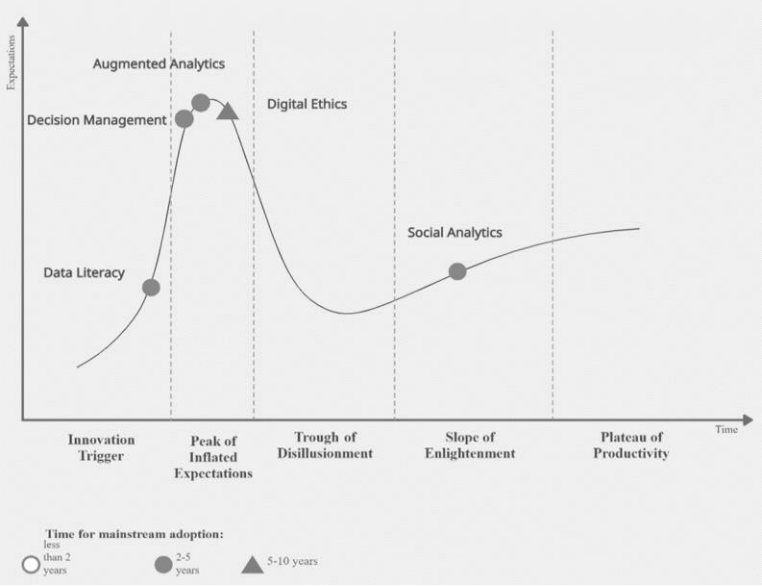


**Figure 1. Key trends of hype cycle for data science and business intelligence (Gartner, 2019).**

governmental institution. As shown at the 'Hype Cycle' in Figure 1, there is no question about the implementation of a digital culture but when the transition will be activated by the leaders of the organization (Gartner, 2019). There are five key trends according to Gartner (2019): augmented analytics, digital culture (shown dimensions in Figure 1 are data literacy and digital ethics), relationship analytics (shown as social analytics), decision intelligence (shown as decision management), and the overall fact of operationalizing and scaling of data.

A set of approaches for advancing and analyzing the practicality of data science are four concepts (Neff, 2017). Concepts as communication, the making sense of data as a collective, data as a starting point, and the perspective to see data as a set of stories. The concept of communication is, for instance, conversations among colleagues and building social relationships to produce datasets. The reason for that is that practices of data science are in the basics of social networking organizing. Furthermore, the concept of making sense of data as a collective. The process of sensemaking of data sciences requires relationships and connections because the data itself is not self-evident. Moreover, the perspective of concept to see data as a starting point. Using data must be seen as an opportunity for making transparent deliberations and assumptions, which creates a "complete" context. The final concept is about seeing data through an exchanged set of stories. The rhetoric of social good must be clear for the data user, for ethical and socially responsible data-driven decision-making.

### *3.1.2 Open strategy*

Open strategizing causes an increase of transparency and inclusion concerning strategic issues. Beneficial will be the early involvement of internal and external stakeholders (Whittington, 2011). The effects of openness are e.g. the availability of more strategic information, which leads to more people engaged. An open strategy must be seen as a constant variation between two dimensions of transparency and inclusion. Driven by dilemmas posed by environmental and organizational contingencies (Hautz, 2016). That transparency and participation perspective is interesting in the context of public organizations. More importantly because in this context stakeholders are even more critical (Schwarz, 2020). The rise of social media increases the transparency and inclusiveness in organizational strategizing. When social media will be used as a feedback tool it will increase the tensions between extant management practices and the participatory nature of technology. This new development and emerged tensions could cause new internal capability to an appropriate feedback structure (Bapista, 2016). As Bapista (2016) suggested this capability could be conceptualized as reflexiveness. Reflexiveness explains the shift towards a more open strategy shift to potentially more stewardship. In other words, more participation and IT-tenability of the organizational members. The challenge of strategizing in practices is conceptualized as a situated, socially accomplished activity. Strategizing is compromising the actions, interactions and negotiations of multiple stakeholders in the situated practices they are facing (Jarzabkowski, 2005). Cultural perspectives for open innovation as a data-driven approach are values or artifacts as management information systems, communications platforms, and project decision criteria. Values that are outside know-how and competence are crucial for open innovation practices. For open innovation, an opening up of the mindset is needed (Yun, 2020). A good open strategy connects practice, practices and practitioners (Jarzabkowski, 2007). In conclusion, the most important factors for an open strategy according to the literature are transparency, inclusiveness and reflexiveness.

### *3.1.3 Organizational culture*

First of all, it is important to define the term organizational culture. That is already somewhat difficult or intangible. Cultures are dynamic and are shifting incrementally and constantly in response to internal and external changes (Watkins, 2013). Another definition of organizational culture could be the persistent and patterned way in which organizations execute tasks. Tasks that do not belong to the existent organizational culture tend to do the organizational members with less interest and energy. In addition, members are willing to resist tasks not compatible with the culture (Wilson, 2001). Describing culture relates to other important key constructs in an organization, for instance, dimensions as particularly identity, institutions and practices (Giorgi, 2015). Culture and identity relate to a category of membership, in positioning the organization in a certain social space, whereas culture and institutions represent more formal and structured norms and conventions. In contrast to practices, it is composed largely unconsciously by automatic practices. Trust and collaborative performance are important factors in a data organizational culture. Information processing could improve those factors. Furthermore, multiple insights become visible. For example to gain more insights into the context of different management styles and cultures (Dubey, 2019). Implementing a data-driven culture can provide an increase in the performance of an organization. In doing so, the organization has a high chance of increased effectiveness and successes in innovations. So, data-driven culture and business analytics can benefit a company in an increase in innovation and performance (Chatterjee, 2021). It is essential to make a distinction between the result and the cause of a certain technical implementation. The reasons for that are disappointments about expectations of automatic quality increases in quality of decisions outcomes or an increase in efficiency in which tasks will be accomplished. So, successful information technology implementation is a result and not a cause of the effectiveness of an organization (Parent, 2020). The municipality of Rheden aims to transform the current culture into a data-driven culture. The definition of a data-driven or data-oriented culture underlines practices, behaviors, and beliefs that agree with the principles of analytical decision making (Holsapple, 2014). In short, in a data-driven culture, managerial decisions are relying on more data based insights (Duan, 2018). According to Duan (2018) competencies of a data-driven culture are elements such as organizational belief, attitude and behavior

towards using insight and information generated from data (Duan, 2018).

Finally, the theoretical background of the thesis is about the connection between data science, open strategy and organizational culture. The (practical) connection between those elements is potentially the answer to the research question.

## 3.2 Research Project Motivation

### *3.2.1 Theoretical relevance*

Challenging factors in public organizations as municipalities are often complex. Literature makes a distinction between technical factors, legal and policy factors, and organizational factors (Zhao, 2017). The technical perspective is affected by the technological capacity of each governmental agency. Legal and policy factors are especially the checks to verify that the related legislation is not violated. Organizational factors as an established special department are for instance exclusively responsible for data that is often lacking in the public sector. Focused, strong, and sustained leadership is often essential for overcoming resistance to internal factors. Besides, research indicates that factors such as data readiness and organizational culture are having important effects on data practices (Attard, 2015).

#### *3.2.1.1 Data readiness*

Data readiness in public sector organizations is something that could be assessed in a framework. The components in the assessment framework are organizational alignment, organizational maturity and organizational capabilities (see Figure 2). Firstly, organizational alignment is an uncertainty that is addressed if, or if not, an organization is suited to the use of data. Secondly, organizational maturity is the stage of data development an organization is in. Referring to the e-government growth stage models. Thirdly, organizational capabilities here are in particular the capacity to use data in an organization. Dutch government organizations are on average quite well developed. This could lead to a belief that organizations are ready for the transition to a data-driven culture. In some cases, this could be true, however using data is a much wider concept than organizational capabilities. The comprehensiveness and potential invasiveness for organizations implementing a data-driven system, importance of organizational alignment and technological facilities are just as many needs for successful use (Klievink, 2016). Research by Klievink (2016) suggests that learning and focusing on what specific added value data could bring and data use entails for organizations will benefit the implementation. Improving the e-government organizational maturity component will support the (national) data value for society.


**Figure 2. The components in the big data readiness assessment framework (Klievink, 2016).**

#### *3.2.1.2 Absorptive capacity*

Absorptive capacity refers to an organization's ability to recognize the value of external, new information, comprehend it and imply it internally (Duan, 2018). Duan (2018) focuses on organizations using business analytics to benefit from big data by turning it into insight information. This thesis is about discovering the present potential factors of data drivenness in public organizations, in this case, the municipality of Rheden. Which will encourage the broader cross-sections of the organization.

According to Dawes, some agencies are having difficulties with the vision and belief of information usefulness and information stewardship. Seeing in advance the mutual benefits for a data-driven culture is hard for governmental members (Dawes, 2010). The transition of agencies' mindset is needed for effective and efficient implementation of, for instance, working with data-driven projects. In addition, support from leadership or policy is required to change the standard culture (Yang, 2015). In the context of data-driven culture factors like business analytics and culture of an organization can benefit the success of innovation. Taking into account the absorptive capacity of an organization. However, there are more factors, for instance, management practices, management of human resources, business strategy and relationship development in inter-organizational activities (Chatterjee, 2021). I hope that the research will result in more important (cultural) factors which will have a significant impact on a municipality.

#### *3.2.1.3 Interpretational factors*

The interpretation of data and the effects on organizational behavior is essential to take into account; especially the difference in factors in which every level within an intra-organization is interpreting the change. Additionally, each department is having its ranking of precedence. Knowing those factors will contribute to the improvement and chance of successful information sharing (Yang, 2011).

In the last layer, Figure 3, the member's belief is the most relevant and important factor to focus on for the municipality of Rheden. In terms of information sharing or data sharing a social dilemma arises. Individuals, in general, weigh short-term personal interests higher than long-term organizational interests (Joireman, 2006). Municipalities over the past years have been given a lot of additional tasks, which increased the complexity of the current staff. Basic data knowledge is crucial to harness the power within this type of public sector agency. Therefore, training is needed which involves raising awareness about the chances and of the working of data. Important is addressing ethical issues in what policy-makers can and are allowed to do with data (de Groot, 2019). There are much more 'costs' for sharing information through the eyes of the employee. For instance, a contributor needs to spend time and effort to articulate, prepare and arrange the information before processing the data. Information ownership is the theory that an organization owns the products its members are producing. Nevertheless, 'expertise' is much harder and more sensitive to share. Within an

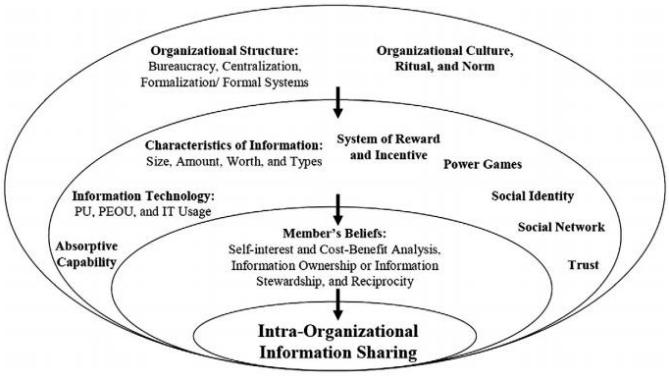


**Figure 3. Factors influencing information sharing in intra-organizations (Yang, 2011).**

organization, subdepartments or groups could be seen as sub-organizations. Information sharing and factors of a smaller cross-boundary scale could be perceived as sharing at the inter-organizational level (Yang, 2011).

The interpretational factors and data readiness in the public sector is still a vague area. Besides, municipality research is not often done (Klievink, 2016). That is why this thesis is theoretically relevant.

### *3.2.2 Practical relevance*

#### *3.2.2.1 National level*

At the end of March 2021, Dutch Prime Minister Mark Rutte was under heavy pressure. The reason for the pressure was a scandal with Pieter Omtzigt, a frequent critic of the Prime Minister, who helped expose the child welfare fraud scandal. In a document from the coalition talks, his name appeared with the words "position elsewhere" (Holligan, 2021). This leakage of data exposes perfectly the relevance of the fourth power/branch within a governmental institution. The note is written by a public administrator, executive, or legislative power. According to the executives, it is an interpretation of the fourth power about the coalition forming conversations. This shows the interpretability of data, the differences in factors and also, the consequences of biases and heuristics of data. Furthermore, there will be municipal city council elections in 2022 (Kiesraad, 2022). After the elections, there will be a local coalition formation. The importance of data interpretation will be relevant in those formations as well. National scandals, as described above, could be avoided if there was awareness about interpretations of differences.

#### *3.2.2.2 Municipal level*

Data and in particular open-government data is still not part of the core business of municipal agencies. In addition, research found that conservative agencies are tending to resist more if data initiatives are clashing with the agencies' culture (Dawes, 2010). That is why there needs to be certain acceptance among the conservative agencies who are not open to changing their cultures. Otherwise, there will be a clash in cultures which will cause frictions that would need to be avoided. The assumptions of data readiness and readiness for change in the public organization must be fulfilled to make the actual change (Klievink, 2016).

# 4. METHODS

Understanding the structure of a public organization such as the municipality of Rheden is by speaking to a lot of people throughout the whole organization. Unfortunately, the Covid-19 pandemic forces, in terms of meetings, the whole world to video calls. Conducting exploratory interviews is to identify critical incidents. That will be the methodology of the research. Besides, a short questionnaire will be conducted to test if certain data-driven culture factors are available in the organization, based on Duan (2018).

The Critical Incidents Technique (CIT) as described by Flanagan (1954) will hypothetically discuss issues such as lack of data, lack of AI abilities, lack of time, lack of awareness about data-drivenness in the organization. Not only issues but also positive critical experiences could be discussed. Those positive experiences could be interpreted as an appreciative inquiry and processed in that methodology (Cooperrider, 2017). This technique started as a task-analysis. Currently, it has expanded to an investigation and exploratory tool. Furthermore, there is evidence that researchers are now asking participants to reflect upon and write down the critical incident instead of only discussing it in research interviews. This is corresponding with the factors which are related to critical incidents. Starting with a focus on eliciting opinions, beliefs, and suggestions are forming parts of the current use of this technique (Butterfield, 2005). The CIT consists of five steps which will be discussed in paragraphs 4.1 up to 4.5.

The ultimate goal of the methodology is to define and test which factors relating to data-driven projects are important for every stakeholder group. Finally, it is hopefully known how every influencing system in the municipality of Rheden will react to a new data-driven culture implementation. When those factors are known, the organization can consider the factors with the implementation strategy.

## 4.1 General Aims

The basic condition for any project is the formulation of the description. For instance, planning and evaluation are not possible without a general statement of objectives. The objective of the thesis should be short and obtained from experts in the fields. Simple and specific statements are much easier to elaborate on with participants. Later on, those statements are formed in an overall impression which should fit the desired aim. The goal of the research is to get to know the factors that are influencing the challenge of improving data science practices at the cross-sections of the municipality of Rheden.

## 4.2 Plans and Specifications

Instructions must be clear to persons involved in the interview. The reason for that is to gain attention on the aspects of behavior that are crucial in formulating the description of the activity. Those instructions must be as specific as possible, concerning the standards in classification and evaluation. The objectivity of the observations is one of the aims of this scientific technique. Independent observers are the only representative of the research if they all are following the same standards and rules. The following specifications need to be established in collecting the data: the situations must be observed, the relevance of the general aim of the observations, the extent of the effect on the general aim, and that speaker made the observations.

### *4.2.1 Interview Technique*

To prepare interviewers, there exists an overview of the interview process and criteria. The section consists of 4 steps: 1) prepare; 2) begin; 3) conduct; and 4) conclude the interview (Stitt-Gohdes, 2000).

#### *4.2.1.1 Pre-interview activities*

Important before the interview is to develop a comfortable interview agenda that corresponds with the project. Using an agenda to establish a relationship within the interview will encourage the respondent to give the needed information. It is important to ask his or her permission about recordings and the use of the given information.

#### *4.2.1.2 Beginning the interview*

From the start, try to explain the purpose, the potential impact, why the participant selected, and how long the interview approximately takes. Take time to let the interviewee ask questions and give a sign when to start the interview agenda.

#### *4.2.1.3 Conducting the interview*

Because the purpose of the interview is to get details on the critical incident, it is important to ensure the respondent is leading in the conversation. The structure will be open-ended questions that are leading to a free-flowing conversation. It is important to listen carefully to answers given, so the interviewee can interact with those answers. Pay attention to voice and tone, and use prompts to keep the respondent on track and encouraged.

#### *4.2.1.4 Concluding the interview*

After all, conclude the formal interview stage and start the conclusion phase. Allow the respondent to ask questions. Try to provide a sort of summary of what was said, which relates to the purpose of the research. Discuss how the interview contributes to the potential success of the research. And most importantly, express the appreciation of the contribution of the respondent.

### *4.2.2 Interview questions*

The questions focus on past experiences to assess influencing cultural factors. Answers to critical incident questions can provide useful information on how to deal with certain events (SOAS, 2021). Describe a general critical / important / significant experience that is an example in your current position of what data science that you could quickly solve on your own (Stitt-Gohdes, 2000).

Based on (Hughes, 2008), is it first important to define the experience exactly. That is the reason for drawing up the first two questions and the five follow-up questions about the situation:

- How important is data justification to you? Why or why not?
- Can you give an example?

Situation related questions:

- Where did it take place?
- Who was involved?
- What happened?
- Why do you think this experience is relevant or representative of your way of thinking?
- What was the impact/effect of the experience you have chosen?

Following will be two questions regarding data science. An area of expertise known because of data knowledge used in relationship with the organization (Van der Wardt, 2020). The combination of those dimensions could potentially lead to the improvement of processes, a cost decrease and respond more effectively to the needs of the citizens (Deventer, 2020):

- What are the important values in handling data? And why?
- How do you make current decisions based on data?
- What is your view about this in the future, for example, do you think it will change?

From there on the interview continues to the theory of open strategy in the organization. Via social media, the influence of citizens is increasing. For instance, in factors such as decision-making and involvement. In governmental organizations as a municipality, transparency will be more and more important. A perfect example is the "Open Overheid" strategy of the government. Values such as transparency, participation and collaboration are the core of the strategy (Brummelkamp, 2016). To research this, the following questions were asked:

- What are in your opinion the priorities of the municipality of Rheden? What is the basis of that opinion?
- Do you think you have an individual influence on the new policy or certain innovation in the municipality of Rheden? Why?

Lastly, questions about the organizational culture, for the most part, based on the organism metaphors of (Morgan, 1987). Enriched and specified through name only animals (Örtenblad, 2016):

- How would you describe the culture within the municipal organization of Rheden? Why? Preferably in terms of an animal…
- What are the characteristics of the animal you mentioned? Which values does that entail?
- What are the inhibiting and stimulating factors?
- What does this mean for a more numerical foundation of policy, choices and proposals?

## 4.3 Collecting the Data

When plans and specifications are clear, data collection is simplified. The necessary condition for data collection is that the results or behaviors observed be classified, recorded, and evaluated when all facts are still fresh in the mind of the observer. The CIT is most of the time used when observations are previously made and reported from memory. Fairly recent reported incidents are most ideal. Collecting data about describing activities is how the observer receives the information he or she obtains. The research will be done in exploratory interview form where the previously mentioned questions will be asked.

In addition, a short questionnaire will be conducted in the organization to explore to know to what extent basis factors as organizational belief, attitude, behavior towards using insight and information generated present in. The basis of the questions are from the literature of Duan (2018):

The five statements of the questionnaire are all in the frame of the 7-point Likert scale (Likert, 1932). To what extent do you agree or disagree with the following statements about your company's culture (1 – strongly disagree, 7 – strongly agree).

1. We believe that having, understanding and using data and information plays a critical role;
2. We are open to new ideas and approaches that challenge current practices based on new information;
3. We depend on data-based insights to support decision making;
4. We use data-based insights for the creation of new services or products;
5. We as an organization have enough data to make good decisions.

## 4.4 Data-analysis

For collecting qualitative data, twelve interviews were conducted with people from the municipality of Rheden. According to the framework described in the introduction. In addition, there were three interviews conducted with other organizations. The collection of data is done by asking the questions described above. Using the qualitative analysis approach of Gioia (2012). Reason for that is to structure the informal terms, categories and codes in a clear overview. The 1st-order concept is defined by the critical statements told by the interviewee. Then, in the first-order code, the sentences are shrunk to a term. The last step was about finding similarities and differences, thereby investigating the possibility of linking a theoretical concept to the term. (Gioia, 2012). The respondents are categorized into the four stakeholder groups as follows, first executive board, second juridical department, third agencies, and fourth legislative municipal council.

The respondents and statements are checked on representativity, types of judgements, appropriate and well-defined, accurate reporting. Only then the results are comprehensive and valid (Flanagan, 1954). The purpose of the data analysis phase is to make an efficient summary so that it can be effectively used.

## 4.5 Interpreting and Reporting

Unfortunately, it is difficult in practice to obtain an ideal situation for each practical problem involved. Nevertheless, the statements of the requirements obtained need a sort of interpretation for

proper use. The real errors are made in the interpretations of the data collection and analysis. I tried to avoid those errors by sticking to the framework of questions. However, in an interview, the interviewer gets a certain feeling afterwards. In researching values and factors, the feelings afterwards are important for interpretations. That is why the objectivity factor of the researcher is important in this thesis.

# 5. RESULTS

## 5.1 Quantitative results of the questionnaire

The results of the questionnaire are conducted among twenty-seven participants in the municipality of Rheden. Except for the first question, which is answered by twenty-six respondents. According to Duan (2018), the questionnaire measured the following aspects which allowed to test the available possibilities for a data-driven culture: organizational belief, attitude, behavior towards using insight, and information generated from data. On average, every aspect is equivalent, see Table 1 in appendix A. This means that the respondents are open and ready for a data-driven culture.

## 5.2 Qualitative results municipality of Rheden

### *5.2.1 Data science*

Multiple factors according to the topic of data science, shown in Table 2 in appendix B, became clear in the conducted interviews. Those factors were transparency, time, clear data understanding, well-defined information sharing, and communication. It is remarkable that some factors are important for multiple stakeholder groups such as transparency, clear data understanding and well-defined information sharing. Whereas communication is the only factor strictly emphasized by the agencies. Besides, time is only mentioned by the council members.

### *5.2.2 Open strategy*

In Table 3 which has been shown in appendix C, the open strategy factors are presented, resulting from the interviews with the stakeholders. The factors of control, inclusion and reflexiveness came forward. Remarkably, control is mentioned by every stakeholder group except members from the juridical department. Additionally, inclusion is mentioned by almost every respondent group apart from the executive board. Reflexiveness in terms of complexity is only mentioned by the municipal council members.

### *5.2.3 Organizational culture*

Table 4 is demonstrated in appendix D, which is an overview of the organizational culture factors. Three concepts were mainly mentioned according to this interview: members' belief, ownership and collaborative performance. Members' belief aspects were mentioned mostly by the executive, juridical, and agency groups. Ownership is addressed in every stakeholder group. What jumps out is the collaborative performance concept which is overall mentioned by council members and for instance, juridical and executive did not mention this aspect.

## 5.3 Qualitative results of best practices

For a complete understanding of the possibilities in terms of data-driven organizations, three so-called best practices were interviewed. I argue that those best practices are especially valuable for the municipality of Rheden, which is in its infancy talking about implementing a data-driven culture. In this section, only the most valuable findings are noted, filtered by their relevance for the municipality of Rheden.

### *5.3.1 NS*

In an organization like the NS, there is so much data available. Data regarding vehicles, timetables, travelers, stations and so on. Basic fundamental values of handling data and the data usage board (DUB) are essential in the data management approach of the NS.

#### *5.3.1.1 Data management circle*

The three basic principles are coincident or not, the same as the principles of the municipality of Rheden. So, the principles are: What do we want? What can we do? What is possible? The question of what we want is about data as an operating resource and data transparency. The aspect of what we can do is mainly focused on the basic technological aspects. In other words, data governance. For example, data quality, data stewardship, metadata and definitions are important values in this domain. The last principle is more about integrity and proven control.

#### *5.3.1.2 Data usage board (DUB)*

This board is helping with most of the time juridical dilemmas. The experts in this board judge if the usage of the data complies with the law. For instance, topics about privacy, competition and confidentiality. The purpose of the DUB is to give structured judgement concerning the secondary use of data. Therefore, NS will stay internally and externally transparent and compliant in this field. An important starting point of the NS is that a lot of law and regulation is falling in a 'grey area' so, interpretable.

### *5.3.2 Municipality of Rotterdam*

The municipality of Rotterdam compasses the nine major component functions of the DAMA framework (Rose, 2009) as fundamentals. The nine components are shown in Figure 4.

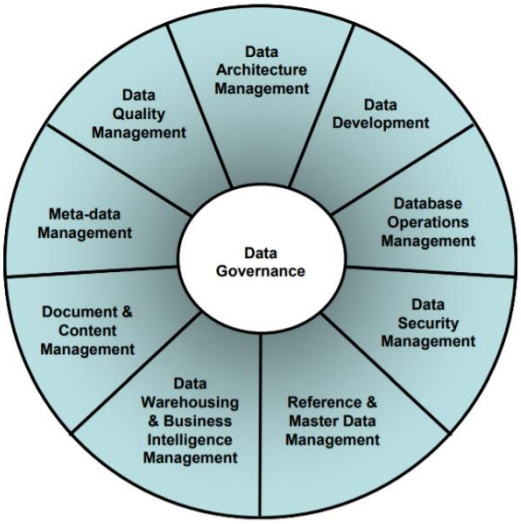


**Figure 4. DAMA-framework (Rose, 2009).**

According to the municipality of Rotterdam, all those components need attention. Because all components have their own 'opinion' and perspective. Responsibility is created by two types of owners. Firstly, the process owner is someone with a mandate, so for instance an alderman. Secondly, a data owner with a complete understanding of that specific data topic. The most important thing in a municipality according to data is increasing awareness. How do you increase data awareness in a municipality? Rotterdam answers this question via communication about data in all kinds of channels. In addition, they created steering groups. Persons involved in those groups are people who value the (potential) of data. Process-owners who could decide things in a municipality are involved in those

steering groups. Additionally, the data owners and key users are advising those steering groups.

### *5.3.3 Municipality of Haarlem*

Data is needed to show the accountability of for example business processes. The means of data is for improving the services of a municipality. According to the municipality of Haarlem, it is important to distinguish the feelings that arise when someone is talking about data. The child welfare scandal is for instance a negative thought about data. That is why it is so important to address all the positive things of data-driven projects. Positive communication and awareness of data intern and extern in a municipal organization is the key to success, in other words, creating intern ambassadors. An open data dashboard as haarlem.incijfers.nl [1] is a service to show the achievements. The dashboard is reporting primarily on indicators, the aims of an indicator are not primarily shown. Also, it could provide a self-service portal for policymakers. In pushing the use of data internally, there is a data-analyst contracted who is constantly investigating what the data needs of the organization are. Additionally, the analyst is learning the employees to work with data daily.

## 6. DISCUSSION OR ANALYSIS

The outcomes indicate that the significance of factors differs per stakeholder group. Starting with the addressed factors which three or more stakeholder groups agreed upon. Transparency, clear data understanding, well-defined information sharing, control, inclusion, members belief, and ownership. The results confirm the importance of certain factors across the whole organization. Whereas, there are also factors that are only addressed by a specific stakeholder group, which is remarkable. Time is only mentioned by the municipal council. Reason could be that they are forced to handle things within a certain timeframe. Furthermore, communication is mentioned by agencies only. The reason for that could be that they are the linchpin of the municipal organization. While they have to communicate with multiple stakeholder groups. Reflexiveness is stated by the juridical department and municipal council. It could be because of the feelings or legal restrictions of no real power. Often caused by the complexity in the framework of a public organization. Another interesting factor is the collaborative performance which is mentioned by all the municipal council members and by one agency member. From the municipal council perspective this could be caused by the perceived lack of involvement of the executive and agency departments in the municipal organization.

Remarkable at the best practices of NS is the point of view in terms of law. The municipality of Rheden argued that law and regulation are strict instead of interpretable which the NS said. Moreover, the data usage board could perfectly be implemented in the municipal organization. For the municipality of Rheden, this is something for a later stage. The steering group of the municipality of Rotterdam is also a perfect initiative that will help by implementing a data-driven culture. Positive communication and awareness in the organization is something addressed by the municipality of Haarlem. Which are factors organizational members will soon forget, but essential to a cultural transition.

## 7. CONCLUSION

The findings suggest a certain pattern which, more or less, corresponds with the theory. There is evidence that the four powers in a municipality are interpreting data science challenges and topics differently. Not strange because of the different perspectives they have to look at things. Crucial when the organization aims for a successful implementation is to know the influencing factors. Thereby, they have to use and take full advantage of these factors in approaching the stakeholders. Early transparent involvement of stakeholder groups will be beneficial in the later adoption of data-driven projects. In other words, creating ambassadors across the entire organization who are thinking along the whole data-driven process. Working from the beginning via a certain framework of important data values as stated in Figure 4 will help to cover all the important aspects of data-driven working. Creating stewardship for certain aspects and projects will help to get things done, the sooner the better in the process. I felt and/or heard about the lack of keeping (innovative) thoughts and projects moving within each stakeholder group. A solution could be to allocate individual responsibility for certain projects and again, as early as possible in the process. Moreover, when addressing the opportunities which for instance, some best practices are already doing, the response was primarily restraint. That mentality will not help in implementing a data-driven culture, after all a bit more ‘sky is the limit’-mentality would help a lot. It is also possible to learn lessons from the best practices and see the benefits and potential in a smaller organization such as the municipality of Rheden. Raising awareness in the organization about data will support the learning process of the organizational members. Openness about cultural transformation and noncommittal participation in thinking about the process will support the data implementation. Participation will always be valued. The key which must be obvious for everyone in the organization is the fact that data is a tool and support resource. Data can greatly help as a starting point in a discussion. From that perspective, it is already possible to avoid the initial discussion about true or false. So, the discussion will take a different approach and is, from the start, already a few steps ahead.

## 8. STRENGTHS, LIMITATIONS AND FUTURE RESEARCH

### 8.1 Strengths

The planning of the research was one of the strengths of the thesis. Firstly, a decent theory investigation resulted in a good approach for quantitative and qualitative research. Fortunately, implementable theories are found which, for example, helped to emphasize the scope. Secondly, the timeframe of conducting the data. Lastly, the time for finishing the thesis.

With the opportunity to interview all different kinds of people through the organization, the multiple perspectives the organization has to deal with were shown. The complexity of a municipality is hard to understand when someone is not directly involved in such an organization. Nevertheless, everybody was willing and open to participate in the research. In addition, this demonstrates the awareness and priority of data-drivenness in the public sector.

### 8.2 Limitations

The generalizability of the theory is limited by the fact that most theories are based on governmental level or are based on the private sector. It addresses the theoretical relevance of the thesis, but also the difficulty to find relatable studies.

Another limitation is the question if the interviewees were the right people to speak with. The people who have to work with,

[1] See https://haarlem.incijfers.nl/dashboard/haarlem-in-cijfers---dashboard for an impression of an open data dashboard.

for instance, the dashboards are not questioned. The questionnaire is not sent to everyone from the organization, so the perspective it gave is limited. Also, the conducted interviews and questionnaire were in Dutch so, it needed some translation into English. It is possible to question if this gave some biased answers in terms of translation.

The fact of the Covid-19 pandemic ensures that most people are working at home. Physically present in the actual municipality of Rheden was no option. This can be seen as a limitation, since the atmosphere in the municipality was not experienced.

## 8.3 Future research

This thesis is focused on the intra-organizational level of a municipality. Further research can expand to both sides. Focus can be on a broader view of the spectrum or a smaller view of the organization itself.

The theory of data science, organizational culture and open strategy are big terms. These scopes could also be narrowed down. For instance, a specification in the different ways to show data in an objective way without biases and heuristics.

# 9. THEORETICAL AND PRACTICAL IMPLICATIONS

## 9.1 Theoretical

The data contributes a clearer understanding of how cultural factors are differentiating between each section in a municipality. Previous research focused on data-driven culture on its own and existing cultural factors. This thesis demonstrated the combination of both.

## 9.2 Practical

The outcome of the interviews is in some way selective in two aspects. People who are interviewed have been contacted via persons of the municipality. In addition, it was not possible to speak to everyone from, for instance, the municipal council. In that way, a complete view is not sketched. The other aspect is the time because the research must take place in a certain timeframe. That is also a reason why it was not possible to get in contact with everyone in the organization.

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# 12. APPENDICES

## 12.1 Appendix A

| | We believe that having, understanding and using data and information plays a critical role. | We are open to new ideas and approaches that challenge current practices based on new information. | We depend on data-based insights to support decision making. | We use data-based insights for the creation of new services or products. | We have enough data to make good decisions. |
|---|---|---|---|---|---|
| Organizational belief | **Agree 38,5%** | | | | |
| Attitude | | **Agree 40,7%** | | | |
| Behavior towards using insight | | | **Agree 40,7%** | **Neither agree or disagree 44,4%** | |
| Information generated from data | | | | | **Agree 29,6%** |

**Table 1. Highest responses in questionnaire items on aspects for a data-driven culture in the municipal organization of Rheden**

## 12.2 Appendix B

| Respondents | 1st Order Concepts | First-order code | Second-order theme |
|---|---|---|---|
| 1.1 | "How do I know the reliability of data?" | Reliability | Transparency |
| 1.2 | "But my concern is that we collect too much (sensitive) data which goes public." | Anxiety | |
| 2.1 | "Take into account the privacy statement." | Privacy | |
| 2.2 | "The legal obligation is so to say my value of acting with data." | Legality | |
| 2.3 | "Confidentiality, availability, integrity are the most important values of acting with data." | Confidentiality, availability, integrity | |
| 3.1 | "What is the goal of the data use? Face this question with an open and transparent mind." | Open-minded | |
| 3.1 | "Important values in handling data are privacy and safety." | Confidentiality | |
| 4.2 | "Velocity and reliability are important values." | Time and reliability | |
| 4.1 | "Time, place and traceability are the most important values in handling data." | Time, place and traceability | Time |
| 4.3 | "Velocity is important because you have to decide in a certain timeframe." | Time | |
| 4.1 | "80% of the decisions are made on emotion because of the quality data delivered." | Quality | Clear data understanding |
| 4.2 | "Keep it simple." | Simplicity | |
| 4.3 | "Reliable and in a manner that is understandable to laypersons." | Simplicity and reliability | |
| 2.3 | "Quantification of data is still difficult." | Awareness | |
| 1.1 | "Data must be easily accessible in the future, but we do not need to rely only on data." | Accessibility | |
| 1.2 | "Use the SMART-principle according to data collection, it is not a goal to collect data." | Relevance | |
| 2.1 | "There needs to be acted with due care and thought about the use of data." | Awareness | |
| 2.2 | "Don't forget the context of certain data." | Definition | Well-defined information sharing |
| 3.4 | "Data gives a broader and better analysis and segmentation of information instead of observations or conversations." | Potential | |
| 1.1 | "It is important that I know the clarification of numbers so I can see it from a certain perspective." | Definition | |
| 1.2 | "There is a rising demand for actual data." | Demand | |
| 3.2 | "The receiver of the data must be critical of the received data." | Interaction | Communication |
| 3.2 | "Collaboration between policy officers about the definition of data is a must." | Collaboration | |
| 3.3 | "Cooperation based on data is important to define the expectations and accuracy." | Cooperation | |
| 3.4 | "Data supports better the defence of certain decisions." | Supportive | |

**Table 2. Structure of qualitative remarks regarding data science**

## 12.3 Appendix C

| Respondents | 1st Order Concepts | First-order code | Second-order theme |
|---|---|---|---|
| 1.1 | "It is now time to get in control of the organization, we need to develop management instruments." | Get in control | Control |
| 1.2 | "We need to keep the budget in balance." | Balance | |
| 3.2 | "Most important priority is to get control on the finances of youth care." | Get in control | |
| 4.1 | "Get the finances in control." | Finances in control | |
| 4.2 | "The big financial losses, because we don't have a solid foundation." | Fundaments | |
| 4.3 | "We have to keep care of healthy finances." | Care | |
| 2.1 | "Try to avoid reputational damage." | Involvement | Inclusion |
| 2.3 | "It is my task to protect the sensitive data of the citizens" | Responsibility | |
| 3.1 | "Effective and efficient goal accomplishment will support the stewardship and expectations of the person in the organization." | Effectiveness and efficiency | |
| 3.3 | "I try to give the best insights, support and advice to the people who have to make the decision." | Insights, advisory and supportive | |
| 3.4 | "Putting innovation, in my case digitalization, on the agenda is a matter of knowing how. " | Innovation | |
| 4.1 | "We are always informed too late about excesses." | Communication | |
| 2.2 | "Don't have too much influence on policy because of my role as supervisor." | Legally bound | Reflexiveness |
| 4.2 | "The complexity of transparency is difficult for the executive board." | Complexity of transparency | |
| 4.3 | "Finances and quality is a field of tension." | Complexity | |

**Table 3. Structure of qualitative illustrations and codes regarding open strategy**

## 12.4 Appendix D

| Respondents | 1st Order Concepts | First-order code | Second-order theme |
|---|---|---|---|
| 1.1 | "I could describe the organization as cumbersome and stuck in the same old patterns of thinking." | Conservative | Members' beliefs |
| 1.2 | "The organization is a bit inward-looking and anxious." | Inward-looking, anxious | |
| 1.2 | "Starting a discussion with the fundamentals of data is different if you start a discussion with opinions and feelings" | Fundaments | |
| 2.1 | "There are already thoughts about a lot of things but nothing is done with those things." | Press ahead | |
| 2.2 | "Interested in the new developments in the environment but at the end stick to the old conservative behavior and thinking." | Conservative | |
| 2.2 | "A municipality has two difficult aspects: the legal obligation which causes slowness and the outdated workforce which is most of the time choosing for the less risky options." | Slowness and risk | |
| 3.1 | "There is a lot of respect for each other but that causes the tension to avoid conflict." | Respect | |
| 3.3 | "Rebel, but at the most of the time submissive." | Submissive | |
| 3.4 | "The organization is a friend to all people." | Friendly | |
| 3.4 | "It is about being busy, but most of the time lack of efficiency is why someone is busy." | Busy | |
| 4.3 | "The agency systems have mutated rapidly, which is creating other insights." | Knowledge | |
| 1.1 | "Need to create stewardship and an intrinsic motivation and drive." | Stewardship | Ownership |
| 2.3 | "It is a cumbersome organization, it is a challenge to move all in the same direction." | Fly in all directions | |
| 3.1 | "I miss most of the time clarity in this familiar organization." | Clarity | |
| 3.3 | "Right education will avoid the tension of flying in all directions." | Fly in all directions | |
| 4.2 | "Behavior of a herd." | Together | |
| 3.2 | "I could describe the culture in the organization as a CC-culture, so everybody has to be involved." | Involvement | Collaborative performance |
| 4.1 | "The organization is moving everywhere, but when she comes close, she flees." | Escapism | |
| 4.1 | "Biggest challenge is to create the we-culture between the executive board, municipal council and the agencies." | Confidence | |
| 4.2 | "It is all about trust." | Trust | |
| 4.3 | "It is a shame that we cannot see all the options in some decisions." | Transparency | |

**Table 4. Data structure and qualitative remarks regarding organizational culture**