FROM DUST TO DATA

On Data-driven Value Creation in the Public Museum Field. An Organizational Perspective with the National Museum of Denmark as a Case.

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Abstract

Public museums in Denmark face increasing competition as a result of a growing experience economy and technological developments, which results in new demands from the audience. In combination with decrease in public funding, the museums are in need of innovation. An innovative force that has been increasingly addressed in literature over recent years is Big Data. However, an overview of the literature to date indicates that public museums' use of Big Data is poorly understood. Moreover, in spite of literature that illustrates Big Data's many potentials, little is known about how organizations actually translate such potentials into value. The main purpose of this thesis is therefore to (1) examine how a data-driven approach to value creation can be understood in the context of public museums and (2) specify the organizational implications that are expected to follow from such an approach. Derived from theory and illustrated through the empirical case of the National Museum of Denmark, we conclude that public museums can generate economic and public value by means Big Data. Moreover, we point to organizational implications that such approach brings along and is influenced by.

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1 Introduction

1.1 A Need for Big Data in the Museum Field

Big Data has been described as a revolution, a new era and a breakthrough technological development (Günther, Rezazade Mehrizi, Huysman, & Feldberg, 2017; IDC, 2017; Mayer-Schönberger & Cukier, 2013). The use of such grand words to describe the phenomenon illustrates the magnitude of the social and economic changes it is expected to bring along. Data are, and will continue to be, a critical element in every aspect of our lives as more and more data are generated every day (IDC, 2017; Mayer-Schönberger & Cukier, 2013). In fact, the pace of data creation has accelerated to such an extend that 90 percent of the entire global data in 2013 was generated in just two years, and most of this data is digital (IDC, 2017; Jacobsen, 2013). In addition to this, the global proliferation of the Internet, the increasing capacity of computing power and the development of new applications allow not only for the collection of more data, it also enables novel ways of processing and analyzing this data (IDC, 2017; Mayer-Schönberger & Cukier, 2013). Therefore, Big Data is not just a phenomenon describing the growing quantity of data, more importantly it also comprises the new opportunities presented to businesses, societies and individuals by analyzing this data to generate insights, make predictions on future developments and inform decision making (IDC, 2017; Mayer-Schönberger & Cukier, 2013). However, the use of Big Data analytics for these purposes is also subjected to criticism, especially when it requires the use of private or sensitive information. It introduces new debates on the extent to which an individual's freedom, autonomy and privacy has to be protected in consideration of this phenomenon. (Boyd & Crawford, 2012; Günther et al., 2017; Mayer-Schönberger & Cukier, 2013)

Despite these concerns, Big Data is understood as an innovative power. The phenomenon is often discussed in light of how it influences organizations and how it can be a new source of economic value (Beer, 2016; Günther et al., 2017; IDC, 2017; Mayer-Schönberger & Cukier, 2013; Varian, 2010). Mayer-Schönberger and Cukier (2013) describe data as a new raw material for companies and emphasize that an understanding of how to use and analyze such data will be essential to businesses in order to innovate and generate value. However, so far, the understanding of how organizations can translate this phenomenon into actual value is limited (Günther et al., 2017). Therefore, organizations, and especially their leaders, have to learn how to *"thrive in and contribute to this golden age of digital innovation"* (Fichman, Dos Santos, & Zheng, 2014, p. 349).

While data is the primary raw material of many digital companies, other companies are working on integrating the digital dimension into older, existing business models in order to harvest its potentials (Günther et al., 2017; Mayer-Schönberger & Cukier, 2013). A field that has been described as 'dusty' and far from being at the forefront of technological development is the museum field (Skot-Hansen, 2008). However, the need for digital innovation within this field has been widely agreed upon by researchers since the emergence of Web 2.0 (Bakhshi & Throsby, 2012; Lyck, 2010; Skot-Hansen, 2008; Vicente, Camarero, & Garrido, 2012). This term was coined by O'Reilly in 2004 (cited in Lyck, 2010) and reflects the two-way communication that has become the reality of the Internet with social media. These new communication technologies have brought along unique opportunities to reach a broader audience, which has added a new dimension to the communication of cultural heritage, which was traditionally associated with 'monologue' communication of physical museum objects (Lyck, 2010). A prevalent activity in this regard has been the digitization of museum collections, which has allowed greater access to cultural information for a broader audience (Bakhshi & Throsby, 2012; Bertacchini & Morando, 2013).

Technology does, however, advance quickly and Web 2.0 is being replaced by Web 3.0, which implies the Web being turned into a massive database, and with the proliferation of new technologies such as sensors and machine learning, this brings along a new level of automation in data collection, transmission and analysis, which creates breeding ground for the phenomenon of Big Data (Gobble, 2013). While researchers have discussed museums in the light of the social dimension of Web 2.0, literature on the use of Big Data in the museum field is still limited.

Nuccio and Bertacchini (2016) state that *"prediction and arts intrinsically belong to opposite epistemologies"* (p. 18). This is evident in literature on the cultural creative industries (CCIs) with for instance Caves (2000) outlining the *art for art's sake* property, which implies greater concern for the creative output than for the financial income it can generate. In light of this, one could question the need for museums to be able to predict and hence adapt to the era of Big Data. However, in light of another property presented by Caves (2000) - the *nobody knows* property - Big Data could also be understood as an opportunity for the CCIs as it might enable them to predict the otherwise largely unknown and volatile market demands. In line with the latter, an additional two reasons could be set forth to support that the innovative potential underlying Big Data does seem important for the museum field to explore. First of all, it is crucial for the museums to meet the lifestyles of the younger generations that are born into a digital world, which will increasingly reflect in their demands to the museums (Lyck, 2010). Second of all, we see how contemporary art and culture is

increasingly making use of digital technologies in the production of aesthetic reflections, which will also bring a new dimension to museum objects (Bakhshi & Throsby, 2012; Lyck, 2010).

In this thesis, we will investigate the concept of data-driven value in relation to the public museum field in Denmark. The Danish museum field is interesting to address in the light of Big Data as a means to innovate as Denmark is largely seen as a secondary destination for tourists (Skot-Hansen, 2008). Museums can be seen as 'knots' in a network of sights that need to attract tourists (Kirshenblatt-Gimblett, 1998), and in this regard, Skot-Hansen (2008) argues that Denmark is in lack of innovative power in order to improve attractions. Here, she states that a great potential lies with the museums. Even though we have seen an increased focus on digital initiatives among the Danish museums during past years, they are far from being at the forefront in this regard compared to international standards. (Skot-Hansen, 2008)

We will focus our attention on the public museums in Denmark, i.e. state-owned and state-subsidized museums. These are deeply rooted in a cultural-political context through which they are entitled to help secure the cultural heritage of Denmark through five tasks outlined in the Danish Museum Act - these include *collection, registration, preservation, research,* and *dissemination* (Agency for Culture ans Palaces, 2017b). The public dimension is particularly interesting in regards to Big Data, as the tension between fulfilling state requirements on the one hand and acting as an independent organization on the other hand is likely to present an interesting point of discussion on the museums' ability to innovate. Public museums are by some, due to legal and administrative restriction, assumed to have less incentive to innovate as opposed to private museums. Others believe that these restrictions can spur innovative efforts (Vicente et al., 2012).

Big Data is about prediction and is thus quantitative in its nature. However, the phenomenon brings along qualitative change as it permeates into still more aspects of businesses, societies and our individual lives (Mayer-Schönberger & Cukier, 2013). Hence, Big Data is not merely a phenomenon on its own - it is at all levels an interaction with our surroundings. Consequently, in order to assess Big Data as a raw material in the Danish museum field, it is necessary to understand the field, its characteristics and complexities. Before specifying our problem formulation, we will therefore provide a brief description of the public museum field in Denmark, which has undergone notable change during the past two decades. To do so, we will draw on insight from Danish as well as international conditions.

1.2 A Changing Museum Field

During past decades, museums worldwide have undergone substantial change due to a number of factors that have given rise to a reassessment of the role of museums. Since the 70's, we have seen an increase in the number of museums in Western societies as well as an increase in the number and variety of leisure activities, which has intensified the competitive landscape in which museums operate (Burton & Scott, 2003). Increased competition for a limited marked has pushed the museums to become more marked oriented, which comes to expression with greater focus on visitor needs (Vicente et al., 2012), branding activities, global partnerships and the like (Skot-Hansen, 2008). Moreover, decrease in public funding to museums is a reality in many countries, which leaves an even greater pressure on museums to operate more as businesses and improve their own revenue (Vicente et al., 2012). This move towards market logics leads to an *enterprising culture* in the museum field, attaching great importance to commercial activities (Skot-Hansen, 2008)

Also the Danish museum field has been subject to these changes with the public museums being of particular interest. In Denmark, around 100 museums covering the areas of cultural, art, and natural history, receive state subsidies (Agency for Culture ans Palaces, 2017a). They are subject to the Danish Museum Act and are divided into state-owned and state-subsidized museums, with the former being under tighter regulations than the latter (Lyck, 2010). These museums face mounting pressure from a variety of factors which jeopardizes their traditional role of simply acquiring and preserving objects for the purpose of making cultural heritage available to the public (Burton & Scott, 2003; Lyck, 2010). This has led researchers to shed light on and debate the role of museums in today's society. Here, Lyck (2010) draws attention to the experience economy in Denmark and how a wide-spread focus on experiences affects the informative and educational role that the public museums are expected to uphold according to the Danish Museum Act. Kirshenblatt-Gimblett (as cited in Skot-Hansen, 2008) talks about a museological paradigm shift. With reference to theatres, she explains how museology moves from being informative to performative, with storytelling and emotional engagement creating experiences that increasingly replace information as being the primary purpose of museums.

With society being on the lookout for engaging experiences, public museums in Denmark are increasingly competing with more commercial attractions, which increases the level of rivalry (Skot-Hansen, 2008). Lyck (2010) argues that the museum field is different from a "normal" industry, as museums will generally benefit more from collaborating than perceiving each other as competitors. However, it is crucial for the public museums to recognize the threat of substitutes as a result of the growing experience economy in Denmark. With great interest for attractions revolving around

experiences such as amusement parks, theatres, etc., the fight for the audience has intensified, and the public museums need to enter the competition. This is particularly a matter of upholding legitimacy (Skot-Hansen, 2008). Museums have long been able to rely on a product-driven ethos enabling them to decide for themselves what to show their visitors. However, this privilege seems to belong to the past (Kirshenblatt-Gimblett, 1998). It is no longer sufficient for museums to rely solely on the intrinsic value that museum artifacts hold. In light of the changing market conditions combined with the constant emergence of new technologies, museums face the need to rethink their role and activities in order to stay relevant (Bakhshi & Throsby, 2012; Vicente et al., 2012). Focus on improving the museum experience is crucial as it will be difficult for politicians to justify public spending on museums if these do not receive support from the audience (Skot-Hansen, 2008). In this regard, the technological development appears to be a game changer, posing both opportunities and challenges on the public museums.

In line with the technological development, digitization of the cultural heritage has been on the political agenda in Denmark since 2006, with a focus on digitizing museum collections for the sake of preservation, protection, and greater access to cultural information (Kulturministeriet, 2009). This can be seen as a first step in using the tools of the digital culture to meet the change in habits that this culture brings along. Hence, the technological development appears to present great opportunities for the public museums in order to meet the changing demands that follow from the experience economy. On the other hand, it can also bring along a major challenge as it requires serious prioritization and new professional competencies that are seldom found within these organizations (Kulturministeriet, 2010).

It is evident that the public museums have been challenged on their role since 2007 with the political focus on culture in the Danish experience economy. It is not only a matter of adapting to changing visitor needs and new technologies - it is how the organization as a whole operates. The public museums have been largely encouraged to enter into new collaborations. With greater interaction between culture and the Danish business society, the political aim in this regard has been to explore culture's commercial potential and strengthen the conditions for growth in the rather immature CCIs (Deloitte, 2012; Lyck, 2010). Not only have local collaborations been on the agenda for the museums. The Ministry of Culture's Internationalization Strategy from 2010 points to increased professionalization through international orientation and collaborations. This entails, among other things, that the public museums need to exploit the funding potentials that lie with EU, and engage in collaborations across sectors, industries and borders (Kulturministeriet, 2010). In

general, the quality criteria for state recognition increases in line with still more expectations for the museums to reach further and broaden the scope of their operations (Lyck, 2010).

The public museums in Denmark seem to be facing a wide range of stakeholders and a pressing need to innovate their activities and operate still more as businesses in light of political and societal changes. This need becomes even more evident when taking the financial situation into account. The public museums in Denmark are under financial pressure which seems to push them even further towards market logics. In 2015, it was set forth that the Danish Ministry of Culture was obliged to ensure budget savings of 600 million DKK over a four-year period. This means that a variety of public institutions, including the museums, are subject to an annual two percent decrease in public funding, which leaves the museums with a need to focus on their own sources of revenue (Schmidt, Andersen, & Thobo-Carlsen, 2015).

In light of the above, it is evident that the Danish museums are subject to great change and consequently challenged in regards to organizational practices. On the one hand, they are cultural institutions with responsibilities rooted in five areas outlines in the Danish Museum Act. On the other hand, they need to be attractions in an era of experience economy and rapid technological change (Skot-Hansen, 2008). This poses challenges on the museums in form of opposing imperatives, or *balancing acts,* that can facilitate ambiguity, which can prevent managers from making well-informed decisions (Lampel, Lant, & Shamsie, 2000).

1.3 Problem Formulation

From the above, it becomes apparent that the public museum field in Denmark is confronted with balancing different, and seemingly conflicting, properties in the act of coping with the changing environment. Current conditions like the growing experience economy and technological development brings along a pressing need for the museums to innovate. Today, Big Data seems to be an often presented solution to address a need for innovation. However, the public museums are of a very unique nature, which leads us to raise questions in relation to the potential and applicability of Big Data within these organizations. "*Prediction and arts intrinsically belong to opposite epistemologies"* (Nuccio & Bertacchini, 2016, p. 18) and this naturally leads to question the capabilities of public museums to work successfully with Big Data and understand data as an organizational raw material. Moreover, the public museums operate in a complex field surrounded by a variety of stakeholders with different expectations, and one can question whether such expectations and the critique connected to Big Data will jeopardize the legitimacy of the museums.

Even though researchers during the past two decades have drawn attention to the 'digital museum' (Lyck, 2010; Bakhshi & Throsby, 2012)(Bakhshi & Throsby, 2012; Lyck, 2010), very little is known about what we understand to be the next step in terms of technological developments - the use of Big Data in the museum field. Moreover, despite massive literature on the phenomenon of Big Data, there is a lack of understanding on how organizations can translate this phenomenon into actual value (Günther et al., 2017). The purpose of this thesis is therefore to investigate and hence contribute to the understanding of how Big Data, from an organizational perspective, can be understood in the context of public museums in Denmark. Overall, we will present an organizational model that seeks to translate and adjust data-driven value as a technological phenomenon to a public museum context. This entails consideration for the kind of value that such museums are expected to create as cultural institutions, and the organizational changes and implications data as a raw material might bring along. The research question guiding this thesis is hence:

> ***How can a data-driven approach to value creation be understood in the context of the public museum field and what organizational implications can such an approach bring along?***

This research question includes three main concepts that will guide our thesis. The first concept is the *data-driven approach*, i.e. that an organization understands data as a valuable resource and new raw material. By implementing a data-driven approach, an organization acknowledges the relevance of the Big Data phenomenon. The second concept is that of *value* and the third is *organizational implications*. These will be explained and discussed throughout the thesis.

1.4 Philosophy of Science

Our thesis revolves around Big Data as a technological phenomenon and how it supports value-creation in the public museum field. However, as we refrain from diving into the detailed technical aspects of the phenomenon, we are interested in understanding how the phenomenon translates to the museum context and how it forms and takes form in the organizational setting. Here, we understand Big Data in line with the *socio-technological* perspective which entails that technology is not seen as separated from but instead highly interacting with society. This perspective provides a compromise between technological and social determinism. *Technological determinism* describes technology as the driving force behind social change - hence, it ignores any social context to have an influence on the technology. *Social determinism*, on the other hand, perceives technology as a pure

social construct. (Scholz, 2017) With a socio-technological perspective, we acknowledge that the phenomenon of Big Data affects the museum organization while the organization at the same time assign meaning to the use of a data-driven approach to value creation. To uncover such meaning, we find our scientific set of beliefs in the social constructivist paradigm. However, it is important to clarify that we do not take a radical stance to the meaning of 'construction'.

Social constructivism has been explained by many, leaving several explanations of the paradigm to exist. On an overall level, consensus occurs around the belief that reality is socially constructed. However, ambiguity exists in how radical this social construction is to be understood (Wenneberg, 2000). Collin (2003) draws a distinction between ontological and epistemological constructivism. *Ontological constructivism* assumes that reality itself is a construction, meaning that no reality exists without our acknowledgement of it. In contrast to this, and less radical, is the *epistemological constructivism*, which simply assumes that *knowledge* about reality is a construction. As we believe that a reality exists independent of our acknowledgement of it, we devote ourselves to the latter. While social constructivism in its radical form would lead to a relativistic ontology (Nygaard, 2012), we argue that with our stance, it is better categorized as a *limited realistic* ontology. Hence, our entry to reality is neither a direct access nor a pure social construct, but must be understood in the light of our understanding of it. The epistemological consequence of this is that the knowledge we can derive from our study is subjectively founded.

1.5 Overview of Chapters

In order to answer our problem statement, we will structure our thesis as follows.

Chapter 2 revolves around the concept of value creation. First, we uncover what kind of value Big Data is expected to provide. In continuation of this, we translate it to the context of the public museum field and conclude the chapter with a definition for how a data-driven approach to value creation can be understood in this context.

Chapter 3 revolves around the organizational aspects of realizing data-driven value as outlined in chapter 2. Through a theoretical discussion of organizational change and implications related to technology and Big Data, we propose a model for data-driven value realization in the public museum field. This model will be used to analyze the case of the National Museum of Denmark in chapter 5.

Chapter 4 sets forth our methodological considerations. First, we account for the search strategy that underlines our literature review (chapter 2 and 3). In continuation of this, we argue for our choice of applying a single-case study in form of the National Museum of Denmark and our choices

for applying the qualitative methods of semi-structured interviews and documentary method. Lastly, we conclude the chapter with an assessment of our research quality.

Chapter 5 presents our analysis of the National Museum and thus is an exemplification of how the proposed model (chapter 3) can be applied. Here, the aim is to add to the theoretical reflections that informed the creation of the model by providing nuanced empirical insights.

Chapter 6 forms our discussion. Here, we critically reflect on our proposed model and analysis. Consequently, we put our theoretical and empirical findings into perspective in order to answer our research question.

Chapter 7 concludes our findings and presents considerations for limitations and further research.

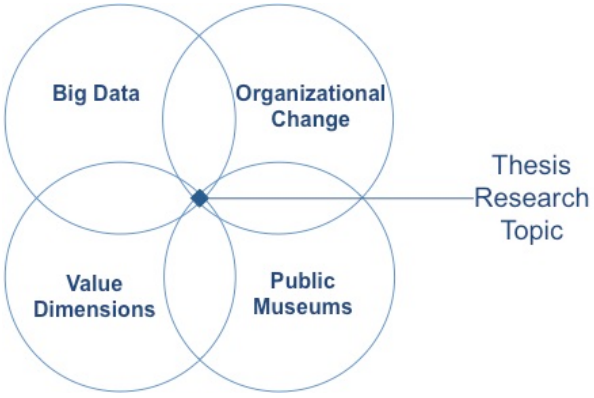
In light of the above, this thesis contains two main contributions; first of all a *theoretical* contribution where data-driven value is conceptualized, related to the public museum field, and formed into a model that illustrates organizational change connected to the use of Big Data. This forms the main contribution of our thesis. The secondary contribution is an exemplification of how the proposed model can be applied. This is done through our *empirical* analysis the National Museum of Denmark.

1.6 Delimitation

The scope of our research is defined through a number of delimitations. Regarding the focus of the thesis, we chose to apply an organizational perspective in our assessment of the phenomenon of data-driven value in the museum context. Big Data is very technical in nature. However, we will address the phenomenon on a conceptual level and hence refrain ourselves from considering technical aspects. Moreover, we delimit ourselves in terms of the scope of the applied case study. Even though the National Museum has several locations in Denmark, we limit our scope to the National Museum in Copenhagen (Prinsens Palæ). In addition to this, we limit the scope in terms of time. It is important to emphasize that our study illustrates a 'snapshot' of the National Museum rather than an over-time process. Further delimitations and following consequences will be explained throughout the thesis.

2 Theory – Value

As indicated in the introduction chapter, the novelty of our topic requires a review and subsequent combination of literature from diverse theoretical areas. In absence of an existing study or theoretical concept that can provide guidance in answering the research question, we identify four general topics that are each central in order to address the topic of data-driven value creation in the public museum field. These are: *Big Data*, *organizational change*, *value dimensions* and *public museums* (Fig. 1). For each of these broader theoretical fields, we identify more specific core concepts or literature. In the following, we will present, review and combine these central theories in order to create the theoretical foundation for and contribution to the topic at hand - data-driven value creation in the public museum field. We will start by discussing the different meanings of value - first in the context of Big Data and second in the context of the museum field. This will lead us to conclude that working with Big Data in the public museums can derive value in two prominent formats; *public* and *economic* value.



Figur 1: Overview of relevant areas of literature

2.1 Big Data and Value

2.1.1 Definition of Big Data

Many attempts have been made to define the phenomenon of Big Data. Among these, one appears to be broadly acknowledged as it is often cited and updated – the one of *the three Vs* (Erevelles, Fukawa, & Swayne, 2016; Flyverbom & Madsen, 2015; Günther et al., 2017; Laney, 2001; Lycett, 2013). This definition emphasizes the key elements of the phenomenon which are *volume*, *variety*

and *velocity*. These elements describe how an increasing amount of data is generated and collected (*volume*), in an increasing pace, often even in real-time (*velocity*), and from different sources as well as in diverse formats (*variety*). By developing the means to collect, process and analyze this data, an organization is able to derive insights that facilitate innovation or inform decision-making (Günther et al., 2017; Mayer-Schönberger & Cukier, 2013; McAfee & Brynjolfsson, 2012). Thus, even though Big Data is quantitative in its nature, it often causes qualitative change (Mayer-Schönberger & Cukier, 2013). Seemingly, the three Vs do not sufficiently reflect the broad effects of the phenomenon, which has led various scholars to add more dimensions to this basic definition. Flyverbom and Madsen (2015) for example include algorithms as the technical component that enables the analysis of large data sets. They further include the main reasons to conduct Big Data analyses, namely to predict, to measure and to govern (Flyverbom & Madsen, 2015). Ebner, Bühnen and Urbach (2014) as well as Erevelles et al. (2016) add *veracity*, i.e. the quality of the data, to the traditional definition of the three Vs. Moreover, Erevelles et al. (2016) extent the definition even further by adding a fourth V – that of *value*. To include value as a dimension of Big Data was also proposed by Lycett (2013). However, value is an ambiguous term and the discussion on how value can be understood in this context is still unfolding. Therefore, we will in the following introduce and discuss different perspectives on value in regards to Big Data. The aim is to provide an understanding of how a data-driven approach can help create value.

2.1.2 Value in a Big Data context

To include *value* in the definition of Big Data as proposed by some researchers (Erevelles et al., 2016; Lycett, 2013) requires, first of all, a more nuanced understanding of how this phenomenon adds value (Flyverbom & Madsen, 2015). As stated earlier, a lot of attention has been drawn to the opportunities Big Data offers to organizations. However, Günther et al. (2017) point out that little is known about how these potentials are translates into actual value by an organization. Furthermore, they argue that these discussions are driven by an optimistic view of the phenomenon and neglect reflections on organizations that have attempted and failed to benefit from Big Data (Günther et al., 2017). Flyverbom and Madsen (2015) share this evaluation by stating that the discussion around Big Data and the value it delivers has been one-sided. Based hereon, they identify a "*need to turn to the social, organizational and political construction and production of data as valuable objects*" (Flyverbom & Madsen, 2015, p. 141). In contribution to this, Lycett (2013)argues that such research should also consider the challenges and opportunities that are involved in mining value form Big Data.

According to Mayer-Schönberger and Cukier (2013), the value of data has changed with the era of Big Data. First of all, a Big Data perspective allows to uncover the *hidden value* of data, which refers to the fact that data is a non-rivalrous good that can be used more than once and for multiple purposes. Usually, data are collected for a specific purpose and are primarily valuable to the individual or organization that collects them because it helps them achieve this purpose. In a Big Data context, however, people become increasingly aware that the same data can be used for multitude purposes, of which some might not have been considered before. Mayer-Schönberger and Cukier (2013) illustrate this by using the iceberg metaphor; only a small part of data's true value is visible, while a much larger potential is hidden underneath the surface. Therefore, in a Big Data context, being data-driven refers to the ability to uncover and make use of this hidden value. When organizations regard data not just in terms of its current face value but uncover novel ways to make use of this data in the future, this can facilitate innovation. (Mayer-Schönberger & Cukier, 2013) The concept of the hidden value of Big Data also seems to be relevant for museums, which have a long tradition of collecting data on objects and artifacts for primarily archival purposes as well as the aim of knowledge creation (Lyck, 2010). Big Data might enable these institutions to uncover a hidden value in using their data sets in new ways.

The potential uses of data seem to be endless, which makes it even harder to assign a certain value to data. Mayer-Schönberger and Cukier (2013) term the endless number of choices of how to employ data value options. The sum of all these options is the *option value*, which describes the worth of data. Furthermore, Mayer-Schönberger and Cukier (2013) identify three ways to uncover the option value of data; reusing the data for new purposes, recombining datasets, and making datasets more suitable for being used for different purposes. This theoretical concept implies that institutions like museums have to consider some prerequisites, such as the compatibility of data sets, when they aim to explore different and new options to generate value from their data.

The option value and hidden value, however, cannot be translated into financial terms or estimates. The intangible and non-rivalrous nature of data makes it hard to financially value it. Companies such as Google, Amazon and Facebook are often used as examples of innovative Big Data firms and are amongst the companies with the highest global market values, even though they cannot fully account for the value of data in their books and balance sheets. (Mayer-Schönberger & Cukier, 2013) Thus, the value of data is hard to describe as it often cannot be expressed in monetary terms and is also not bound to just one initial purpose. Even though it appears difficult to translate the value of data into financial terms, some authors still argue that a qualitative valuation of data occurs, as it becomes an increasingly important resource (Flyverbom & Madsen, 2015; Günther et al.,

2017). Flyverbom and Madsen (2015) focus on the process of how data is turned into knowledge that can be used to inform decisions and to be acted upon, i.e. a valuable resource. They argue that these valuation processes happen in active organizational practices and in different socio-technical contexts. Thus realizing value from Big Data is case specific and can vary from project to project. (Flyverbom & Madsen, 2015)

Not just Flyverbom and Madsen (2015) understand Big Data value creation as something that is specific to an organization or a project. Günther et al. (2017) point out that how Big Data is used and how the value of data is perceived depends on an organization's strategic objectives as well. Even though Big Data value creation seems to be specific to organizational contexts, little is known about how organizations translate the potential values (hidden value and option value) into actual value for the organization. In most literature on Big Data value creation, the authors seem to implicitly take an organizational perspective. In contrast to this, Günther et al. (2017) explicitly focus on the organizational perspective and by doing so, they uncover how little is known about actual value creation in an organization through the use of Big Data. With our focus on museum organizations, Günther et al. (2017) become a valuable source for our purpose.

Günther et al. (2017) identify two categories of value that can be generated in an organization through the use of Big Data – *social value* and *economic value*. Firstly, by adopting a data-driven approach, organizations can create value for individuals and also larger society. For example, Big Data analytics can help companies improve their product or services, which ultimately can lead to a consumer surplus, i.e. consumers receiving more value for the same or even less amount of money (Brynjolfsson, Hu, & Smith, 2003; Günther et al., 2017; Loebbecke & Picot, 2015). Other examples of *social values* that benefit society in general are an increase in productivity and the growth of employment (Günther et al., 2017; Loebbecke & Picot, 2015). In addition to that, public institution can create social value through Big Data by improving their services to society. Fields that have been studied in this context are, for example, public safety and healthcare (Günther et al., 2017). However, applying Big Data analytics to these areas is also associated with some risks, such as increasing surveillance, the exposure of private and sensitive information and limiting effects on personal freedom and autonomy (Boyd & Crawford, 2012; Günther et al., 2017; Lyon, 2014). Secondly, organizations can benefit by using Big Data to create *economic value*. Günther et al. (2017) summarize the potential monetary benefits that are discussed in literature by stating that this economic value takes the form of an increase in profit, the growth of a business or a competitive advantage. Organizations that generate such value through the use of Big Data generally implement a data-driven approach to guide their decision-making on a strategic and operational level (Günther

et al., 2017; LaValle, Lesser, Shockley, Hopkins, & Kruschwitz, 2010; McAfee & Brynjolfsson, 2012). Using Big Data is expected to increase the performance of an organization by enabling the organization to operate more efficiently and effectively (Günther et al., 2017).

2.1.3 What does this mean for museums?

Organizations that are presented as the 'Big Data pioneers' due to their successful realization of data-driven value are usually large digital corporations such as Google or Amazon. However, Mayer-Schönberger and Cukier (2013) point out that public institutions and especially governments have a much longer tradition of gathering massive amounts of data. Until today, the amount of data that governments hold surpasses the volume of data held by most private organizations. Beer (2016) claims that the history of Big Data already started before the aforementioned companies even existed, as governments have collected statistical data, especially on people, long before that. Even though governments are in the possession of large amounts of data, Mayer-Schönberger and Cukier (2013) argue that they are ineffective in using it. They state that "*the lessons of big data apply as much to the public sector as to commercial entities: government data's value is latent and requires innovative analysis to unleash*" (Mayer-Schönberger & Cukier, 2013, p. 116). As a public institution one could argue that the same applies to the public museums. They, as well, have a long tradition of collecting data and generating knowledge (Lyck, 2010), and using this data effectively in today's Big Data world requires innovation as well as an understanding of how to uncover and extract value. One approach to find novel ways to generate value from data is to provide private citizens and businesses access to non-sensitive data, and thus enabling them to find new and potentially valuable ways of using this data. Such an approach appears to be increasingly applied among governmental institutions (Mayer-Schönberger & Cukier, 2013). A rationale that supports this approach lies in the fact that governmental institutions collect data on behalf of the society they serve and consequently should also provide public access to this data (Mayer-Schönberger & Cukier, 2013). However, the mere collection or accessibility of data usually does not create value, as the true value of data *"lies in its use"* (Mayer-Schönberger & Cukier, 2013, p. 122)**.**

All this indicates that in today's Big Data world, data can be an even more valuable resource for museums. However, unleashing the full value of data requires the museums to uncover new, hidden ways of using data. Working effectively with Big Data also means working strategically with it. Thus, museums need to consider in which ways they can generate social and economic value with a data-driven approach. However, working with Big Data also entails some risks. Thus, museums need to consider to what extent a data-driven approach can help them operate more efficiently,

innovatively and successfully as well as how it might impair the value that they aim to provide for society. To inform these considerations, we will in the following focus on the different values that museums are providing.

2.2 Museums and Value

Value takes a central role in the discussions of museums' purpose and their role in society (Hume, 2015; Scott, 2008), and there have been several attempts to specify and define the kind of value museums create (Bakhshi & Throsby, 2012; Bryan, Munday, & Bevins, 2012; Kotler, Kotler, & Kotler, 2008; Scott, 2008). In general, value is understood as a construct that is specific to a certain context and perceived uniquely by the different beneficiaries (Grönroos, 2011; Hume, 2015). Therefore, addressing the concept of value specifically for a museum context and addressing the involvement of several beneficiaries seem relevant for our purpose. However, the definition of value in a museum context is still quite ambiguous. To illustrate this ambiguity, several perspectives are put forward and discussed in the following.

2.2.1 Paradigm Shift

The value produced by museums and other cultural institutions differs in one central aspect from most industries outside the CCIs – its non-utilitarian nature (Lampel et al., 2000; Scott, 2008). For most cultural industries, it holds true that the value of services is not defined by functionality in contrast to for example consumer goods. However, Scott (2008) points out that cultural institutions, such as museums, are often measured based on a utilitarian logic and that a shift towards a more holistic and nuanced assessment of culture in Western societies only began recently. This change in perspective towards a value based view instead of an instrumental view is understood as a paradigm shift that makes the understanding of value in a museum context a significant and central issue (Bryan et al., 2012; Scott, 2008). Even though several scholars acknowledge this paradigm shift towards a more comprehensive understanding of culture and the value museums are providing (Bakhshi & Throsby, 2012; Bryan et al., 2012; Scott, 2008), no consensus seems to be found in terms of a single concept assessing this value.

Scott (2008) identifies two main drivers causing this paradigm shift. One explanation is an increasing global interest in measuring the wealth and health of countries and their societies in a more nuanced way and not solely based on economic factors. In addition to this, especially the governments in Western societies seem to increasingly acknowledge the impact of arts and culture on greater societal realms such as social cohesion and community health (Scott, 2008). Even though,

according to Scott (2008), there seems to be an increasing understanding that the worthiness of museums goes beyond an economic and instrumental contribution to society, museums still bare the responsibility to demonstrate their value in order to argue that public funds are used efficiently.

Nowadays, the value museums provide to societies often goes beyond the traditional and well-established role of museums as institutions of culture and education (Bryan et al., 2012; Scott, 2008). Generally, museums are understood to be responsible for the preservation and interpretation of a nation's history and cultural heritage as well as for making it accessible to the wider public. However, these traditional mandates of museums are extended more and more, and a broader understanding of museums' role and value in society is developing. These new perspectives include reflections on the public value of museums, the experience they provide, the contribution of museums to the tourism sector and other aspects. (Bryan et al., 2012; Scott, 2008) These diverse obligations have a social and cultural dimension and they also include an economic perspective. Even though the understanding of museums seems to be shifting to a more value based and less instrumental and utilitarian view, it does not mean that museums are not held accountable for the allocation of public funds and their economical performance. In fact, Bakhshi and Throsby (2012) argue that cultural institutions *"face greater accountability for government funding"* (p. 206). The responsible and efficient allocation of public funds is also a dimension of public value. This example illustrates the duality of the museums' value and impact on society. Bryan et al. (2012), therefore, define the impact of museums as being socioeconomic. This dichotomy is addressed differently in literature. Bakhshi and Throsby, 2012, for example, use three general terms - *public*, *cultural* and *economic* value - to illustrate the concept of value in a museum context. Other authors, such as Bryan et al. (2012), Scott (2008) and Voss, Cable and Voss (2000) find other value dimensions or establish another terminology that they implement into their more detailed frameworks.

2.2.2 Bakhshi and Throsby's Value Dimensions

Cultural Value

Bakhshi and Throsby (2012) argue that creating *cultural value* is the fundamental purpose of cultural institutions. Therefore, a broad definition of cultural value could include the economic value generated through cultural activities as done by Hewison (2006) and Holden (2004). Bakhshi and Throsby (2012), however, use their definition of cultural value to differentiate it from economic value, by stating that cultural value *"refers to those aspects of cultural life and experience that are important to people, but whose value to them cannot be expressed in monetary terms"* (Bakhshi & Throsby, 2012, p. 211). They acknowledge that it is possible to find more detailed definitions, for

example, by addressing the question whether value is provided to individuals or society as a whole, and by defining different elements of cultural value.

Economic Value

The corresponding value dimension to cultural value is *economic value*. Bakhshi and Throsby (2012) define it as the value created by cultural institutions that can be expressed, measured and analyzed in financial terms. One simple example is the purchase of an entry ticket to a cultural institution by a customer, as this person is willing to pay for this ticket as an exchange for an expected private benefit. Museums can also generate economic value for the larger society, e.g. by contributing to making an area or city more attractive as a touristic destination (Bakhshi & Throsby, 2012; Bryan et al., 2012). However, Bryan et al. (2012) point out that measuring and attributing the financial value of museums to the community is difficult. One example to illustrate this challenge is put forward by Scott (2008). She points out that museums can have an indirect impact on the growth of the creative sector and economy in a region by constituting an 'ideas archive' that facilitates creativity and innovation. (Scott, 2008)

Public Value

Even though the definition of cultural and economic value already presented some challenges, *public value* seems to be the most ambiguous value dimension. Bakhshi and Throsby (2012) argue that the value created by publicly funded institutions, which thus are publicly accountable organizations, can be understood as public value. However, Bakhshi and Throsby (2012) do not define the scope of public value to a precise extent, and it becomes difficult to distinguish public value from cultural or economic value. They argue that cultural value is in part also public value, because the sum of the *"individual cultural experiences"* of the consumers could also be understood as public value to the community generated by the institution (Bakhshi & Throsby, 2012, p. 210). Hence, Bakhshi and Throsby (2012) acknowledge that there are different beneficiaries of the value generated by public cultural institutions, and that there might be differences related to how these beneficiaries experience value. Scott (2008) further elaborates on the concept of public value by supporting the argument that the public is the co-producer of such value. One of Scott's (2008) arguments on the reasons for a paradigm shift in the museum sector towards a more value based assessment, presented earlier, was that governments in Western societies are increasingly interested in the impact and benefits arts and cultural institutions present to social dimensions, such as social health. Bakhshi and Throsby (2012) understand this as a dimension of public value as well. They argue that

public value also includes the impact that cultural institutions have on social indicators, such as social health or inclusion, that are used to assess a society.

2.2.3 Scott's Value Dimensions

Scott's (2008) approach to define the concept of value in a museum context is to assess what kind of value museums offer to different stakeholders. As mentioned before, the three value categories - cultural, economic and public value - also address different stakeholders and might represent different benefits to an individual consumer than to the entire society (Bakhshi & Throsby, 2012; Bryan et al., 2012; Scott, 2008). In her value typology for the museum sector, Scott (2008) assumes the perspective of communities to define three different types of value generated by museums – *use*, *institutional* and *instrumental value*. Taking this perspective is also in line with Bryan et al.'s (2012) argument that cultural institutions are embedded in a local economy and are expected to offer diverse contributions to this economy and society. In fact, Bryan et al. (2012)directly refer to Scott's arguments and support the notion that various stakeholders are involved in the 'valuation' of museums. Therefore, we will introduce the three value dimensions used in Scott's typology (2008).

Use Value

Use value mostly refers to quantifiable, utilitarian aspects of value created by museums. Direct consumption is the main form of use value (Scott, 2008). However, there are also indirect use values, or *non-use values*. Based on different literature, Scott (2008) defines these as *existence*, *option* and *bequest value*. When referring to these non-use values, Scott (2008) points out that the presence of museums in society and their execution of their main role as educators and preservers of cultural heritage can also be valued by individuals who are not directly making use of these functions. This could include people who did not yet visit a museum but still understand it to be a valuable institution, and might consider visiting the museum in the future. In alignment with this, Scott (2008, p. 33) argues that value can be attributed to museums *"irrespective of direct consumption"* (p. 33).

Institutional Value

Scott's (2008) second dimension is institutional value which is similar to what other authors refer to as public value (Bakhshi & Throsby, 2012; Holden, 2004, 2006). Scott (2008) and Holden (2006), however, add a dimension to public value that was not introduced before. They state that museums serve as agents of the public and the government they are funded by. As such, museums also play a role in the creation of trust in governments and their agencies (Holden, 2006; Scott, 2008). They

make a contribution to the meaning and understanding of citizenship and can, for example, support notions like equality by making the collections available to everyone on equal terms (Scott, 2008).

Instrumental Value

With instrumental value, Scott (2008) refers to the expected socioeconomic returns of governments' public investments in museums. The term 'instrumental' might be slightly misleading in this context, because it does not necessarily refer to measurable, utilitarian values. Moreover, this value dimension also presents an intersection with Bakhshi and Throsby's (2012) explanations of public value. However, Scott (2008) distinctively identifies three categories of beneficiaries of the 'instrumental' or public value – the *economy, communities* and *individuals*. As mentioned before, museums make a contribution to the economy by, for example, supporting tourism, city branding and even enabling other industries, such as the CCIs, to thrive (Bryan et al., 2012; Scott, 2008). This was defined by Bakhshi & Throsby (2010) as economic value. However, Scott's (2008) concept of instrumental value goes beyond economic value and also includes non-monetary value such as social capital. Scott (2008) argues that the instrumental value of museums to communities is, for example, an increase in social capital and cohesion as well as cultural diversity. In this context, Scott (2008), defines social capital as *"the ability of museums to facilitate social connections and networks through meaningful participation in public programs, commemorative events, volunteer activity and special interest groups."* (p.36). The third group of beneficiaries of instrumental value are individuals who are able to learn or increase personal well-being by visiting or engaging with the museums' and their offers (Scott, 2008).

2.2.4 External vs. Organizational Perspectives on Value

Overall, by assuming a more community-focused perspective, Scott (2008) was able to detect also more indirect value produced by museums. The arguments presented for the three value dimensions show that museums create value not just for active visitors or in form of financially measurable indicators, they also create ethical, educational or democratic impact in the greater social realm (Scott, 2008). Furthermore, by taking this position, Scott (2008) investigates the value dimensions from an external perspective. She assesses the value created by museums from the standpoint of external subjects such as the larger economy, the public and other social spheres as well as individuals. Even though Bakhshi and Throsby (2012) used different value dimensions (economic, culture and public value) they also choose to adopt the external perspective. However, organizations usually also hold internal values. Voss et al. (2000) approach the topic of value creation in non-profit

cultural organizations from the opposite direction by linking an institution's *organizational values* to their relationships with external stakeholders. They point out that organizational values are an important influence on the management of cultural institutions and therefore identify five organizational value dimensions or measures (Voss et al., 2000). These are the *pro-social*, *artistic*, *financial*, *market* and *achievement dimensions*. The underlying aims for these value dimensions are often similar to the ones discussed by Bakhshi and Throsby (2012) and Scott (2008). However, by taking on an organizational perspective, Voss et al. (2000) illustrate that these values are not dictated for cultural organizations by external forces such as the government that funds the institution. They are rather internalized by the organization itself. For example, Voss et al. (2000) identify the value to enable and broaden the access to art as an internal organizational value, as well as the aim to achieve financial stability and being publicly recognized to be a substantial contributor to culture. Even though Voss et al. (2000) exemplify the organizational value dimensions by analyzing the public theatre sector, their work shows that the analysis of value creation of cultural organizations does not have to be exclusively addressed from an external perspective.

Another way to address value creation from an organizational perspective is by analyzing an organization's business model. Even though public cultural institutions like museums might not be understood as traditional businesses, the concept of a business model still applies to them as it is defined as *"representations of how organizations create and appropriate value"* (Günther et al., 2017, p. 197). Bakhshi and Throsby, (2012) argue that especially in a changing environment, cultural institutions have to understand how and for whom they generate value. Furthermore, they argue that having a clearly defined business model helps organizations shift towards a more consumer focused orientation, which many cultural organizations appear to aim for in today's increasingly competitive environment (Bakhshi & Throsby, 2012).

2.3 Sub-conclusion: Understanding Data-driven Value Creation in Public Museums

From the above, it becomes apparent that value can have very diverse meanings in different contexts. By assessing value first in a Big Data context and second in a museum context, one difference becomes prominent. Value in a Big Data context revolves much around the organizational perspective and is hence largely understood as something that is generated within the organization with the aim to generate internal benefits. In contrast to this, value in a museum context takes on an external perspective as it is mostly understood as something that is generated for external spheres such as society, the economy or individuals.

In order to understand how a data-driven approach to value creation can be understood from the perspective of a public museum, we will therefore combine the value dimensions that were presented for both contexts. In regards to Big Data and how organizations can translate the value Big Data offers into actual organizational value, two value dimensions were presented - social and economic value. While there are various ways to define the value that museums offer to societies and individuals, we argue that it can be summarized to two value dimension - public and economic value. Public value, in our conceptualization, includes Bakhshi's and Throsby's (2012) categorization of cultural and public value as well as Scott's use, institutional and partially instrumental value dimensions. As described earlier, instrumental values are, according to Scott (2008), the 'expected socioeconomic returns of governments' public investments in museums', the social returns will hereinafter be understood as an element of public value and the economic returns as an element of economic value. In addition to this, our understanding of economic value also includes Bakhshi's and Throsby's (2012) definition of economic value. In conclusion, we argue that museums generate public value, as they are providing cultural experiences to individuals and contribute to society in multiple ways, e.g. by building social capital. Additionally, they also provide economic value by generating money, e.g. from ticket sales as well as contributing to other economies such as tourism. Economic value also refers to an appropriate utilization of the governmental funds that public museums receive.

The dimensions of public and economic value can be directly translated to Günther et al.'s (2017) organizational value dimensions that can be enhanced through the use of a data-driven approach. What Günther et al. (2017) identify as social value, i.e. the benefits that are created for individuals and larger society, corresponds to the public value dimension of museums. Günther's et al. (2017) economic value corresponds to the economic value dimension of museums. Consequently, a data-driven approach to value creation in the public museum field entails that museums work strategically with Big Data in order to generate public and economic value in more innovative, effective and efficient ways. Such an approach might enable public museums in Denmark to fulfill their role in society even better. However, the use of Big Data is also linked to some risks that might be more pressing for museums, as these are public institutions serving the society. The various value dimensions are listed in Table 1 below.

Main value dimensions	Sub-value dimensions	Authors
Public Value *= generate benefits for individuals and larger society - more specifically, in the context of the Danish museum field, fulfilling the five tasks more efficiently, effectively and innovatively*	Cultural value	Bakhshi & Throsby (2012) Hewison (2006) Holden (2004)
	Public value	Bakhshi & Throsby (2012)
	Use value	Scott (2008)
	Institutional	Holden (2006) Scott (2008)
	Instrumental Value (social)	Scott (2008)
	Social Value (Big Data)	Günther et al. (2017)
Economic Value *= generate more money, allocate government funds appropriately, support other economies*	Economic value	Bakhshi & Throsby (2012) Bryan et al. (2012) Scott (2008) Günther et al. (2017)
	Instrumental value (economic)	Bakhshi & Throsby (2012) Bryan et al. (2012) Scott (2008)

Table 1: Value Dimensions

3 Organizational Change

In the previous chapter, we explained what Big Data is and how the value it is believed to generate is generally understood. We illustrated that the perception of value is context dependent. Hence, we brought forth a critical discussion of different conceptualizations of value and based hereon, we defined how a data-driven approach to value creation can be understood in the context of the public museum field.

We will now move on to address how a data-driven approach takes form in the organization. This includes the identification of organizational implications that might result from the implementation of such an approach. Organizational implications for cultural-creative industries have largely been identified and acknowledged in literature and form prominent characteristics of cultural organizations. Here, the properties presented by Caves (2000) as well as the balancing acts introduced by Lampel et al. (2000) take a central role. As forming part of the CCIs, the public museums are subject to these properties and balancing acts which will most likely influence the museums' abilities to use and adapt to Big Data. The rationale behind this is that studies on organizational implications in the CCIs also consider the role of new technologies, which opens up new possibilities and changes existing practices (Bakhshi & Throsby, 2012; M. D. Smith & Telang, 2016). For example, the music and film industries have been fundamentally changed through technological developments with new services such as online streaming (M. D. Smith & Telang, 2016). In this regard, Bakhshi and Throsby (2012) recognize that the ability to innovate through the use of new technologies also applies for public cultural institutions. However, it is worth noting that the new technologies do not only bring along potentials. M. D. Smith and Telang (2016) state in their book on how new, data-related technologies have currently influenced the CCIs that *"for the creative industries - music, film, and publishing - these are the best of times and the worst of times"* (p. 3). This reflects the consideration for the challenges that likewise follow with the technological development. While some fields as well as specific organizations within the CCIs have been addressed in the Big Data literature - e.g. Netflix which is an often referenced example (Erevelles et al., 2016; Mayer-Schönberger & Cukier, 2013; M. D. Smith & Telang, 2016) - others have gone widely unacknowledged. The museum field is an example of the latter as literature on Big Data's role for museums is very rare. However, based on the indications given above, it is natural to expect that the implementation of Big Data in museums will bring along organizational implications for these institutions as well. These implications can be understood as both opportunities and challenges that

lie within the adaption of a data-driven approach in the organization. In the following, we will place our understanding of a data-driven approach as the 'technological component' at the center of a revitalized version of Leavitt's (1965) model on organizational change. The aim is to illustrate and discuss how data-driven value creation forms and is being formed by organizational change in interaction between a museum's *people, processes, structure* and *culture.* We combine this with a model on Big Data value realization proposed by Günther et al. (2017), which takes a broader perspective by taking the external world, i.e. the supra-organizational level into account. Based hereon, we propose a model on *data-driven value creation in the organizational context of public museums*, which functions as our main tool for analysis in chapter 5.

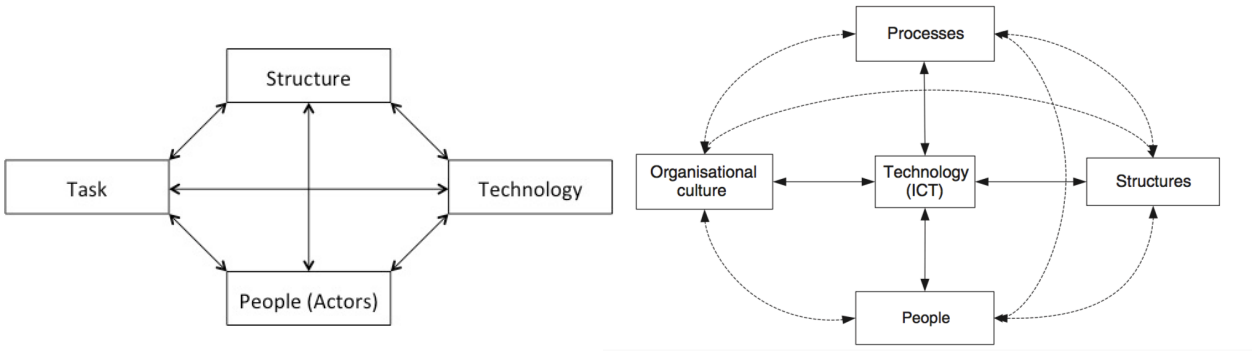
3.1 Organizational Change Models

One of the most well-established and broadly recognized models within literature on organizational change is the organizational change model proposed by Leavitt in 1965 (cf. Figure 2). Leavitt (1965) describes the organization as a complex system consisting of four interdependent variables. These are *tasks* referring to the core of the organization or its *raison d'être*, *actors* referring to the people in the organization*, technology* which entails machines and programs designed to solve problems, and finally *structure* representing systems of communication, authority and work-flows. (Leavitt, 1965) The original model was developed for industrial organizations in the private sector in 1965, and with more than 50 years of societal change between then and now, the model has naturally been subjected to critique. Consequently, authors have redefined variables and extended the model to various extents (Lyytinen & Newman, 2008; Nograšek & Vintar, 2014, 2015; Park & Kim, 2015; C. Smith, Norton, & Ellis, 1992). For example, a fifth component in form of 'organizational culture' has been added, and extensions in form of the surrounding environment has been attached with the rationale that the interdependence does not only exist between the organization's components, but also between the organization and the environment. (Nograšek & Vintar, 2014)

The many variants of Leavitt's organizational model - also known as the diamond-model - proofs the validity of Leavitt's underlying idea that an organization can be seen as interdependent components where change in one leads to change in the other. In our situation, the assumption will here be that a data-driven approach, seen as change in technology, will affect and be affected by the organization's other components; maybe it will bring along a need for new skills (*people*) or provide whole new opportunities in *tasks* and thereby redefine the organization's *raison d'être.* This makes the fundamental idea behind Leavitt's model highly interesting for our purpose as it can help us understand how the phenomenon of Big Data can be understood in the organizational context of

public museums. However, while the original model is rather outdated for our purpose, we will use a more recent adaptation of the model as our point of departure.

Nograšek and Vintar (2014, 2015) have revitalized Leavitt's model (cf. Figure. 2). They do so in order to shed light on Information Communication Technologies (ICT) as a driving force to organizational change in public sector organizations during the e-government era. ICT is strongly connected to the phenomenon of Big Data as these technologies (e.g. wireless signals, sensors, etc.) largely enable the collection of data (Davenport, Barth, & Bean, 2012; Flyverbom & Madsen, 2015; Mayer-Schönberger & Cukier, 2013; McAfee & Brynjolfsson, 2012), and in combination with the focus on public organizations, Nograšek and Vintar (2014, 2015) propose a model with great relevance for our purpose.



Figur 2: Leavitt's Diamond (1965) compared to Nograsek & Vintar's (2014, 2015) model of ICT-driven organizational change

Nograšek and Vintar (2014) develop their model based on a combination of technological determinism and socio-technological theory. We briefly touched upon these concepts in the course of explaining our philosophical stance (cf. Chapter 1). *Technological determinism* explains technology as an influence guiding social change (Nograšek & Vintar, 2014). Based on this point of view, Big Data can be perceived to form society - an idea that has been described as 'data constructivism of reality' (Scholz, 2017). *Socio-technological theory* combines technological determinism with *social determinism.* The latter describes people to be the driving force behind change, leading Big Data, its meaning, use and impact to be determined by the social context in which it occurs (Scholz, 2017). Hence, a socio-technological perspective describes Big Data and society as being mutually shaping each other. In light of this, Nograšek and Vintar's (2014) proposal for a 'new paradigm' falls short. They argue that technological determinism in form of seeing ICT as a driver for organizational change should be combined with socio-technological theory in the sense that the transformational potential

depends on the social context in the organization. However, the fact that Big Data - in our case - is a driver for organizational change does not appear to fall outside the scope of the socio-technological perspective; Hughes (cited in Scholz, 2017), for example, argues that *"a technological system can be both a cause and an effect"* (p. 47) supporting our point. In the following, we choose to draw on the socio-technological perspective, which describes both Big Data and the organization as integral parts of a holistic system.

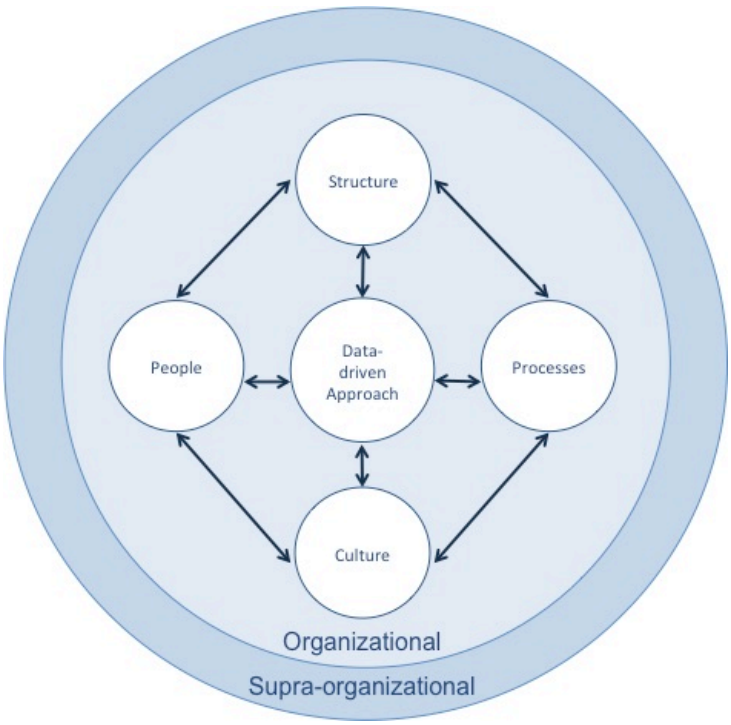
3.2 Scope of Change

As proposed in the previous chapter, the rationale for public museums to implement a data-driven approach can be explained with the realization of public and economic value (cf. chapter 2). When speaking of the realization of such value, we cannot ignore Nograšek's and Vintar's (2014) recognition of the different degrees to which such value can be realized. In the assessment of ICT as the key enabler of change in public organizations, Nograšek and Vintar (2014) distinguish between first- and second-order change with the former referring to incremental change and the latter to radical change. In a similar manner, Günther et al. (2017) distinguish between improvement and innovation in the context of Big Data's effect on business models. *Improvement* refers to the bettering of existing processes, i.e. better efficiency and effectiveness, and can be compared to first-order change. *Innovation* can be compared to second-order change, and occurs when the organization with a data-driven approach develops new value propositions or becomes able to target new customers or interact with already existing customers in new ways (Günther et al., 2017). Nograšek and Vintar (2014) argue that compared to private organizations, public organizations face greater challenges regarding successful implementation of new technologies due to their bureaucratic nature. In light hereof, improvements appear likelier to achieve than innovations for the public museums. However, innovations are not neglected in literature. Bakhshi and Throsby (2012) set forth a framework for innovation in cultural organizations, which includes innovation in *audience reach*, *artform development*, *value creation* and *business management and governance*. In this regard, they provide examples of how digital technologies have led to innovations in the museum field such as personalized presentations enabled with hand-held mobile devices as an improved service compared to standard wall texts, or increased access to collections by means of the web. However, these types of technological innovations are not necessarily developed by the museums themselves. Google is a prominent example of a private organization that develops novel, data-driven technologies that can be used by museums. With the Google Cultural Institute, Google has developed the Google Arts & Culture online service and app, where the company offers virtual tours

through museums around the world, providing access to digital collections and exhibitions. In addition to this, Google continuously develops new technologies and tools to innovate digital collections and find novel ways to interact with the 'visitors' (Google, n.d.; Luo, 2018). For this sole purpose, Google has developed a lap that is part of the Google Cultural Institute. (Google, n.d.) Google's initiatives provide a great example of the possibilities that lie within combining Big Data and Culture and thereby innovatively approach the collections and artifacts that museums hold.

3.3 Nature of Change

Nograšek and Vintar (2014) build their framework for organizational change on two dimensions; the *nature* and *depth* of change. The nature of change refers to the four organizational dimensions, i.e. the dimensions of *structure*, *tasks*, *people* and *technology*. Slightly different from Leavitt's original model, Nograšek and Vintar (2014) replace *tasks* with *processes* and add the dimension of *organization culture.* For our purpose, we will transform the central component of *Technology* (ICT) to *data-driven approach,* which reflects the definition we brought forth in the previous chapter. In the following, the other four components (structure, culture, processes, people) will be presented and discussed in more detail. Figure 3 below presents our proposed model.



Figur 3: Integrated model of Big Data value creation in the public museum field

3.3.1 Structure

Leavitt (1965) defines *structure* as the dimension that describes the systems of authority, communication and work-flows that are in place in an organization. An example here can be organizational hierarchies (Nograšek & Vintar, 2014). Nograšek and Vintar (2014) explain that public institutions tend to have bureaucratic structures in place, which can be a hindrance when implementing new technologies. New technologies, however, can be understood as a useful means to reform these bureaucratic structures (Nograšek & Vintar, 2014). When new technologies are introduced in the organizational context, new positions are often required. While Nograšek and Vintar (2014) place the need for new positions under the dimension of *people*, we chose to place it under *structure.* In relation to new positions, Günther et al. (2017) present an additional consideration that organizations have to make in terms of their structure when they aim at generating value through the use of Big Data. They point out that the positions and thus the capabilities to work with and analyze large data sets can be either centralized in one organizational unit or decentralized in several departments (Günther et al., 2017). As illustrated in Leavitt's (1965) original definition of structure, this dimension also includes directive and communicational flows. Thus, the line of decision- making can be understood as another structural element. In regards to decision-making, Moore (2015) sets forth the '*Data Maturity Spectrum*' describing different degrees to which data-driven decision-making can be implemented in museums, varying from *Data 1.0* with very little data-driven decision-making to *Data 2.0* and finally *Data 3.0* where data-driven decision-making is the key-tool in managers' planning. Moore (2015) emphasizes that museum's ability to effectively and innovatively use Big Data is determined by their commitment to make decisions based on data insights. This perspective is supported by McAfee's and Brynjolfsson's (2012) line of argumentation.

3.3.2 Culture

Culture is the organizational dimension that is newly introduced in Nograšek's and Vintar's (2014) adaptation of the model. They define it in accordance with the often-cited author Schein (1999) who explains organizational culture on three levels; the level of artifacts, espoused values and basic underlying assumptions. While we believe that the cultural dimension is of great value for understanding organizational change, we will adjust it for our purpose and not rely on Schein's (1999) framework for particularly two reasons. First of all, making a holistic study of the organizational culture would be beyond the scope of this thesis, as *culture* only constitutes one of the dimensions in the proposed model. Second of all, our review of Big Data and technology-related

literature indicates prominent cultural aspects that appear to be of greater relevance for our purpose. These aspects will thus form the elements that we focus on in our analysis. In general, Big Data is, according to Scholz (2017), understood as a 'social phenomenon'. Therefore, the attitudes that people within an organization hold towards change and innovation are important cultural factors that influence the success of the implementation of new technologies (Erevelles et al., 2016; Kiron, Boucher Ferguson, & Kirk Prentice, 2013; Nograšek & Vintar, 2014; Scholz, 2017). Resistance, for example, is widely understood as a limiting factor that can jeopardized or even prevent an organization from being able to adapt to new technologies (Kiron et al., 2013; Nograšek & Vintar, 2014; Orlikowski & Gash, 1994; M. D. Smith & Telang, 2016).

Managers can influence this organizational culture by displaying a mindset that facilitates change. The managerial mindset plays an important role in acknowledging and realizing the potential of value creation through the use of Big Data (Kiron et al., 2013; Mayer-Schönberger & Cukier, 2013; Rydén, Ringberg, & Østergaard Jacobsen, 2017).

Another aspect of the cultural dimension can for this purpose be seen as at that of visitor orientation. In the light of the competitive environment that the public museums currently face, a positive attitude towards visitors appears to be important. Big Data is often understood in light of consumer analytics, which might enable organizations to improve or innovate their services to customers (Günther et al., 2017; Iansiti & Lakhani, 2014; Mayer-Schönberger & Cukier, 2013). Such service orientation can in the context of museums be coined visitor orientation.

3.3.3 Processes

In the definition of processes, Nograšek and Vintar (2014) refer to Davenport's (1993) definition of organizational processes, which describes them as the order in which work activities are arranged "*across time and space*" (Nograšek & Vintar, 2014, p. 113). In relation to processes, we can draw on Günther's et al. (2017) conception of improvement and innovations. Even though Günther et al. (2017) refer to improvements and innovations in regards to business models, as mentioned earlier, these changes in business models are facilitated through an improvement or innovation of the underlying processes within the organization. Based on this, the ability to improve and innovate organizational processes appears to be a seminal aspect for value creation through Big Data. In addition to this, Erevelles et al. (2016) support the notion that organizations might have to change their processes in order to generate value from Big Data insights. Bakhshi and Throsby (2012) assume a similar position, however not specifically for data-driven approaches but more general for new technologies, as they understand new technologies as means to improve or innovate business

processes in public, cultural-creative organizations. Nograšek and Vintar (2014) provide further insights on processes in public organizations and how they are affected by new technologies. They highlight *outsourcing* of processes as a central and often occurring aspect when public organizations adapt new technologies.

3.3.4 People

The final organizational dimension is, according to Nograšek and Vintar (2014), understood as organizational elements that have an impact on the *"availability, adaptability, and productivity of staff"* (p. 113). Among these elements, *leadership* and *skills* are examples of organizational, people-related elements that shape the adaptation of new technologies in public organizations (Nograšek & Vintar, 2014). In regards to Big Data initiatives and the ability to generate value with a data-driven approach, also other authors acknowledge the influence of leadership and the need for certain skill sets. McAfee and Brynjolfsson (2012), for example, state that in order to support the implementation of data-driven decision making in an organization, it is important that the top-management leads by example by adopting these practices. Whether the implementation of a data-driven approach is successful does, according to McAfee and Brynjolfsson (2012), dependent on the leadership teams and their abilities to overcome the managerial challenges related to such an approach. In regards to the skills that are required to successfully work with Big Data, McAfee and Brynjolfsson (2012) mainly focus on the need for analytical skills. Gao, Koronios and Selle (2015), however, state that analytical skills are just one of a variety of skills that are needed for successful Big Data initiatives. They suggest that organizations should form multidisciplinary teams consisting of members with different specializations when conducting Big Data projects (Gao et al., 2015). Such specialized skills are also recognized as a success factor by Nograšek and Vintar (2014) in the implementation and use of new technologies in public organizations. In order to promote employees' ability to cope with changes brought along by the implementation of new technologies, they emphasize the need for communication skills, innovative thinking and the ability to work in teams (Nograšek & Vintar, 2014).

3.4 Depth of Change

After presenting the four dimensions that constitute the *nature of change* in Nograšek and Vintar's (2014, 2015) model, we will now turn to the *depth of change*. By acknowledging this second dimension, Nograšek and Vintar (2014, 2015) extent the scope of Leavitt's (1965) model and introduce the external world as an influencing factor for organizational change. In this regard, they

argue that an analysis of organizational change in public sector institutions cannot be confined to a single organization due to the network structure they form part of (Nograšek & Vintar, 2014, 2015). Therefore, Nograšek and Vintar (2014, 2015) argue that the depth of change consists of three different levels; *the workplace-, organizational-* and *inter-organizational level*. In a similar manner, Günther et al. (2017) acknowledge the depth related to generating value through the use of Big Data. With only a slight variation in wording, these are the *work-practice, organizational* and *supra-organizational* levels. In line with these conceptions, we choose to hold on to the principle of depth. We will in this regard adopt the terms introduced by Günther et al. (2017) which are more thoroughly described than those presented by Nograšek and Vintar (2014, 2015) and which are presented in the context of data-driven value well-fitted for our purpose.

3.4.1 The Three Levels

The work-practice level refers to Big Data-related daily tasks and decisions of individuals in the organization (Günther et al., 2017). This dimension, for example, could include how a data scientist analyses a dataset. In this sense, the work-practice is more concerned with the technical aspects related to the actual work with Big Data. However, as stated in the delimitations of this paper (cf. chapter 1), the focus of this thesis is more conceptual and less technical. Therefore, the work-practice level and the related debates are less relevant for the purpose of this research. In addition to this, the aim of this research is to study and understand organizations as a whole, and thus a detailed analysis of the individual working dimension is not justified by the scope of our research. Instead, we will focus on the other two dimensions put forward by Günther et al. (2017) – the organizational and the supra-organizational level.

Günther et al. (2017, p. 194) list "*structures, norms, resources, and procedures*" as elements of the organizational level. All of these are structured and deployed in order to realize the objectives set forth by the organization. If an organization adapts certain processes or even changes its entire business model with the aim to generate value through the use of Big Data, this implementation of a data-driven approach is reflected in the organizational level. On top of that, there is the supra-organizational level. Based on Zott and Amit's (2013) research, Günther et al. (2017) present their definition of the supra-organizational level by stating that it comprises the "*relations with institutional and technological ecosystems*" (p. 194). Thus, the supra-organizational level consists of collaborating and competing organizations, parties that provide or analyze data, regulatory institutions as well as customers, users or visitors (Günther et al., 2017). The interactions with these external parties are shaped and influenced by the value that can be generated through these

collaborations as well as the risks they entail (Günther et al., 2017). Boyd and Crawford (2012), Günther et al. (2017) as well as Newell and Marabelli (2015) primarily focus the societal or ethical concerns associated with such interactions.

3.4.2 Organizational Debates

By conducting an in-depth literature review, Günther et al. (2017) identify several debates related to the use of Big Data that are currently unfolding in literature. These debates are assigned to the organizational and supra-organizational level respectively. On the organizational level, these debates are concerned with issues related to the implementation of a data-driven approach including the way data is collected, governed, processed and analyzed (Günther et al., 2017). However, this should not be understood from a technical perspective, but rather from a general organizational point of view, including which capabilities, skills and resources are required to facilitate data-driven value creation, which aligns with the delimitations presented in the beginning of our thesis.

According to Günther et al. (2017) the aim of these theoretical debates on an organizational level is to uncover "*what appropriate organizational models can be developed to create and appropriate value from big data*" (p. 198). There are two specific debates that are especially relevant - the question of centralization and decentralization as well as the debate on business model innovation and improvement. The debate on centralization and decentralization refers to the theoretical and practical discussions on where in an organization the analytical skills and the capabilities to work with Big Data should be located. One approach is to centralize competencies and resources by building competency centers for Big Data analytics within an organization. The corresponding decentralized approach would be to establish analytical competencies in various 'business' units or departments. (Günther et al., 2017) This debate is therefore referring to structural and skill-related organizational implications. In our proposed model, we understand the question of centralization or decentralization mainly as a structural one which is why it was briefly discussed under the structural dimension above when accounting for the nature of change.

The second debate reflects on the extent to which a business model is changed based on the commitment to a data-driven approach. Innovation here refers to the creation of entirely new business models. However, Günther et al. (2017) and Loebbecke and Picot (2015) acknowledge that small young start-up organizations usually have an advantage in creating "*new data-driven business models*" (p. 197), whereas more established or bigger organizations tend to improve their business models by incorporating data-driven perspectives into existing structures and processes. However, this does not mean that incumbent organizations cannot innovate their business model through the

use of Big Data. Even though public museums are usually not perceived as businesses, the debate on business models in regards to Big Data still seems relevant. As described earlier (cf. chapter 2), the business model in its very core simply describes how an organization generates value (Günther et al., 2017). Therefore, museums as well can learn from this debate by considering how a data-driven approach might enable them to improve or even innovate their organizational value creation. This theoretical debate of improvement or innovation is represented in our proposed model as well. While Günther et al. (2017) refer to the business model, which describe the entire organization, we choose to include the insights on this debate in the *processes* dimension of the organizational model. We elaborate on the reasons for this decision above.

3.4.3 Supra-organizational Debates

On the supra-organizational level, Günther et al. (2017) focus on two debates, one concerning the access to Big Data and the other reflecting on the social risks associated with the use of Big Data. Firstly, the debate on open or controlled data access concerns itself with the extent to which data is shared with and is accessible to external parties. Here, public institutions are expected to assume a special role based on the nature of their role as organizations that serve society. Secondly, some risks are associated with the use of certain kinds of data. Besides the legal dimension of handling data according to the rules and guidelines set by regulatory bodies, there are also some public as well as ethical concerns and expectations that organizations might have to consider (Günther et al., 2017). Especially, as public institutions that are expected to act on behalf of the public and to build trust in the government that is funding them (cf. chapter 2), handling data with care appears to be highly relevant for museums. Günther et al. (2017) acknowledge that organizations that are set out to generate what we earlier defined as *public value* are in a particular difficult position to balance value realization through the use of Big Data analytics on the one hand and minimizing risks or potential conflicts associated with it on the other hand.

In addition to the debates presented by Günther et al. (2017), we identified additional dimensions on the supra-organizational level that appear to be of importance when studying the public museum field. While Günther et al. (2017) already introduce public policies but only in regards to regulations and legislations that influence the handling of data, the impact of public policies on museums is much larger than that. Lyck (2010) and Skot-Hansen (2008) identify public policies as a major influencing factor on state-owned museums in Denmark, which have an impact on the strategy, the financial situational and also operational processes of such organizations. Based on this, on the one hand, we expect such policies and the predominantly bureaucratic structure of public

institutions (Nograšek & Vintar, 2014) to have a restricting effect on public museums and their ability to innovate and adopt a data-driven approach. On the other hand, funding policies that acknowledge the potential of new technologies and innovative approaches can actively promote and facilitate the implementation of such technologies and approaches in the organizations that are subject to these policies (Bakhshi & Throsby, 2012). There are indications that this is the case for the Danish funding policies, which for example include a digitization foundation that is set up by the Danish Ministry of Culture in order to finance the digitization of public collections and archives (Lyck, 2010). In this sense, public policies can also support a museum's ability to innovate and to become more data-driven.

Public policies also have an effect on the financial situation of museums in Denmark. State-owned museums partly funded by the government and can in addition to that apply for funds provided by private and commercial organizations (Lyck, 2010). As the governmental funding in Denmark is currently going down by two percent annually, public institutions are in an increasing need to attract other funds as well as generating money through their own activities and services (National Museum of Denmark, 2016; Schmidt et al., 2015). Therefore, the financial situation of public institutions in Denmark largely appears to depend on external parties which includes governments, private organizations as well as visitors.

Another externality of museums is their effect on other industries and the economy. Scott (2008) identifies museums as contributors to the tourism and cultural-creative economy. As discussed earlier, the economic value that museums provide is in part their contribution to these industries. In addition to that, museums operate within a changing environment which is primarily influenced by a growing experience economy. Lyck (2010) and Skot-Hansen (2008) point out that this growing sector changes the role of museums and also leads to an increase in competition for these organizations. We expect that public museums address these changes and therefore react to external influences.

3.5 Sub-conclusion: Understanding the Nature and Depth of Change

After defining data-driven value creation in a museum context, we presented the organizational changes and implications that the implementation of such an approach is expected to bring along. We define the *nature of organizational change* by using Nograšek and Vintar's (2014, 2015) adaptation of the Leavitt diamond (1965). According to them, the implementation of new technologies impacts four organizational dimensions - *structure*, *culture*, *processes* and *people*. Furthermore, they understand *technologies* as the driving force of organizational change. In our

conceptualization, we replace this fifth dimension of *technology* with *data-driven approach*. Even though we do not understand a data-driven approach as a technology as such, we acknowledge that the implementation of such an approach in an organization is facilitated by technologies. For each of the four organizational dimensions surrounding the data-driven approach, we identify several theoretical debates and arguments that point towards changes and implications that one can expect a museum to face with the implementation of a data-driven approach. The expected changes and implications are summarized under several topics to which we hereinafter refer to as elements. For the *structure* dimension, these elements are *hierarchy*, *new positions*, *decision-making* and *centralization and decentralization*. For culture the elements are *attitudes towards change and innovation*, *data mindset* and *visitor orientation*. For *processes* the elements are *improvement and innovation* and *sourcing*. Finally, for *people,* the elements are *leadership* and *skill sets*.

In addition to the organizational dimensions and elements, we discuss in *depth of change* the external influencing factors that impact organizational change and the ability to adapt to a data-driven approach. Based on Günther's et al. (2017) model of Big Data value creation in organizations, we add a *supra-organizational level*. We are presenting theoretical debates and organizational implications for this level as well. The corresponding elements for the supra-organizational level are - *public policies*, *financial situation*, *access*, *social risks* and *economies.* These two levels, five dimensions and sixteen elements constitutes the substance of our proposed model of *data-driven value creation in the organizational context of public museums* and will subsequently guide our analysis in the following empirical part of this thesis.

Dimensions	Elements	Main Literature
Structure	Hierarchy	Nograšek & Vintar (2014)
	New Positions	Günther et al. (2017)
	Decision Making	McAfee & Brynjolfsson (2012) Moore (2015)
	Centralization and Decentralization	Günther et al. (2017)
Culture	Attitudes towards Change and Innovation	Erevelles et al. (2016)
	Data Mindset	Erevelles et al. (2016) Rydén et al. (2017)
	Visitor Orientation	Nograšek & Vintar (2014)
Processes	Improvement and Innovation	Günther et al. (2017) Nograšek & Vintar (2014)
	Sourcing	Nograšek & Vintar (2014)
People	Leadership	McAfee & Brynjolfsson (2012)
	Skill sets	Gao et al. (2015) Nograšek & Vintar (2014)
Supra-organizational level	Public Policies	Lyck (2010) Skot-Hansen (2008)
	Financial Situation	National Museum of Denmark (2016)
	Access	Günther et al. (2017)
	Social Risks	Günther et al. (2017)
	Economies	Scott (2008)

Table 2: Dimensions and Elements of the Proposed Model

4 Method

In this chapter, we will explain the actions undertaken in order to investigate our problem statement. This includes an account and argumentation for the choices we have made throughout the entire process - how we have identified, selected, processed and analyzed various information in order to answer our problem statement. We will start with a presentation of the search-strategy that underlies the previous chapter on theory. Secondly, we will account for the choices made in relation to the empirical part of our study which includes a presentation of our case - the National Museum of Denmark - and considerations on qualitative methods. Finally, we conclude the chapter with an evaluation of the quality of our research.

4.1 Literature Search

As emphasized in chapter 1, 2 and 3, we assign great importance to the theoretical contribution of our thesis because Big Data in the context of public museums has received very little attention despite its relevance. As evident from chapter 2 and 3, we have drawn on authors and theories from different fields in order to compose and define the theoretical foundation on which our thesis is built. We have drawn on literature on *Big Data*, *organizational change*, *value dimensions* and *public museums*. This has of course been a process of selecting and rejecting theories and authors, which naturally influences our study. Therefore, a thorough literature review has been of great importance to us in order to ensure a well-conducted study with solid argumentations. During chapter 2 and 3, we argued for our choice of theories based on critical reflections, and in addition to this, we will here provide an insight into our search-strategy, i.e. where and how we have located our sources.

In order to identify relevant sources, we have primarily used the library at Copenhagen Business School, which provides us with access to a great amount of databases. Among these, we have primarily used the database Business Source Complete provided by EBSCO Information Service as well at the database Scopus. First, by combining relevant search terms, we identified the existing gap in literature, as the number of provided search result was very low. For example, combining the key-words *"Big Data"* and *cultural creative industries* in a search in the Business Source Complete database provided no results, while the combination of the key-words *"Big Data"* and *museum** provided eleven results, five of which were published in academic journals. Due to this limited number of results, we broadened the scope of our search terminology, for example by using key-words such as *technical innovation* or *digitization* instead of *Big Data*. This approach provided us with more search results. A combination of the key-words *technical innovation* and *museum**, for

example, resulted in a list of 169 search results, of which 40 articles have been published in academic journals. After gathering more search results, we could identify relevant literature by reading through abstracts. Subsequent to reading these relevant academic articles in full, we could furthermore specify the relevance of such an article and decide whether it was to become core literature or supporting literature. Literature on single core concepts (Big Data, organizational change, value dimensions and public museums) was easier to find. Here, we opted for often referenced literature such as Mayer-Schönberger's and Cukier's book (2013) on Big Data or literature that was particularly well-suited for our purpose, such as Lyck's (2010) book on the Danish museum field. While some of these were new sources to us, others were taken from our study curricula. Overall, our adapted search strategy led us to find initial articles and books, which we then reviewed. Based hereon, we used other search techniques to uncover additional relevant literature. We selected a few articles that appeared to be particularly relevant for our purpose and used the database Scopus to identify other articles, in which the main article was referenced. This subsequently provided us with a foundation of existing studies and often cited authors within the relevant areas.

4.2 Qualitative Research

4.2.1 Single-case study

As our research design indicates, we work predominantly with a deductive approach to our research. We start with existing theory from which we propose a model, which we then seek to test empirically and consequently modify if needed. Here, it is important to mention what we infer by *testing*. With our constructivist standpoint, we are aware that we cannot derive explanations of generalized facts that apply to the entire public museum field (Hewison, 2006). Hence, when we test empirically, we mean that we bring our theoretical understanding of the investigated matter to the field where we seek nuances and details from a real-life case that can give us an in-depth understanding of the investigated matter. For this purpose, we have chosen to work with a single case study in form of the National Museum of Denmark.

Case studies are often used in the beginning of a research process as a means to generate hypotheses through an inductive approach. The reason for this is that the case method is often assumed to be well-suited for pilot-studies and less suitable for the later processes of testing or building theory, which is founded on a rather commonly accepted understanding that individual cases cannot derive generalizations (Flyvbjerg, 2006). Despite of this, we choose to apply the case of

the National Museum in continuation of proposing a theoretically-founded model, whereby we ascribe value to the case study as a valid method for the later processes of theory-building. In accordance with Flyvbjerg (2006), we see such a context-dependent case as a valuable contribution to our study for particularly two reasons; first, human behavior, which lies at the core of the organizational context, cannot only be understood based on theory which puts behavior into defined 'boxes'. Secondly, the case becomes important for us as researchers in regards to our research conduct and the quality of our results. Flyvbjerg (2006) argues that *"Great distance to the object of study and lack of feedback easily lead to a stultified learning process, which in research can lead to ritual academic blind alleys, where the effect and usefulness of research becomes unclear and untested."* (p. 223). Consequently, by using a single-case study, we get the opportunity to reach a nuanced view of reality, which adds to our own learning process as well as to the overall value of our research. Moreover, the depth we can gain by using a case study corresponds nicely to the field of social science and our social constructivist standpoint. In order to apply our proposed model to the field, we have chosen to investigate the National Museum of Denmark which we believe to be a rich case for our purpose. We will elaborate on this in the following section.

4.2.2 Case Description: The National Museum of Denmark

The public museum field in Denmark consists of five state-owned museums and 97 state-subsidized museums. These are divided into the three categories of *cultural history, art history* and *natural history*, and are all subject to the Danish Museum Act which outlines a number of requirements for the museums. For each museum category (cultural, art and natural history), one main-museum is appointed. These museums carry a special status as they take on more responsibility and specialized tasks compared to the remaining museums. (Agency for Culture ans Palaces, 2017a)

For our study, we have chosen to work with the National Museum which is the main-museum of cultural history. The National Museum is geographically spread out with a total of 20 locations in Denmark. However, for our purpose, we will limit the scope to the National Museum in Copenhagen (Prinsens Palæ) which is the largest unit of the museum and the unit that holds the most functions in-house. The museum in Copenhagen (hereafter referred to as the National Museum or simply the museum) is chosen for several reasons. These will be outlined in the following.

Focus on Visitor Experience

As of July 1st 2017, the National Museum got a new director - the social anthropologist Rane Willerslev. This was an event that attracted great attention in the media and it even became the foundation for a television program consisting of six episodes that illustrate Rane's new adventure at

the museum. Upon the employment of Rane Willerslev, the minister of culture, Mette Brock, stated that she expected the new director to *"add a contemporary and modern appearance to the museum's research, preservation and dissemination"* (Torp-Pedersen, n.d.). The new director himself stated that his goal for the museum was to *"free its [the museum's] creative energy so it becomes a challenging, wild and engaging place for the visitors to be"* (Torp-Pedersen, n.d.). Rane Willerslev has been promoted as a visionary leader that is brought to the museum in order to innovate the tradition-bound museum in times of financial pressure - and his efforts are not to miss. As a result of Rane's vision to innovate the visitor experience, the National Museum is currently in the midst of a rather big reorganization. A new department has been realized - the Development Department - which is limited to the National Museum in Copenhagen and holds the functions of 'Communication, Marketing and Digital Dissemination', 'Experience and Learning' and 'Audience Service'. This reorganization is an interesting event to shed light on as it addresses the external pressure that comes with the increasing experience economy and digital development as described in chapter 1. Moreover, in light of our proposed model in the previous chapter, this structural change becomes an interesting event to address in the light of Big Data, as the use and impact of a data-driven approach is largely shaped by the organization (Scholz, 2017).

Focus on Digital

Since 2012, the National Museum has had an evident focus on digital initiatives. A Digital Strategy was developed for the period of 2012 to 2015 with focus areas such as building the 'Digital National Museum' in order to capture the opportunities of the Internet and building digital competencies across the whole organization (Det Digitale Nationalmuseum, 2013). Since then, the museum has realized digital initiatives, such as establishing several online collections that make images and information on the artifacts and the objects the museum holds available online. In addition to that, as mentioned above, the museum has recently created a new Development department which holds a focus on 'Digital Dissemination'. With this organizational change the museum furthermore implies that it has realized the importance of the technological development. These examples, indicate, on the one hand, that the National Museum has developed along the stages of digital innovation in the museum field that were laid out in literature (cf. chapter 1). On the other hand, it also implies that the museum does not perceive their digitization efforts as a completed process and has laid the groundwork for further developments in this area, which could move the National Museum towards a data-driven approach.

A Critical Case

From the above, it is evident that the National Museum is currently undergoing big organizational changes which appears to be a primary result of having a new, visionary director who brings along new ideas to meet the future and the challenges it brings along for the tradition-bound museum. The National Museum is chosen as a case to empirically illustrate how a data-driven approach to value creation can be understood and realized in a public museums and what challenges this might bring along. The museum is not chosen as a 'best' case that obviously works strategically with Big Data - instead, it is chosen because it is a great example of the current situation that face the Danish museum landscape having long and rich traditions on the one hand and endless opportunities in the era of Big Data on the other hand. Also, the National Museum is not chosen as a representative case as this is not necessarily the best choice when aiming for rich information. Instead, our choice of case can be rationalized with characteristics of what Flyvbjerg (2006) coins a *critical case.* A critical case is defined as *"having strategic importance in relation to the general problem"* (p. 229) and can generalize based on Karl Popper's falsification principle. While there are no specific guidelines for identifying such cases, it is a good idea to look for "most likely" or "least likely" (Flyvbjerg, 2006). Taking a few things into consideration, the National Museum can be seen as a "most likely" case. The National Museum is the biggest public museum in Denmark, and the size of the organization is a fact that matters in the context of Big Data. According to Mayer-Schönberger and Cukier (2013), larger organizations are more likely to benefit from Big Data than small and medium-sized organizations. In addition to this, Vicente et al. (2012) state that larger organizations are generally believed to be more likely to innovate and harvest advantages related to technological capacity than smaller organizations. This, combined with the current and prominent focus on visitor experience and digital development, makes us argue that if a data-driven approach cannot be seen as a strategic tool to generate value in the National Museum, it is quite unlikely that it will in other public museums. In our study of the National Museum, we limit our scope in two ways; first, as mentioned, we focus on the National Museum in Copenhagen. Second, our study is conducted as a 'snapshot' in time - hence, we not conduct a process study where we follow the organization over time.

4.2.3 Qualitative Interviews

Semi-structured Interviews

In chapter 1, we outlined our philosophical standpoint and devoted ourselves to the epistemological constructivism. In light of the limited realistic ontology and subjective epistemology this carries along that the methodology, i.e. how we best investigate the reality (Nygaard, 2012), naturally becomes

qualitative. Flick (cited in Kvale, 2007) defines qualitative research as *"intended to approach the world 'out there' and to understand, describe and sometimes explain social phenomena 'from the inside'"* (p. 10). With our aim for understanding how Big Data can create value in the context of public museums and what implications this might bring along, qualitative research becomes ideal for our purpose as it, opposed to quantitative research, can generate in-depth knowledge 'from the inside' (Kvale, 2007; Andersen, 2002).

With the National Museum as our case, we seek to uncover the meaning and relevance assigned to a data-driven approach in the organization. For this purpose we use semi-structured interviews that are somewhat in between everyday conversation and closed questionnaires (Kvale, 2007). Conducting such interviews can help us bring nuances to our results as they enable us to critically discuss our theory in light of a practical setting. This exemplifies the main advantage of the method which lies in the ability to obtain in-depth knowledge (Kvale, 2007; Roulston & Choi, 2018). However, the method also carries limitations that are important to reflect upon. The main concern here stems from epistemological concerns (Roulston & Choi, 2018); we do not aim for our study to derive an objective truth, however our research question is defined in a way that sets forth the expectation that our results to some degree are transferable to other situations. In light of this, using qualitative interviews as our only method appears problematic. Therefore, we first of all make sure to derive data from different sources - also known as *data triangulation* - by interviewing several persons at the National Museum. Second of all, we apply the documentary method in addition to the interview method whereby we apply *methodological triangulation* (Roulston & Choi, 2018). The documentary method will be explained further on.

Prior to Interviewing

Prior to interviewing, we designed an interview guide based on themes derived from our literature review (cf. Appendix 2). These themes cover organizational practices, Big Data, innovation, supra-organizational aspects and visitor experience and were used to form research aims, i.e. descriptions of what we aimed to cover throughout the interviews in order to be able to answer our problem statement. However, while these aims are theoretically bounded and hence become too abstract to use for the actual interview, we translated them into interview questions that are formulated in everyday language which makes it easier for the interviewee to follow (Kvale, 2007). These questions were primarily *introductory questions* that are open and allow for rich descriptions of the different themes, and *structuring questions* that indicate the shift from one theme to another, which served the purpose of guiding the interviewees and avoid long irrelevant answers. However, with the semi-

structured interview that allows a degree of freedom when conducting the interview, we also asked *follow-up questions* to get extended answers when needed, *interpreting question* in order to make sure we had understood the interviewees right, and a few *direct questions*, primarily towards the end of the interviews, to revisit aspects that appeared prominent. (Kvale, 2007) Before interviewing, the interview-guide was slightly adjusted for each interview due to different positions and adjusted according to external feedback and a test-interview among ourselves in order to ensure the best possible tool for practical use.

The data we have collected are based on interviews with four different managers at the National Museum who were selected based on different considerations. First of all, we have aimed for the manager level as we refrain ourselves from looking at the work of the individual employee in the organization (work-practice level, cf. chapter 3) and focus on the data-driven approach to value creation as a strategic tool in the organization, whereby prominent decision-makers become more relevant. While there are many managers in the organization, we have limited the number by locating those areas in the organization where Big Data, based on literature, appears most likely to dominate. This was combined with sound judgments of who we expected to have the required knowledge to provide inputs on the subject matter which led us to interview four managers within the areas of IT/digital, marketing and exhibitions. The number of informants should be seen in light of both the nature and the purpose of our thesis. Our thesis is rather theoretically driven and less empirically driven, which should be reflected in the distribution of resources such as time and scope. Moreover, the purpose of our study is not to describe an objective truth, which would have required a representative sample of many more subjects, but to explore the understanding of the Big Data phenomenon in the museum context, which calls for rich descriptions (Kvale, 2007). Since our fourth interview only brought us little new knowledge, we concluded that we had reached a reasonable amount of data and decided to stop the interview process. The four interviews correspond to 4.5 hours of interviewing and 86 pages of transcription.

As (Kvale, 2007) states it, *"An interview inquiry is a moral enterprise"* (p. 23), which necessitated the need for ethical considerations to be made. Prior to conducting the interviews, we have made sure to get the interviewees' informed consent to participate. Few days before the interview, we sent a consent form (cf. Appendix 1) that explains the purpose, process and use of the data. Moreover, it considers possible consequences and ensures anonymity. Each interview session has been initiated by going through the consent form orally before it has been signed by both parties.

Conducting Interviews

The interviews have been conducted at the National Museum as it occurred natural to interview the managers in the organizational context studied. We have both been present during all four interviews and have had clearly defined roles in order to ensure consistency; one has interviewed while the other has recorded and kept track of the interview guide in order to make sure that every topic was covered. The interviews were held in English - partly for the sake of consistency and partly in order for both of us to be able to understand what had been said. This of course carries the risk of people not being able to express themselves as intended. However, we tried to accommodate for this by allowing them to shift to Danish if they were struggling. The interviews were audio recorded using the software QuickTime Player, which allowed us to be present in the moment and focus on the dynamics of the interview (Kvale, 2007).

After conducting our interviews, the audio recordings have been turned into text by means of manual transcription. We have both been involved in the transcription process which holds the risk of inconsistency (Kvale, 2007). Therefore, in order to ensure consistency, we have developed a set of rules to guide the process. We have transcribed verbatim and indicated pauses, laughter and emphasis in intonation in order to stay loyal to the managers' statements and uphold some of the context that is otherwise lost through two abstractions; when real-life situation is turned into recording, and when audio is turned into text (Kvale, 2007).

4.2.4 Documentary Method

While semi-structured interviews provide the primary data for our analysis, we have also chosen to apply data that are not produced on our request or with our involvement. These are documentary data, or secondary data, that can work as great supplements to our semi-structured interviews as they contribute to shed light on the empirical field and thereby add to the quality of our data (Sune Holm Larsen cited in Nygaard, 2012). The use of documentary data has proved to be useful in studies related to the cultural domain since a great variety of data in this context are often made publicly available through different institutions (Veal & Burton, 2014). This is also the case with the National Museum; as a public institution, a lot of data such as strategy papers, annual reports, etc. are made available to the general public online. While these data are prepared for other purposes than our study, they do of course not directly address our research focus which makes up the greatest disadvantage of this method (Veal & Burton, 2014). However, they can provide insights that can be held against the data gathered through our interviews and hence be used to verify or critically reflect on oral statements (Roulston & Choi, 2018), which can compensate for the major weakness of the

interview method and increase transferability (Veal & Burton, 2014), i.e. the extent to which our findings can be transferred to another situation (Shenton, 2004). The documents we have used for our purpose include strategy papers, organizational diagrams, reports and surveys, and are published by the National Museum itself, the Ministry of Culture or the consultancy firms Deloitte and Rambøll which we perceive to be valid institutions.

4.4 Data Analysis

After collecting our data and preparing it for analysis, i.e. turning our recorded interviews into text, we have analyzed the material by means of the software NVivo which can assist in more efficient coding as it offers several ways for organizing the process. We have primarily coded deductively, i.e. applied codes from a predefined list (Miles, Huberman, & Saldaña, 2014) that were derived from theory and go hand in hand with our proposed model. However, we have also allowed for inductive coding, i.e. using codes that emerges throughout the coding process (Miles et al., 2014). These are empirically derived codes and have been important for us to refrain from forcing information into pre-fixed codes. This has allowed us to critically reevaluate our proposed model after our empirical illustration of it (cf. chapter 6).

Our coding scheme contains subject codes with both primary codes and sub-codes, i.e. second order codes assigned to the primary codes for the sake of detail. This structure reflects the dimensions and elements underlying our proposed model as described in the previous chapter. Moreover, some pieces of text have been assigned more codes when they give information on several topics of concern which aligns with the interdependency that characterizes the dimensions of our proposed model. The data have been coded by both of us which carries the risk for inconsistency in terms of when to apply a given code (Miles et al., 2014). In order to accommodate for this, we have first of all defined the codes and their meanings together. Second of all, we have jointly coded the first interview while the rest has been split up between us however revised by the other party.

4.5 Research Quality

In the assessment of research quality, literature often refers to the concepts of validity and reliability. *Validity* refers to the fact that a researcher actually investigates what he or she claims to investigate while *reliability* refers the ability to reproduce a study's results, i.e. whether the same findings can produced by another researcher at another time (Andersen, 2003; Kvale, 2007). These concepts have been subject to critique in qualitative research as they build on logics from the positivist tradition

and infer that an objective trust exists (Kvale, 2007). For the same reason, we will refrain ourselves from using these concepts and instead critically evaluate the quality of our research as a matter of *trustworthiness* which can be understood in terms of *credibility, transferability, dependability* and *confirmability* (Shenton, 2004).

Credibility can be understood as the congruence between one's findings and reality (Shenton, 2004). In our attempt to build such credibility, we have first of all drawn on previous research that has helped us frame our results. Moreover, we have developed an early familiarity with the National Museum in order to facilitate a good relationship with the interviewees and ensure an adequate understanding of the organization, which is crucial for our interpretations. We started reading through the organization's website and strategy papers in October 2017 and had the first meeting with one of the managers November 6, 2017. The contact was maintained throughout Spring 2018 where we conducted our interviews and communicated via email for clarification of issues. In addition to this, we have, as described, combined the interview method with the documentary method in order to triangulate and hence compensate for the shortcomings that each method holds. Moreover, we have aimed for ensuring honesty in informants by explicitly explaining the aim of our research and giving them the opportunity not to participate. This way we can ensure that the interviewees who participate are sincerely willing to take part in the study which was particularly important to us in order to eliminate risks associated with interviewing managers. Interviewing people at management level where imbalance in status - student vs. manager - can lead to issues of control in the interview process (Andersen, 2003). Finally, in order to heighten credibility, we have made sure to discuss all aspects of our research throughout the entire process to exchange interpretations and ideas and make sure that alternative approaches have been taken into consideration.

Transferability refers to the extent to which one's results can be transferred to another situation (Shenton, 2004) and reminds of the conception of *generalizability* (Kvale, 2007). Although our case might be unique and our interviews derive subjective knowledge, the National Museum is still a case within the broader field of public museums. We cannot, based on a single case study, derive objective facts that hold true for all public museums in Denmark, but we do argue that our results to some extent can be transferred to the broader field based on our choice of case and collection methods. Throughout our thesis, we have aimed to provide an adequate amount of contextual information regarding our theory, case and research process in order to create a solid foundation from which we can judge the transferability. We will return to this by the end of our thesis (cf. chapter 6).

Dependability is similar to the term *reliability* and calls for sufficient information about the research study which enables others to conduct similar research even though the same results are not reproducible due to the qualitative nature of our study (Shenton, 2004). In order to meet this quality criterion, we have aimed for being transparent by arguing for all the choices made throughout the process - both in relation to our theoretical and empirical work. As human actors, and with our constructivist standpoint, we acknowledge that we as researchers influence our results through our subjective interpretations. Therefore, we have aimed for clear communication and a well-arranged thesis to create the best foundation for others to evaluate and judge our work.

The last quality criterion is that of confirmability which relates to the objectivity which is understood as the fact that findings are derived from interviewees' experiences rather than from the researchers' preferences (Shenton, 2004). In order to meet this criterion, we can again mention continuous discussions throughout the entire research process and the triangulation of methods, which can assist in reducing the bias that may follow from our research. Moreover, our philosophical stance and hence what underlines our beliefs and assumptions are clarified as explained in Chapter 1. Lastly, we explicitly recognize the limitations of the methods applied and evaluate the effects they may bring along.

5 Analysis

As stated in the previous chapter, we have conducted a single case study with the National Museum of Denmark as our case. In this chapter, we will conduct the analysis of the case. For this purpose, we will draw on the model we proposed in chapter 3. This model, with its belonging dimensions and elements, will create the structure for the analysis below. However, before turning to the model's dimensions, we will assess the organization's overall 'data maturity', i.e. how advanced the organization appears to be in the sense of working strategically with data. This will provide a good starting point before assessing the organization in detail.

5.1 Data Maturity

As mentioned in chapter 3, Günther et al. (2017) point out, that start-ups have the advantage of building data-driven business models more easily than established companies that have to rethink existing business practices in order to adapt a data-driven approach to value creation. The National Museum is a classic example of the latter. The organization is more than 150 years old and is built on a long history of values and norms that were not originally designed to meet the digital era and the phenomenon of Big Data Lyck (2010). However, during past years, and now more than ever before, the museum appears to move more in this direction. As one manager states: *"there are a lot of initiatives popping up all over the place all the time that have more or less to do with digital"* (Int. 1). The most prominent initiative is the digitization of collections, i.e. the conversion of analog information on the collection into digital form. This serves as a tool for internal use but parts of the digital collection are also made available to the public online, ensuring greater access to the cultural heritage. In addition to this, the museum has engaged in the implementation of the SARA system - a shared collection database that is mandatory for all public museums in Denmark to be part of (Agency for Culture ans Palaces, 2018). While these two projects revolve around collection data, the museum has also started to gather more data on visitors. In this regard, an analysis application has recently been set up. These projects indicate that the museum is in the middle of a digitization process which has brought along new potentials that are recognized at the managerial level:

> *"So as I see it right now we are in the beginning of the second era right here in the museum, because five years ago we weren't even close to be able to do that [referring to research projects that involve the use of the digital collection]. We've done a hell lot of digitization,*

infrastructure development, creating an open API [application programming interface] so that also external researchers and students are able to actually get a hold of the data of the museum" (Int. 1)

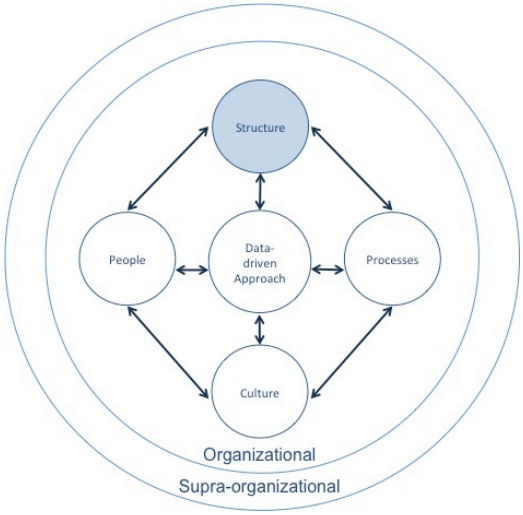
However, despite the number of data-driven projects, Big Data does not yet appear to be acknowledged across the organization as a central tool for strategic planning:

"we haven't reached that realization of the importance of this area. To me, it would be impossible to run a cool, relevant, exciting museum in a twenty-first century without seeing digital as part of the DNA of the organization. [...] And digital is the biggest difference between how a museum worked before and now, going forward." (Int. 1)

In light of Moore's (2015) *Data Maturity Spectrum,* which was presented in chapter 3, the National Museum can, based on the above, be categorized as being in the second stage of data-driven decision-making. Here, the use of data is commonly considered to be relevant for only "digital issues" (Moore, 2015, p. 270) that are perceived as being separate from other organizational activities. However, the implementation of the above mentioned initiatives indicates that the museum is moving in the direction of the third stage which aims at using data insights for managerial decision-making. The current data projects could potentially lead the way for the museum to be more data-driven in their approach to value creation. However, the use and impact of such an approach is largely defined by the context in which it occurs (Scholz, 2017). Consequently, we will in the following provide an analysis of the different organizational dimensions in the National Museum in relation to a data-driven approach.

5.2 Structure

5.2.1 Hierarchy



The museum is currently in the middle of a major restructuring process. One of the managers refers to it as "*the biggest reorganization we have had for more than five years*" (Int. 3). The new structure consists of four departments: Operation and Administration, Research and Conservation, Museums and Sites and a

newly created Development department. Especially the creation of the Development department is likely to affect how the organization will generate data-driven value in the future, due to the focus of that department, which is, as one of the managers explains it "*how we translate all the knowledge at the museum into visitor oriented businesses*" (Int. 3).

Despite the reorganization and the creation of a new department, the museum is still structured in a formal and hierarchical way, as illustrated by one of the managers, who states "*decisions are made on top of the hierarchies. [...] And to me that's a very traditional way of organizing things.*" (Int. 1) However, he/she also acknowledges that the museum has the ambition to blur the borders between departments by moving from a silo-based structure to a more project-based organization by enabling more "*cross-department, cross-unit collaborations*" (Int. 1). Another manager argues that the entire restructuring of the museum's departments can be understood as a commitment to a more project-based approach by stating "*we have reorganized towards this project*" (Int. 2), referring to the increased focus on the visitor experience in the museum in the Prinsens Palæ building. When the collaboration across departments and teams leads to an increased sharing of data and insights in the organization, this potentially could enable a more data-driven approach.

5.2.2 New Positions

With the current restructuring of the National Museum, some positions have been redefined in the organization. The process appears complex and causes confusion in terms of responsibility areas. One manager expresses it as follows: *"we are all trying to find out how much this new way of working in our new organization will mean for each of us"* (Int. 3). The confusion is further expressed when we ask another manager about his/her title: *"my title… I just got a new title [laughs], we are restructuring all the time"* (Int. 4). The creation of new positions comes with the restructuring process and is a result of the new focus on the visitor experience. It is evident that the awareness of "business thinking" prevails - one of the managers states that the museum *"need(s) to act like a business organization and not like, well, a pure political organization"* (Int. 3). In continuation of this, he/she states that this *"create(s) some new needs for competences and people in HR, economy, controlling, financing and stuff like that"* (Int. 3). In the definition of new positions, it is evident that the use of data is acknowledged as a matter of concern in relation to the museum's new focus when one manager describes his/her new position: *"I have changed the position because one of the things is that we need to use our data and our knowledge about markets and visitors more"* (Int. 3). The different positions in the museum are key in determining the use and consequently the results

related to working with Big Data, and it appears that the museum is moving in a promising direction in regards to support a data-driven approach to value creation.

5.2.3 Decision making

The restructuring of the museum has affected existing workflows including the way decisions are made. This is particularly evident in relation to the exhibitions, where the researchers are currently facing great changes due to *"a new research agenda"* (int. 4). This new agenda has been developed to support the vision of being more visitor oriented. One manager explains it as follows: *"At the moment, the researchers can research into whatever they want, picking their own target, and now we are going to work with more focused research so maybe we will say 'we would really like to see an exhibition about that' and then they have to do research."* (Int. 4). Based on this, it appears that decision-making becomes more centralized which results in the researchers' intrinsic visions becoming subordinate to the vision of the organization. This change illustrates the tension between *creative* and *humdrum* inputs that are often seen in the cultural creative industries (Caves, 2000). The creative input reflects the vision of the artist, or in this case the researchers, which comes to expression in the exhibitions. As one manager puts it, the researchers sometimes do *"more exhibitions for themselves or their colleagues than [...] for a normal audience"* (Int. 4). The humdrum inputs refer to the business components that appear to be of great concern to the managers at the moment. The latter comes to expression in efforts made to ensure that the creative vision underlying an exhibition is equally compelling to the visitors: *"we have to earn money, so nowadays you can't make very narrow exhibitions. [...] you cannot make exhibitions that are only interesting for a very limited group of people."* (Int. 4)

Besides the aspect of *who* makes the decisions, it is also relevant to look at *how* these are made. Even though data is acknowledged as a tool for better decision-making in museums (Moore, 2015), data are not yet considered a central tool in the National Museum. One manager is quite straight-forward in his evaluation and states that *"I wouldn't say that we are data-driven in the sense that we use data to support decision processes"* (Int. 1). The same manager recognizes that this might be a problem and that decisions are often made on irrational foundations and lack understanding of the museum as a business. This comes to expression when we talk about opportunities for making money on the basis of selling data in form of images to external parties:

> *"I am not even sure we've made money before. Like, the cost of administering people writing us 'Can I use this or that image of this book?' and then we are like 'Yeah, you can buy it for*

> *250 DKK' and then we've spent one work hour that costs maybe 375 DKK doing that. [...] the niche businesses that we built throughout the years - selling images is one of them - we've never really treated them like hardcore business, like really realizing: are we making a profit on this?"* (Int. 1)

However, a focus on changing this lack of business-understanding prevails, and an external collaboration with the consultancy company Rambøll has been initiated in order to develop what is referred to as the "model" - an analysis application based on data, which is developed with the aim of generating valuable insights for better decision-making. The model is still very new but the goals and intentions connected to it are clear. It is described as *"a great model"* (Int. 3) which can assist in forecasting and evaluation of business cases:

> *"We will be using this model to say 'hey, if we want to invest one million in doing a new exhibition or we could use one million for doing a big campaign, or we could use one million on hiring another public relations assistant - where is that money most well spent?' [...] So just make qualified decisions about how we spend our money here because we do not have much money."* (Int. 3)

By means of the new model, it will also be possible to derive insights that are relevant for the development of exhibitions. This new analysis application is therefore an ideal example to illustrate a point made by McAfee and Brynjolfsson (2012), who argue that the tools of Big Data, when implemented and spread within in an organization, will substantially change how decision are made and experience is valued. While all the interviewees seem to agree that insights about visitors' preferences are of great value in this regard, the model does not appear to be the number one tool coming to mind among the different managers. When we talk to an interviewee about the development of exhibitions, he/she refers to non-digital techniques such as observations and focus groups as valuable ways of generating insights. In addition to this, he/she emphasizes that *"sometimes you can decide not to use them if it doesn't work."* (Int. 4). Based hereon, the reality of how to make decisions and hence how to plan and work in the organization appears inconsistent - first of all in terms of *where* to derive insights from, and second of all in terms of to what *extent* to use such insights. This inconsistency can also be observed in literature. McAfee and Brynjolfsson (2012), for example, argue that organizations used to entrust 'well-placed' employees, usually managers on an executive level, with making important decisions based on their experience or

intuition. This practice was developed in a time where data were often scarce, expensive to collect and only available in analogue form. However, with the era of Big Data, these conditions have changed drastically which has led authors like McAfee and Brynjolfsson (2012) to argue that managerial decision-making should increasingly be based on data analysis insights because "throughout the business world today, people rely too much on experience and intuition and not enough on data" (McAfee & Brynjolfsson, 2012, p. 9). In contrast to the remark made by Interviewee 4, McAfee and Brynjolfsson (2012) point out that managers have to learn to be open towards overruling their initial decisions or opinions based on data insights in order to lead a successful data-driven organization. However, authors like Moore (2015) and McAfee and Brynjolfsson (2012), who are in favor of data-driven decision making, do not offer a clear guideline for practitioners regarding the extent to which they should reject intuition and instead rely on data-generated insights. Though, they all acknowledge that experience, visionary thinking and intuition should not be entirely replaced by data-driven decision making. Here, we can draw a parallel to a debate that has long dominated the cultural industries. Among several dilemmas or *balancing acts* that face managers in cultural institutions, Lampel et al. (2000) discusses the act of balancing *Demand Analysis* and *Market Construction*. Demand analysis illustrates the view that cultural products are shaped based on customers' needs and desires (Lampel et al., 2000) which is in great alignment with a data-driven approach where for instance exhibitions can be build on customer insights. In contrast to this is market construction, which represents the view that customers' demands are solely shaped by the producers' creativity. From such a view, data-driven customer insights appear much less valuable as customers are believed to not know what they want. While there is no either or, Lampel et al. (2000) argue that both polarities must be kept in mind when doing business in practice. The different realities of decision-making processes that appear when we talk to the managers at the National Museum illustrate both views and might in fact be a good prerequisite for finding a balance between analysis and construction.

5.2.4 Centralization and Decentralization

The question of centralization vs. decentralization applies to different organizational contexts. As illustrated earlier, it can refer to the centralization or decentralization of decision-making as well as strategy development. According to one manager, both are centralized to a certain extent. He/she compares the decision-making process to a nervous system, where the top management operates as the brain and sends out signals to the different organizational levels, "*so that the body does what the brain decided*" (Int. 1). According to his/her perception, this also applies to funding decisions and

strategy development. Even though the development of projects might happen more decentralized in the organization when it comes to funding and consequently the realization of projects, "*the board of directors has the power to decide what goes out and what doesn't in terms of what it is that we ask for money for*" (Int. 1). A similar process is in place for the development of strategies, even though one manager and his/her colleagues were able to suggest how the general strategy for the museum "*could be strengthened by a digital perspective*" (Int. 1), they did not have "*any power over the strategy*" (Int. 1), thus decisions concerning the general strategy appear to be rather centralized. This centralization of important decisions is also likely to have an effect on the museum's ability to implement a data-driven approach. In the strategy, for example, the suggestions made by Interviewee 1 and his/her colleagues, were "*adopted on a varying scale*" (Int. 1) and he/she points out that the extent to which a data perspective is integrated in the general strategy depends on whether the top management is *"able to sense the relevance of the stuff that we fed into it"* (Int. 1).

When Günther et al. (2017) refer to centralization and decentralization, they focus on 'big data capability structures' in the organization. As mentioned earlier (cf. chapter 3), this addresses the location of the capabilities and analytical skills to work with Big Data in the organization, i.e. whether they are centralized in a competency center or integrated in a decentralized fashion into the different departments and units. In this regard, there appears to be no consensus in the museum whether the organization should commit to a decentralized or centralized approach. While the technical knowledge of setting up and managing databases is centralized in the IT department, one manager within this department explains that it is "*important that the knowledge on the data – what kind of data, and the registration methods, and so on – is out in the collections*" (Int. 2), indicating that he/she believes that the researchers within the organization, who work with the collection databases, have to have an analytical understanding in order to use these databases efficiently. The same perspective is shared by another manager who furthermore sees potential in "*weaving developers into the research teams at the museum as well [...] to just accelerate some of the processes that goes into research*" (Int. 1). Implementing this idea would mean to establish decentralized data capability structures, according to Günther et al. (2017). The development of digital and data related initiatives also seem to be decentralized. However, the museum has established a position to structure these scattered projects, as one of the managers explains:

> *"there are a lot of initiatives popping up all over the place all the time that have more or less to do with digital and one of my tasks is to have a broad network at the museum, being in the know on if there are projects being developed that haven't been funded or activated yet,*

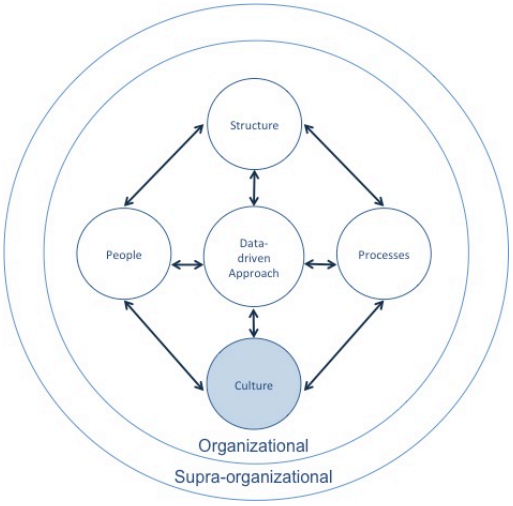
trying to figure out how - if that's the case at all - how they contribute to the strategic goals of the museum or trying to nudge them into a place where they do." (Int. 1)

This illustrates an effort made by the museum to align and centralize digital and data-driven initiatives to guarantee that those projects support the overall strategic objective of the museum. The responsibility areas of Interviewee 1, therefore, could be understood as the counterpart of the IT department in terms of centralization, while the IT department ensure that all technical components and databases are aligned, Interviewee 1 works towards a qualitative alignment of independently developed data projects. However, these centralization tasks prove to be challenging as both managers admit that it is hard to become aware of all ongoing project. While Interviewee 1 states that he/she "*do[es]n't cover all kinds of digital initiatives, because they pop up in many different kinds of places of the institution*", Interviewee 2 acknowledges that there might be some missed potentials, caused by the decentralization of databases and applications that were created independently by employees or PhD students for specific, temporary purposes: *"There is also, I am sure, there are also databases around that we do not know anything about, that might be created only by one, two persons. And if they are not employed here anymore, it might just lay dead somewhere on a file share*" (Int. 2). Another manager, however, raises concerns in regards to the decentralization of analyses and use of data which is promoted by Interviewee 1 and 2. When talking about the use of the new analysis application, which was mentioned earlier, he/she explains that it is centralized in the organization with him/her being in charge of the model, given the potential risk that *"people will [...] misinterpret things [...] which could be a problem"* (Int. 3).

The mixed approaches and opinions when it comes to centralization or decentralization of Big Data capabilities could be an indication for a development towards a hybrid model, as proposed by Günther et al. (2017). By combining elements of centralized and decentralized structures when it comes to the capabilities of working with Big Data, organizations can optimize their value creation. Interaction and communication across departments, for example, is perceived as being an important element of Big Data value realization, whereas in regards to data governance, centralized approaches are expected to be more favorable (Günther et al., 2017; van den Broek & van Veenstra, 2018).

5.3 Culture

5.3.1 Attitudes towards Change and Innovation



It is not an univocal answer that comes from the different managers when we start the dialogue about the National Museum being an innovative organization. On the one hand, the museum is described as being quite innovative compared to museums abroad, while on the other hand it is emphasized that the organization is far being as innovative as it could be. However, there is agreement among the managers that big changes will dominate the organization during the coming years due to the new strategic focus and a plan to rebuild the entire physical exhibition space. In line with this, the organizational culture is under great change as a result of the new director, Rane Willerslev, who makes an effort to nurture change and innovation within the museum. One of the managers describe this change as follows:

> *"Before [...] it was very much an academic no-fault culture [...] where you can't take any chances. If you do take chances and you fail, you'll be punished. If you have a success, no one will really recognize it… It was very, very cautious and very much non-experimental, and that is changing because of our new Director who will say 'you have to make mistakes, you have to make some errors, you have to try, you have to experiment. I won't punish you, I'll embrace it if you do it, because if you don't try, that is the thing I won't accept'. So, that is changing the way we are working together too. We have much more confidence in each other, and we need that."* (Int. 3)

In the implementation of data-driven initiatives, the focus on *values* such as experimentation and trial-and-error to guide the culture will most likely benefit the museum (Erevelles et al., 2016). The technologies that are connected to Big Data might be limited to IT functions, but its transformative power is, in line with the socio-technological perspective, largely shaped by the people in the museum (Scholz, 2017). Therefore, the organizational culture is an important consideration for the museum's further work with data-driven initiatives. In this regard, one of the interviewees points to the fact that many employees within the organization are recruited from similar disciplines and universities that are not business schools. This can be seen as an example of what DiMaggio and

Powell (1991) describe as *normative isomorphism* which constitutes homogenization driven by professionalism. In the efforts of upholding legitimacy, organizations tend to conform to certain standards in the field they form part of through, for instance, the filtering of personnel (DiMaggio & Powell, 1991). This way, certain norms enter the organization which tend to be reinforced through internal socialization (DiMaggio &Powell, 1991). Based on the rationale that most employees at the National Museum are not educated within business, one of the managers conclude that the organizational culture is not necessarily data-ready.

It is however evident that many innovative projects have been planned across the organization. For example, a tracking system has been put into place with the purpose of tracking visitors as they move around the exhibitions. The IT department is currently working on covering bigger parts of the exhibitions to make the tracking system even more detailed. With projects like this, it appears that positive attitudes towards innovation exist in the organization. However, at the same time it appears that several projects fail due to lack of funding which has an effect on the museum's digital progress: *"We are far from implementing new IT-based solutions in our exhibitions. As I said, we need funding first"* (Int. 2). As funding is primarily linked to the supra-organizational level, this dimension appears to pose hindrances on the museum in regards to its ability to change and innovate.

5.3.2 Data Mindset

In order to be able to generate value with a data-driven approach, an organization does not solely have to build the technical prerequisites, it also has to establish the corresponding culture, as described above. From a technical perspective, the museum is in the process of building the structures that enable Big Data analysis, which includes, as mentioned in the definition of Big Data (cf. chapter 2), the consolidation of different data formats. This is illustrated when one of the managers explains: "*So actually, we could put apples and pears and bananas and convert [them] into the same data structure. That's actually what we have been working on for few years to create this fundament.*" (Int. 2). By building these technical data infrastructures, the museum follows a strategy proposed by Mayer-Schönberger and Cukier (2013) that was mentioned earlier: making data sets compatible as well as suitable for different purposes so that organizations can unleash the *option value* of their data. Besides the technical requirements, Rydén et al. (2017) identify the managerial mindset as an enabling or limiting factor of the successful use and implementation of Big Data technologies. In line with this, we will in the following refer to this managerial understanding as the *data mindset* which will affect the organizational culture.

One manager offers the implementation of the analysis application as an example of the changing culture towards a data-mindset in the museum when he/she states: "*that has definitely changed. I mean, if I was to suggest something like this four years ago, they would have looked at me and said 'what are we going to use that for?' I mean, 'we know what people want' - and that's changing*" (Int. 3). Another manager acknowledges that Big Data now could be understood as a mainstream phenomenon and that *"the real value creation of Big Data is getting more and more profound"* (Int. 1). However, this manager makes a differentiation in his/her evaluation of the phenomenon. On the one hand, he/she describes it as a "mainstream phenomenon" to the general world. On the other hand, in the organizational context of the National Museum, he/she states that "*Big Data is to us not bleeding edge, but maybe it's cutting edge*" (Int. 1). Despite this acknowledgment - that the data mindset might not be sufficiently proliferated in the museum yet - the manager appears to be optimistic about that the effectiveness of data-driven solutions will cause a wider adoption of Big Data analytics, especially in a research context:

> *"It's like using a crane for building a house, why wouldn't you? If you have cranes you are able to imaging different kinds of houses, because it opens up new kinds of very practical opportunities or practicalities as well. So this is how I see that in relation to research – that using data, using digital methodologies, inviting developers into research teams, for example, not with specific goals necessarily, but just as a resource, so that they don't have to go through it all on a very manual level. That would be super cool."* (Int. 1)

Erevelles et al. (2016) support the theory that Big Data can substantially influence how research is approached. According to Erevelles et al. (2016), Big Data coupled with a (partial) ignorance-based view, i.e. a focus on the things that are unknown, allows researchers to pose new questions that are not based on established knowledge which ultimately might lead to novel scientific discoveries. In order to do so, researchers need a data-mindset, which in this case primarily refers to an open-mindedness and the acknowledgment that creativity facilitates the discovery of new, interesting questions and consequently valuable insights (Erevelles et al., 2016). However, Erevelles et al. (2016) point out that organizations tend to rely on existing knowledge and past experiences, which in turn can hinder creativity and the development of innovative ideas (Erevelles et al., 2016). Therefore, Erevelles et al. (2016) recommend using Big Data analysis as a research tool in combination with a (partial) ignorance-based, inductive view. The comments made by one manager regarding the approach to research in the museum are very much in line with these ideas:

> *"So doing data analysis across huge datasets to enable us to ask new questions, rather than posing new answers – I think [...] that's one of the key ways to show the value of data analysis on a bigger scale. It's not about finding answers, it's about finding questions - as I see it. And obviously cool research projects are based on good questions. The good answers, that's something that comes later on, but on the outset it has to do with great and relevant questions and new kinds of questions. So there is a huge potential, as I see it"* (Int. 1)

In addition to that, with the comment above this manager acknowledges that their might be some *hidden value* in the museum's collection data that can be uncovered by using new ways of doing research and introducing Big Data Analytics to research.

As illustrated in the above, some of the managers in the museum display the data-mindset that is expected to build the cultural foundation for data-driven value creation. However, there are also limiting factors to the proliferation of the data-mindset in the organization. As mentioned in the beginning of this chapter the relevance of Big Data and related technologies has not reached all organizational units. One manager explains that "*The maturity of using digital tools efficiently is not that high. So, there is really a potential on raising the knowledge of the users [employees] in using digital tools.*" (Int. 2). According to the same manager, this lack of awareness also includes the top-management. However, their support is especially important because they make, as illustrated earlier, the strategic and financial decisions that guide the organization. This misalignment is addressed by Interviewee 2: *"a larger investment would be needed and also a clear governance model […] If I tell the top management about a potential, they nod and accept that of course, but they do not allocate any extra resources for that purpose"* (Int. 2). Another manager provides a suggestion regarding how the data-mindset could be further established in the museum in the future, also on a top management level:

> *"draw in digital expertise in the boards, in the boardrooms, in the management teams, [...] as a way to show the realization that this is becoming an evermore central piece of the puzzle in terms of running a modern, twenty-first century company, institution, organization.*" (Int. 1)

Another way to establish a more data-driven mindset is introduced by Interviewee 3. He/she argues that some of the data that are collected are not analyzed because there is no incentive to do so in form of a target set out that the organization or department is measured against. Therefore, by

setting such targets, the ministry of culture or the top management of the museum could incentivize relevant departments or teams to use data analytics to a larger extent.

There are also projects that can potentially influence the data-mindset in the organization. One manager presents the example of the annual hackathon 'HACK4DK' which the National Museum takes part in:

> *"It has been running annually within archives, museums, libraries, as a way of both showing that it is not necessarily impossible to do digital stuff. That's kind of the mindset of many people that it is expensive, takes too long [laughs], doesn't realize the initial goals of it - that's a lot of the stories or narratives [...]; digital kind of tends to fall into that category. [Referring to the purpose of the hackathon] just to show that you are able to draw in creative, talented people for a weekend and when they present their project Sunday, you are actually able to see that something has been done and you can kind of get a sense of the idea that they have, because they have put it into realization and all" (Int. 1)*

Another project that can be understood as an illustration of how the mindset shifts gradually towards a data-driven approach is the tracking system in the museum that was mentioned earlier. As one manager explains, this technical application was created "*some years ago*" as a proof of concept. The management at that time, however, did not pursue this solution, which would have needed more funding, any further. Nevertheless, this perspective seems to have changed because the management recently has expressed interest in the tracking system and approached the department which was responsible for the initial implementation. Interviewee 2 explains his/her rationale for developing the proof of concept for the tracking system as follows:

> *"We had a proof of concept on the tracking solution, but it was actually not when we created or when we implemented it some years ago, we knew that the business was not mature at that time to use this solution, but when they came and asked how we do that, it was good for us to show we actually have a proof of concept here, we can log in, we can show you exactly where different kinds of visitors access their smartphones in the exhibitions, and then they worked further on with that."* (Int. 2)

Another manager elaborates on that example by stating that even though the museum has not yet used this system to support decision-making, based on the data it provides, they intent to do so - "*we want to and we are discussing it in terms of, for example, heat maps in galleries*" (Int. 1).

These examples illustrate that not everyone is on the same page regarding the data-mindset in the museum. This is in line with Moore's (2015) argumentation that the different stages of the *Data Maturity Spectrum*, which was mentioned earlier, do not have to be mutually exclusive. Thus, some managers might already display a mindset that is closer to the third and final stage of the spectrum, where insights from Big Data analysis are used to support managerial decision-making, whereas others are still in the first or second stage of data-driven decision-making. However, by pioneering a data-mindset and establishing relevant initiatives, these managers might support the distribution of such a mindset within the organization. The new interest in the tracking system could indicate that the increased focus on the visitor experience might function as a catalyzer for a broader distribution of the data-mindset within the museum. Therefore, the following dimension focuses on how the organization appears to be affected by this more visitor-central approach.

5.3.3 Visitor Orientation

The museum has set forth a new strategic focus on improving the visitor experience. By acknowledging that this focus on visitors is a central aspect of their organizational activities, the museum displays its service-oriented culture. In light of Nograšek & Vintar's (2014) assessment of the impact of new technologies on a service oriented organizational culture, one can argue that a data-driven approach can also facilitate a faster transition towards such a culture as well as a significant change in the values and assumptions ingrained in the organization. Due to the fact, that the service the museum is providing is a service to its visitors and the public, we will hereinafter refer to the *visitor orientation* when discussing how a data-driven approach is potentially affecting a service-oriented culture.

The strategic change, that brings along an increased focus on the visitor experience also affects the organizational culture, as one of the managers explains: "*in terms of the culture that is here, it is rapidly changing right now*" (Int. 3). It appears that one of the factors that fostered this 'rapid change' is the clear communication of that aim to the different departments, especially through the new director Rane Willerslev. All interviewed managers identified the increased focus on the visitor experience as one of the main forces that drive current changes in the organization. This is exemplified by a statement of one manager:

> *"There is definitely a strategic change and it has been very, very clear given out to the whole organization. I would say no one in the museum must have doubts on what the strategy is and it is "visitors first!" That is the strategy. We have – as I said – we have reorganized towards that goal"* (Int. 2)

By stating that the museum has '*reorganized towards that goal*' the manager refers to the newly created development department that is primarily focused on improving and innovating the visitor experience in the Prinsens Palæ building. This, on the one hand, includes the physical visitor experience which, according to one manager, is in desperate need of a renewal:

> *"in terms of the visitor experience, there are a lot of different visions and possibilities of using digital media to heighten the quality of the visitor experience at the museum. And in the museum here [referring to the Prinsens Palæ] if you would put on glasses so that you can only see digital exhibition elements that would be a time machine into the late 90s. [laughter]"* (Int. 1)

On the other hand, the Development department is also responsible for gathering more detailed insights on the visitors in order to align the visitor experience with visitor's interest and preferences. As one of the managers who is part of this department explains:

> *"So my key task is to follow our progress, how we are doing in terms of creating visitors experiences, ratings, internal things like the satisfaction levels, different types of experiences for children, for adults… and also of course all external data such as brand awareness, how many people know about the museum, visiting intentions - how many people are planning or preparing or wanting to visit us and why not - some people are not coming here. It is also a lot of information about our current day-to-day, month-to-month economical performance on our visitor experiences, I mean how many ticket sales, turnover and stuff like that."* (Int. 3)

The analysis application that was described earlier is an important tool for gathering these insights that are expected to inform decision-making and ultimately lead to improvements and innovations in regards to visitor experience. The results provided by this analysis application are complemented by annual visitor surveys, one form the Danish Agency for Culture and Palaces and one conducted by the museum itself. The fact that the museum is gathering these data might also indicate that they

are developing“ *a methodology way [of] - messing or aggregating more, and more, and more [data] and furthering the crispiness of our images of our customers*” (Int. 1). According to the same manager such a methodological approach to the visitor experience is still missing. Another manager supports the idea to further develop the analysis of visitor data in order to provide more valuable insights on specific target groups. He/she illustrates this with an example on Danish visitors who used to come to the museum on a recurring basis but stopped to do so when the museum started to charge entrance fees. The manager imagines that in the future, the museum would be able to provide solutions for these issues based on the insights provided by data analytics:

> *“So, the thing is, could we create a little bit of value for them, meaning that it would make sense for them to come more often and use that data to create more personalized experiences and more valuable experiences? It would be solving two problems in one. We had a coverage of the Danish marked and higher turnover - that would be great!”* (Int. 3)

In this statement the manager already introduces the potential of ‘*personalized experiences’*. Another interviewee picks this example up and elaborates on the potential of creating personalized tours to guide visitors through the exhibitions space in the museum based on their personal interests.

The visitor orientation is not only expressed in an increased focus on gathering and analyzing visitor related data, it is also apparent in the way exhibitions are planned. According to one manager the strategic emphasis on enhancing the visitor experience also affects roles like interpreters, researchers and architects, who are responsible for releasing exhibitions. As he/she illustrates the shift towards prioritizing the visitor experience has an impact on the team composition for the planning and set up of exhibitions. The interpreter who is in charge of assessing the exhibition from “*an audience point of view*” by asking “*How can we make this interesting and how can we make them look at this? There is no purpose if they just don’t see it*” (Int. 4) is given more power.

Furthermore, the visitor orientation is not restricted to the physical visitor experience it also includes the digital visitor experience. As illustrated earlier, the museum has started to offer access online to some of their digitized collections. In this regard, some managers explain that the public digital collection should not simply be understood as an expression of what is technologically possible. They should also provide a contribution to the visitor experience. As one manager explains: *“I mean it's nice, it's interesting, but if it has no relevance to the public, ‘why do it?’ we would say”* (Int. 3). Another manager expects that there is some undiscovered potential in using the digital

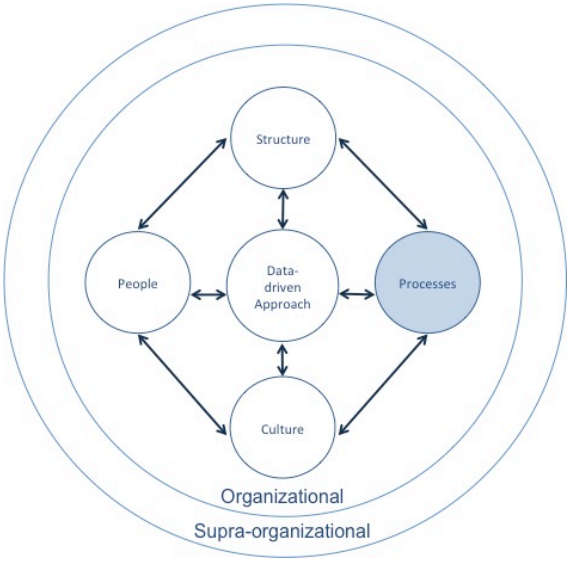
collections to enhance the engagement with visitor. When referring to the second era, after firstly digitizing all the analog information on the collections, he/she states:

> *"And now the second era we should start doing regular projects actually, because we've got the prerequisites for it, we've got a massive agenda on visitors. So if we are able to kind of connect those two things, I think that would be pretty cool and that's one of the things that we work on very much right now"* (Int. 1)

All these examples illustrate that the visitor orientation is shared across different departments and roles and that it is the central cause around which many activities are structured. By providing an enhanced visitor experience the museum cannot only fulfill its mandate to disseminate the knowledge preserved and created by the organization to the public in an improved way, it can also, as illustrated in some of the examples given above, potentially generate public value by drawing more customers in and engaging them in new ways.

5.4 Processes

5.4.1 Improvement and Innovation



The different data-related initiatives at the National Museum have obviously led to change in the museum's existing processes. According to the interviewees, the initiatives have resulted in *improvements* of processes, i.e. better efficiency and effectiveness (Günther et al., 2017). Particularly collection data are emphasized as a tool to support the researchers' work, which is perceived as important in the organization because the researchers *"must provide knowledge for new exhibitions"* (Int. 4). The digitization of the otherwise analogue data does not only provide faster access to information but also enables people in the organization *"to create relations between the different kinds of entities or objects that are in the collection"* (Int. 1), which also carries the potential of innovating existing research processes as explained above. This is further supported with the earlier mentioned SARA system which also

appears to give rise to better collaborations across the museum field. Even though one of the managers points to the fact that the system is delayed and that they *"are not also sure what SARA – the SARA system – will bring us of opportunities"* (Int. 2), the museum's strategy for the period of 2017-2020 expresses optimism about the system:

> *"The development of SARA and shared standards for preservation lay the groundwork for sustainable coordination of museum collaborations at the national level within preservation and collection and for new collaborations with other museums regarding communications and research initiatives"* (National Museum of Denmark, 2016, p. 5)

In light of this, the system appears to present opportunities to improve several processes that relate to the museum's main tasks (collection, registration, preservation, research and dissemination).

In addition to the collection data, the use of data derived from Social Media platforms are also by some managers perceived to have improved marketing processes with opportunities such as monitoring marketing campaigns, targeting and retargeting potential visitors more successfully. However, a user survey made by Rambøll in 2017 shows that Social Media is the least mentioned source when visitors are asked what has driven them to the museum. This indicates great room for improvement in marketing, which is otherwise known as a discipline that has been greatly transformed with consumer analytics being at the core of the Big Data phenomenon (Erevelles et al., 2016). In addition to this, initiatives that are currently put into place are very likely to generate improvements of processes within the near future. Here, the tracking system that has been set up in the exhibitions can be mentioned. The ability to create heat maps based on how people move around in the building can help assist in the process of planning exhibitions more effectively. Moreover, the 'model' developed in collaboration with Rambøll is likely to generate plenty of useful insights that can improve decision-making at the museum. First of all, it can assist in making qualified decisions on investments and hence ensure the optimal cost-benefit. Moreover, it can assist in forecasting regarding, for instance, visitor numbers, which in turn can help plan most effectively. This model will, over time, create a better foundation for improving decision-making as one of the managers explains: *"We will provide them with the new data and they will put that into the model and say 'well, before it was like 90% correct, now it's 93% or 94%' so we will get more and more exact results from the model for each year"* (Int. 3). On an overall basis, the different data-initiatives, that are either in place or about to be realized, appear to improve a number of processes in the museum

that can help the organization improve the visitor experience and run more cost efficiently which are central points in the museum's current strategy (National Museum of Denmark, 2016).

In contrast to improvements, *innovations* occur when the organization with a data-driven approach develops new value propositions or becomes able to target new customers or interacts with already existing customers in new ways (Günther et al., 2017). Here, it is relevant to draw on Bakhshi and Throsby (2012) who introduce three ways of innovating audience reach. *Audience broadening* refers to the capturing of a larger share of the already known population, *audience diversifying* refers to the attraction of new user groups, and *audience deepening* refers to an intensified engagement with the visitors (Bakhshi & Throsby, 2012). At the National Museum, the realization of the online collections have provided an open access to plenty of collection data. This has first of all enabled audience diversifying as new user groups - for example people settled abroad - are now enabled access to parts of the museum's collections. While the access is free and therefore does not provide direct economic value to the museum, it supports the fulfillment of the task 'dissemination of cultural heritage' and adds to the creation of *public value*. As mentioned earlier (cf. chapter 2), making collections available on equal terms to all members of society is an element of public value, more specifically it refers to the institutional value museums hold (Scott, 2008). The online collections can also be seen as innovation in audience broadening as people located in regions far from the Copenhagen area have the possibility to access information at home. The aforementioned user survey made by Rambøll in 2017 shows that 62% of the Danish visitors at Prinsens Palæ are from the Copenhagen area while only 6% are from the region of Northern Jutland and 7% from the region of Southern Denmark. This could indicate a geographic barrier, which can partly be eliminated with the online access. However, it is important to note that the online collections can mainly replace the need for information and not the physical experience that are sought by 'experience seekers' who make up 24% of the museum's visitors (Kulturministeriet & Rambøll, 2017) - a fact that is supported by one of the managers who states: *"looking up information on the Internet is a pretty different experience than coming here with your friends or family, to have a social event. Museum visits are very social events, like going to the cinema as well"* (Int. 1)

Audience deepening as a result of data-driven initiatives are harder to identify in the organization. However, one example can be found in "The Digital National Museum" which was initiated in 2012 as part of the museum's digital strategy (Det Digitale Nationalmuseum, 2016). The website was built for the purpose of adding geo-tags, i.e. geographic identification metadata, to the museum's image collections by means of crowdsourcing where individuals can submit data via the Internet. This gives the audience a new way of interacting with the museum and can thus also be

understood as an innovation in the museum's delivery of public value. By presenting the public with new, meaningful ways to participate in public programs the museum can increase social capital, which is understood, according to Scott (2008) as a dimension of instrumental value. This crowdsourcing initiative is, according to one interviewee, also seen as an opportunity to tap into a pool of new, creative and free resources and therefore as a way of improving the process of realizing the digital collections.

While the project is still running, there has been no follow-up, and the last official update from the museum was posted in January 2016 (Det Digitale Nationalmuseum, 2016). This could indicate that data-driven innovations have not been of great prioritization in the organization - a point than can be supported even further through an additional exemplification. During our interviews, one manager points to the fact that a big problem exists in the visitors not being able to find their way around the museum. To this, he/she proposes a solution that gives breeding ground for intensified engagement, which could be realized based on a data-driven approach:

> *"We got 12,000 square meters of exhibition space, so nobody is able to visit everything in one day [...] people coming here for two hours, what are they supposed to see, how do they make it more possible for them to actually experience what it is that interests them? [...] you got brochures on different tours in the museum, so it's very much a one-size-fits-all offer [...] but I would suppose that the differences between our visitors are greater than three different tours. So, for example, for you to be able to kind of just on a very basic level find your way around the museum and maybe creating your own tour, like a custom-made tour. That you are able to input certain things and then you get printed out the custom made tour, because we know where our stuff is and what it is, so we create that tour for you."* (Int. 1)

The example provided carries the potential of combining different datasets; visitor data provided by the visitor, collection data provided by the museum and even data from the aforementioned tracking system could likewise be incorporated. Hence, it illustrates a great example of an innovation derived from the work with Big Data and well-fitted for the museum's increased focus on visitor experience. Yet, the idea has not been realized and one can question why given the fact that the problem of visitors not being able to find their way around appear to have existed for long. A case study made by Center for Tourism and Culture Management in 2010 points to the exact same problem (Lyck, 2010).

5.4.2 Sourcing

While we have covered a number of processes related to exhibitions, marketing, research etc. in the above discussion on improvement and innovation, we choose to review sourcing processes separately as they are, especially in this case, an exemplification of how processes on the organizational level are influenced by stakeholders of the supra-organizational level (Nograšek & Vintar, 2014). According to Nograšek and Vintar (2014), outsourcing of ICT related processes is common in public institutions. Even though the technical capabilities that are required to set up and manage the collection databases are located within the National Museum, more specifically centralized in the IT department, other technologies and capabilities that, for example, include digital elements in the physical exhibition space might be provided by external parties. As one of the managers explains:

> *"I am sure that the modernizing of the physical exhibitions also will include some digital solutions somehow and also different kind of digital solutions that we do not know today or we do not have today, but actually there are companies specialized in that kind of solutions. So I am not sure that we here will directly support that kind of solutions but I hope that we can provide the data that should be used in these systems"* (Int. 2)

This example illustrates that there seems to be a clear understanding of which technical and data-related tasks are essential for the museum in order to fulfill its five tasks and which are therefore developed in-house as well as which technical solutions have more of a supporting character and can thus be outsourced to external providers. However, outsourcing decisions can be restricted by public policies and regulations as pointed out by another manager. He/she describes these policies as a potentially limiting factor to any kind of project work where external expertise is required. The museum cannot hire whomever they want for a certain task but is necessitated to do open tendering:

> *"For instance, if we are going to do a big campaign or a big project [...] we can't just go out and hire anyone we want to. Within a very limited amount, we can just go and hire whomever we want, but if we cross a line, like 500,000 DKK or 800,000 DKK or 900,000 DKK which isn't a lot for a lot of companies, we have to do a national, nationwide call [...] it's very time consuming."* (Int. 3)

Nonetheless, when the museum lags the qualifications needed, for example for new analytical tasks such as the ones required for the analysis application, they appear to collaborate with external parties such as Rambøll in the case explained above.

In addition to outsourcing, the museum is also engaging in crowd-sourcing, primarily in regards to their digital collections. As explained by one manger, the collections website is not just a means to provide data to the public, it is also "*an open source project*" (Int. 1). By providing open access to these collections, the museum aims *"to benefit from the creative potential of web users, doing all kind of crowdsourcing projects and stuff like that"* (Int. 1). As illustrated earlier when presenting the innovative example of the use of geo-tagging for a crowd-sourcing initiative, such projects can deliver valuable results for the museum and at the same time open up new ways to engage the public, and therefore generate public value. Another argument for offering crowd-sourcing opportunities, that is presented by the same manager, is that it might help saving resources:

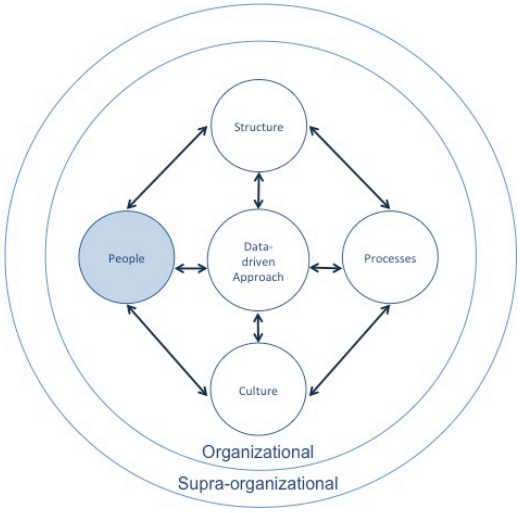
> *"If we are the ones creating all the relevant information around our collections, I mean it's going to take 500 years with the resources we have. So if we want to break that curve and scale it, crowd-sourcing is the only way to go, as I see it. And there is so many knowledgeable people out there that are not on the payroll of the museum - it seems so obvious for me to hook into that resource and try to blur the lines between the formal organization and an informal community around us"* (Int. 1)

This approach is in line with Mayer-Schönberger and Cukier (2013) observation that governmental institutions increasingly provide open-source projects. The authors offer two arguments in support of this trend. First of all, despite being in possession of valuable and relevant data, governmental institutions have been ineffective in using the data in innovative ways. While these institutions are not able to access the latent value of their data, it is expected that private organizations or individuals might find more innovative ways to unleash these hidden values. Second of all, the data held by public institutions could to some extent be understood as data that should be open to the public because the role of these organizations is to serve the public. Consequently, by providing open access to the data, these institutions are simply in compliance with their roles as public servants. (Mayer-Schönberger & Cukier, 2013) The same argumentation can be applied to the National Museum and other public museums in Denmark, as they are responsible for making their collections and knowledge available to the general public as well as for research purposes (Lyck, 2010). By

providing an open access to their collection databases online, the museum is hence able to generate public value.

5.5 People

5.5.1 Leadership



According to McAfee and Brynjolfsson (2012), the most challenging aspect of implementing a data-driven approach in an organization is the managerial side of things and not the technical component. This is further supported by Nograšek and Vintar (2014) who argue that when new technologies are implemented, the *"greatest challenges occur on the leadership level"* (p. 115). This impression is shared by one of the managers who explains: *"doing instructional change in other people that's a very difficult thing to do, because there's a long way from something being said to a habit being changed"* (Int. 1). McAfee and Brynjolfsson (2012) and Nograšek and Vintar (2014) indicate that transformational processes, such as implementing a data-driven approach and new technologies, are largely shaped by the organization's leadership. While Gao et al. (2015) argue that the success of Big Data initiatives is tied to strong involvement of leaders, McAfee and Brynjolfsson, (2012) present the argument that becoming a data-driven organization in some cases requires "hands-off leadership". Examples for both perspectives can be identified at the National Museum. On the one hand, the strong and clear commitment to a more visitor-oriented approach, which is primarily prompted by the new director, has facilitated the creation of Big Data initiatives like the new analysis application as illustrated earlier. On the other hand, there have been examples of data-related projects that have been developed independently in the absence of a clear mandate. Here, the examples of the initial implementation of the tracking system or the crowd-sourced geo-tagging project of images from the digital collections come to mind. However, as explained earlier, both initiatives are also examples of projects in lack of follow-up actions (the tracking project is revisited now, but as one of the managers explains, several years have past between the initial implementation and the resumption). One explanation for these discontinuations of data projects that otherwise bore potentials for value creation could be the missing involvement of the top-management. When asked about the tracking

system, one of the managers mentioned that once the top-management became aware of the potentials of this solution, they decided to continue the project. These examples could therefore support Gao et al.'s (2015) reasoning that Big Data projects require strong support and involvement from the top-management in order to be successful. So far, according to all the interviewed managers, the director and top-managers are primarily focused on the visitor experience, more specifically the physical visitor experience in the Prinsen Palæ building, and some data initiatives are understood as supporting this goal.

Even though a data-mindset as well as a data-driven approach to decision making do not appear to be disseminated throughout the top management, the changes in organizational culture set forth by the new director might build the breeding ground for changes in this regard. According to one of the managers, the organization is shifting from a non-experimental culture to a culture that allows for freedom and experimentation which is primarily nurtured by the new director. This illustrates a new approach to leadership which is also expected to bring along changes in the museum's image, i.e. the way the museum is perceived by the public, as one of the managers states: *"I think our Director, Rane [Willerslev], is also changing it [the National Museum] a little bit to get it more down to earth so that it is not that mysterious or academic, it's more open to a broader audience"* (Int. 4). Overall, by promoting these changes the new director appears to express his visionary qualities. Such leadership qualities are understood as valuable, both in a context of organizational change (Nograšek & Vintar, 2014) as well as in regards to becoming a successful data-driven organization (McAfee & Brynjolfsson, 2012). Some of the interviewed managers also could be seen as visionaries in regards to Big Data projects they realised as well as in regards to the potentials they identify for the organization in the future. Having such managers in the organization, who pair their visionary qualities with a data-mindset as well as data-driven decision making, is according to McAfee and Brynjolfsson (2012) pivotal in order to become a organization that successfully can generates value form Big Data.

5.5.2 Skill Set

Working strategically with Big Data requires certain skill sets to be in place in an organization. First of all, data scientists, i.e. experts with the necessary analytical skills and computational background, are needed for the purpose of analyzing the massive amounts of data. However, while the amount of such experts is still scarce due to the novelty of the phenomenon (Gao et al., 2015), it is common to outsource Big Data analytics (Erevelles et al., 2016) which is exactly what the National Museum is currently doing with their analysis application - the 'model' - where Rambøll is in charge of analyzing

data. Though, data-driven projects are not limited to analytics - it also requires certain skills among the organization's employees to help translate insights into action that can add economic and public value. Gao et al. (2015) state that multidisciplinary project teams are one of the success factors in Big Data projects which hence pose a need in the museum for skills like innovative thinking, teamwork skills (Nograšek & Vintar, 2014) and business skills (Gao et al., 2015). This greatly aligns with the socio-technological perspective on Big Data technology which acknowledges that the gains of Big Data are not determined but must be understood in the context of the social context (Scholz, 2017) - in this case, the National Museum.

With Rane Willerslev as the new director of the museum, the focus on eliminating a no-fault-culture in the organization is an important step in the direction of developing innovative thinking among the employees. Moreover, the restructuring towards more cross-departmental project work is likely to spur and develop the teamwork skills in the organization. Some of the skills that appear to be lacking in the museum is however those related to *"act(ing) like a business"* (Int. 3). In relation to this, one of the managers emphasizes that it *"create(s) some new needs for competencies and people in HR, economy, controlling, financing and stuff like that"* (int. 3). This is further emphasized in the museum's strategy for the period of 2017 to 2020. Here, it is stated that *"the museum needs to develop the control of the museum's financial and human resources"* (National Museum of Denmark, 2016, p. 7) as a result of pressure to rely increasingly on self-finance combined with more stringent requirements from the Danish Ministry of Finance related to financial control and personnel administration.

In addition to the need for business-related skills, the need for technical skills among the museum's employees also appear to be a topic of concern among the managers - however, it is expressed with certain inconsistency. While one interviewee explains that *"most employees here have a computer, but [...] the use is not very efficient. They maybe only use the email system and maybe our intranet and that's it."* (Int. 2), another manager points to the fact that several initiatives have been made at the museum to build such technical skills as well as a broader understanding of the digital era and its effect on the museum:

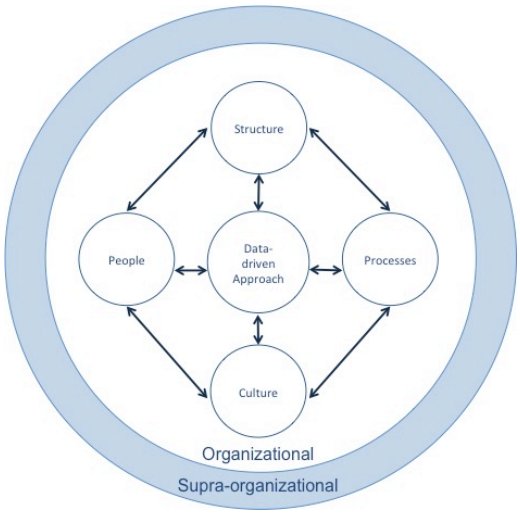
> *"we've been doing a lot of training courses, inspirational workshops, practical workshops as well, like trying to develop both the employees, their kind of tool set that they might need in the job that they have, but also [...] discussing, diving into kind of the broader theme of digital transformation, trends, tendencies, stuff going on in the world, 'what does it mean to be a museum in a new millennium?'"* (Int. 1)

When we discussed the cultural components earlier on, it became evident that the museum is a knowledge-heavy organization with a culture that does not exactly revolve around the digital era. Even though data analytics might not be skills that are placed in-house for some time to come, it does however appear important to build supplementary skills that support and ensure a more holistic approach to the use of data. Hence, innovative thinking, teamwork and business related skills are skill sets that the museum in particular might benefit from working on.

5.6 Supra-organizational level

5.6.1 Public Policies

As a public institution, the National Museum is subject to a number of public policies that regulate its daily operations to certain extents. Most noticeable are the Danish Museum Act which broadly defines the tasks of the museum and the Finance Act which annually sets forth the financial framework for the museum. Based hereon, we talk with the managers at the National Museum about how the public policies affect the organization. The perceptions are different and hold examples of both enabling and restricting character.



One of the interviewees describes the public dimension as a rather limiting factor as he/she states: *"it [the public dimension] limits us in a lot of ways which I would like to see change."* (Int. 3). First of all, he/she refers to the fact that the museum has to do public calls whenever they want to invest in bigger projects, which is time consuming and hence a hindrance to the organization's flexibility: *"If we are to be a little flexible and agile in our way of working, if something happens in society that we need to address during an event or an exhibition, we can't wait for six months for people to respond to that. It doesn't work. It limits us."* (Int. 3). Secondly, the audit of public spending is brought forward as a factor that has taken much focus from the museum: *"focus has been very much on keeping them [The National Auditors] happy, but that's also what is creating the no-fault culture because you want to make sure every Krone you spend is spent within the limits of how we are able of spending it" (Int. 3)*. With examples like these, the public policies appear to impede the museum's ability to adapt to external factors due to heavy

bureaucratic procedures that need to be fulfilled along the way. In addition to this, it is stressed that most of the museum's money is spent on storing and conserving artifacts that *"may or may not ever be part of an exhibit"* (Int. 3) which is perceived to be a big problem because money is spent on tasks that are not directly visible to the audience. Another manager supports this point as he/she illustrates the complexity of living up to the museum's tasks of particularly collecting, registering and preserving objects which are at first not perceived to go well in hand with living up to the expectations of today's experience economy:

> *"we need to be in charge of our collections, they should be well sorted, they should be well administered, they should be like properly administered and that's like the Ministry for Culture like saying 'You're a museum, you uphold the collection, that's one of the primary reasons that you exist, you should do that!', 'Did you take care of your 2 million objects and you're 1.5 million images and your 5.5 shelf kilometers of archival material? Because that's what you are supposed to take care of.' So in that sense, there are some like formal policy, law-based things that kind of demands us to do something that is boring and – boring in the context of experience economy."* (Int. 1)

However, after giving it some thought, the same manager explains that the thorough foundation of knowledge and objects that exists as a result of the museum's tasks might actually nurture the museum's ability to create great experiences: *"I think it is possible to create cool, wicked, wild, magical experiences using the very foundation of the museum, it's collection and knowledge"* (Int. 1). Hence, the positive side of being a public museum is also recognized and is in fact quite clearly expressed when we ask how the public dimension affects the daily work to which we get the answer *"Primarily in a good sense I would say"* (Int. 1)

In relation to work strategically with Big Data, the public dimension appears to encourage important initiatives even though it is not explicitly recognized by the managers. Here, the SARA system can be mentioned. The system is mandatory for all public museums to be part of and it encourages a better use of data for fulfilling the five tasks more efficiently. This can contribute to the museum's ability to generate both economic and public value. Moreover, the Agency for Culture continually runs user surveys in collaboration with Rambøll, which are likewise mandatory for the public museums to take part of. Such surveys generate more detailed data on the visitors, which the museum can exploit for the purpose of improving or innovating existing practices. The results of this user survey are published in a report that does not only report the results but also discusses them in

relation to the development of society which affects the museum field. Here, it is worth noting that the most recent report from 2015 dedicates a part of the report to the topic of Big Data (Moore, 2015), which emphasized the current relevance of the topic and supports the fact that the public dimension actually acknowledges and encourages the development towards data-driven decision-making in the pubic museums.

In spite of endeavors from public bodies to encourage better exploitation of the massive amount of data that digitization has brought along, it does not change the fact that the National Museum is under financial pressure which is clearly expressed as a topic of concern when we talk to the managers. As earlier mentioned, the Financial Act has caused a two percent annual decrease in public funding to the museum which leaves greater pressure on the museum which comes to expression with statements like *"we have to make money, we have to be interested in how money is driving and securing the museum"* (Int. 3), *"we need funding first"* (int. 2) and *"there are so many possibilities, we are only lacking time and money*" (Int. 4). The financial situation regulated by the state is hence clearly perceived as a limitation to progress and leaves pressure on the organization. First of all, the museum must run as cost-efficient as possible (Strategy) and money must be spend wisely. As we discussed in chapter X about value, part of the economic value that museums provide also exists in making sure that governmental funding is spent in the best possible way. Here, Big Data provides a good opportunity with the ability to forecast the success of different investments, which will soon be available with the 'model' that is currently being developed at the museum in collaboration with Rambøll. In addition to own revenues and public funds, the museum relies heavily on funding from private foundations, which leaves us to the next section.

5.6.2 Financial Situation

It is evident from the interviews that private foundations are perceived as important stakeholders as they support multiple research projects and exhibitions at the museum. With public funding going down, the pressure to attract funding from private foundations increase and here a data-driven approach appears to provide opportunities. By means of the 'model' the museum can, as mentioned before, predict the success of various investments. This can strengthen applications to private foundations and hopefully help attract financial resources. One manager, however, stresses the point that foundations sometimes determine the topic and provide funding based hereon: *"Some are own ideas, some are foundations - like the white busses - it wasn't our idea to make an exhibition about the white busses, but the foundation came and gave us nine million Kroner"* (Int. 4). In such situations, foundations' ideas for a topic might overrule topics generated from customer insights.

However, such insights can still be applied in the translation process - how to turn the topic into an interesting and relevant exhibition for the visitors. On an overall level, the museum appears to rely quite a lot on funding, and while plenty of good ideas for research and exhibitions might exist in the organization, lack of financial resources might hinder the realization of such ideas.

5.6.3 Access

Public museums in Denmark are expected to make the information and knowledge they hold available to society. They do so primarily by setting up exhibitions of the objects and artifacts of their collection in their physical exhibition spaces (Lyck, 2010). However, the examples presented earlier in this analysis show that there are new ways emerging of making the collection of the National Museums accessible for the public. In addition to that, digital and data-driven means enable the museum to present the public with new ways to interact with the institution. While Günther et al. (2017) argue that most organizations opt for limiting data access to external parties, this is clearly not the case for the museum in terms of its collection data. Here, the aim is to "*democratize the collections and knowledge of the museum*" (Int. 1) and ultimately enable the public to "*access our data from all over the world via the Internet*" (Int. 2). These two managers share the vision, to make the entire collection data available online for public consumption and research, which is "*not possible today*" (Int. 2). Further technical infrastructure development is needed to achieve this main goal, as explained by one of the managers: *"The biggest problem is that the collection databases are in their technical structure not able to access the Internet for public access at the moment and that's the transition we are doing right now, where we consolidate databases into the same structure"* (Int. 2). However, some of the collection data is already available online, as explained earlier. These digital online collections are also used as tools to interact with the public, and thus creating public value. Günther et al. (2017) as well as Mayer-Schönberger and Cukier (2013) state that providing such open and interactive access to data, might help governmental institutions to innovate. This impression is also shared by one of the managers, who explains that by creating the open access to the collection data and facilitating crowd-sourcing projects, the museum might "*benefit from the creative potential of web users*" (Int. 1). However, the same manger, despite being in favor of an open access policy in regards to collection data, does not neglect the risks such an approach brings along that are brought forward by Günther et al. (2017). Günther et al. (2017) states that organization can generate economic value by controlling the access to data and only distributing the data to paying customers. As illustrated earlier, Int. 1 acknowledges that "*there is obviously the risk of not making money from selling it [data]*", when referring to the museums open licensing policy in regards to their images.

Nevertheless, he/she also expresses doubt that a true economic value lies within the opportunity to sell the data. Another concern that has to be addressed when considering to generate money by selling data, and thus creating a limited access for the public, is in how far such an approach is conform with the public tasks the museum has to fulfill. In regards to collection data, the museum is also part of a future network, where data is shared - the SARA system. Günther et al. (2017) present such network strategies as a compromise between open and controlled data access, because different modes of access can be defined for the actors within this network. In regards to SARA system, the aim appears to be that all included museums share the same open access, while it is not clear if this open access will also be extended to the public.

The museum does not only share their collection data, they also provide their 'business' data, such as the data on visitor numbers, demographics and satisfaction, to external parties. However, this data is not generally open to the public, it is shared with one external party - Rambøll - for a very specific purpose. As explained earlier on, the museum provides this partner with the data in order to receive insights that can inform the decision-making. Because the museum, so far, does not have the analytical skills that are required to generate these insights, in house, working with an external specialist and providing it with access to the relevant data is a necessity.

5.6.4 Social Risks

The questions and decisions in regards to different modes of access are closely linked to the ethical, social and security risks of sharing data. Günther et al. (2017) argue that whenever an organization aims at generating value through the use of Big Data, the realization of such value will most likely include some social risks. Whereas Boyd and Crawford (2012), Günther et al. (2017) as well as van den Broek and van Veenstra (2018) are mostly concerned with the risks associated to the use of sensitive and personal data for purposes like targeted marketing, personalized services, surveillance and research based on publicly available social media data, the museum appears to face much more complex risks due to the nature of their data.

First of all, the museum has a social responsibility to present the historic truth and facts, as one manager explains "*what we administer as well, is truth on events, the truth of things, the place that they had in the world, the perceived value of that thing*" (Int. 1). By making the data access open for everyone, the museum has limited control over what the data is used for and thus cannot entirely ensure that all users adhere to that standard, which is perceived by the same manager as an ethical risk. This risks is closely linked to another concern that the same manager shares in regards to making collection data publicly available online: "*there is the risk of someone not adhering to the*

seriousness of the data, for example images that we put up for free, like people drawing moustaches on portraits or companies using it for marketing" (Int. 1)

Second of all, the museums houses several ethnographic collections, where the single objects and artifacts of these collections hold a special value to the ethnographic group that provided them. When these collections are digitized and datafied to be used for example for research or crowd-sourcing projects *"different kind of value sets collide and we live within the western, scientific worldview – they don't necessarily"* (Int. 1). Using the potentials Big Data offers on these datasets might be a disrespectful or unethical act towards these ethnographic groups and their culture, this is why Interviewee 1 describes this concern as "*very profound*". The data the museum holds could therefore be understood as *sensitive* data and Günther et al. (2017) argue that organizations in general when working with Big Data have to consider regulations and legislations as well as "public expectations and ethical considerations" and in particular when they handle sensitive data. That members of the public are very much interested in how certain collection data of the museum is used is also an impression shared by one of the managers who explains, when talking about the responses to one of the exhibitions and the difficulties to align different perceptions, "*so whatever you do, it will be wrong to somebody. It's very, very difficult*." (Int. 4).

In addition to these social and ethical risks there are also some risks related to data security. Even though one manager does not "*see the museums as high-end value targets for hackers and so on*" (Int. 2) he/she does not neglect the risks of losing valuable data due to technical problems: *"but we cannot afford to lose our data. So, the risk where some malware destroys our databases and where we are not able to recover from our back-ups, that's of course a big problem"* (Int. 2). With this statement the manager illustrates that by digitizing the collection data and making it accessible online the museum's role and task to preserve the cultural heritage of the nation is affected. This perception that data storage and access issues are related to the role of the museum in society is also shared by another manager who states "*Of course we have to worry about where our data is located*" (Int. 3). These social, ethical and security risks are not solely limited to the collection data, they also include the data the museum holds on their visitors. When discussing the potential of analyzing personal data on their visitors, one of the managers explains: *"we don't have any personal data. It's all in anonymized form. We don't have any names, we don't have any emails or anything. Well, we do have a little of that but we haven't used our newsletter data for instance in what I've been doing"* (Int. 3). He/she also provides the reasons why the personal data the museum holds is not used for analysis: *"I'm pretty sure we are not allowed to use the data because we didn't ask for permission"* (Int. 3). This response indicates that the manager is concerned about the potential social

and ethical consequences of not abiding by the legal regulations in regards to handling personal, sensitive data. According to Günther et al. (2017) not complying with such regulations could have damaging effects on an organization's reputation. The museum relies on its strong reputation and the trust society places in it. In addition to that, the public value the museum provides also includes that it operates as kind of a proxy for the government that it is funded by and thus establishes trust in this government. Therefore, one could argue that handling data carefully and in compliance with all regulations put forward by regulatory and legal bodies is especially important for the museum as a public institution.

5.6.5 Economies

When we introduced the Danish museum field in the very beginning of this thesis, we stated that museums' role appears to shift from a primarily informational and educational institution towards a more experience-based, performative role (Lyck, 2010). This impression is shared by managers of the National Museum as well, as one of them explains: *"we look more like a university than we look like an amusement park, and we have to find a way in between those two that fits us, and I think it is somewhere in between. At some point, we have to be much more like an amusement park"* (Int. 3).

In addition to that, museums face a growing competition by commercial players within the experience economy (Skot-Hansen, 2008). According to another manager this pressure is felt by the museum, which in turns reevaluates some of the traditional perspective. The interviewee illustrates that with the example that the museum used to have a very long-term and prescient perspective in regards to their activities. The manager explains that the museum acknowledged that some of their activities or projects, will only show their value in the long-term, maybe even over a hundreds years from when they were started. He/she further states:

> *"that's a perspective that is under pressure in these years, due to the - what is it called? - experience economy. So we've got a lot more focus on creating value now, for people that are living now, our customers, visitors, stuff like that. So and that kind of draws energy out of the long perspective initiatives, into the maybe shorter oriented initiatives."* (Int. 1)

According to this statement the concerns of manager are not primarily the effect of an increased competition due to experience economy, but rather how the reaction of the museum to this growing field is changing its usual perspectives and practices. His/her assessment is, therefore: *"in terms of the experience economy we shouldn't do whatever it takes"* (Int. 1). He/she draws the same

comparison to an amusement park as the manager referenced earlier, but rather to use this example to explain that the museum should not try to compete on fields that others have established as their core competencies. Even though this manager is critical towards the effects that the growing experience economy has on the museum, he/she acknowledges that what the museum is offering is a social experience, often shared with family and friends. With its increased focus on the visitor experience the museum now concentrates on this aspect of the services and value they create for the public.

Besides being associated with the experience economy, museums are also contributors to the tourism economy. As mentioned earlier, part of the economic value museums provide is their contribution to tourism. In order to understand, how the museum can most effectively address tourist, they conduct and study market research on trends within tourism and also collaborate with external parties, such as DMOs - Destination Marketing Organizations - and other museums, according to Interviewee 3. The aim of the new analysis application, that was introduced and discussed earlier on, is to learn more about the museum's visitors in order to use these insight to inform decision in regards to the visitor experience and offer more tailored services to the different visitor target groups. As explained by one of the managers, this is not just restricted to the Danish visitors, it will also help the museum to design solutions for their different global audiences: *"if we know when the English speaking people are coming, and the Spanish speaking, and the French and the German and all that, we can provide specific things because their interests differ. We can do programs that are much closer to what they need and want"* (Int. 3).

Lastly, museums also belong to the CCIs and while Scott (2008) argues that museums function as a place of inspiration to some of the creative and innovative minds within the CCIs, the reverse conclusion can also be made for the museum based on the statements of one of the managers. He/ she draws parallels between other industries within the CCIs and sees them as inspirations. He/she uses the example of the Disney movie 'Frozen' to illustrate that the museum should become less academic and more visitor-oriented by finding ways to translate the knowledge on the artifacts that the museum holds into stories that are interesting and exiting to the visitors:
"We are still very serious. All the artifacts we have are still real, but the way you present it to people is another thing. Why is Disney so successful? That's because when they do a Hans Christian Andersen adaptation, they don't sell you a 150 year old book, they do Frozen. Right?" (Int. 3)

The same manager also finds inspiration in other cultural-creative industries in terms of their use of a data-driven approach. When he/she talks about the potential of gathering more insights on visitors through the use of Big Data analytics, the interviewee refers to the Royal Theater of

Denmark, which to his/her account is a great example of a public cultural institution that uses a data-driven approach to improve and innovate its organization, which faces a similar situation as the museum in terms of reduced governmental funding.

5.7 Sum-up

In the above analysis of the National Museum, we have sought to provide an empirical illustration of the model proposed in the previous chapter. We have done so in order to provide nuanced answers to our research question. As evident from the analysis, the National Museum is currently subject to great changes - primarily as a result of the new director, Rane Willerslev, who appear to bring along innovative visions and a heavy focus on visitors. While the museum as a whole does not appear very data mature, several conditions do however point in the direction that data is likely to become a valuable resource for the museum. Particularly prominent is the analysis application, which appears to be a promising tool for the museum's future, as it can inform decision making. With better decisions, this data-driven tool is likely to help the museum in providing both economic and public value. Moreover, organizational dimensions appear to change in a direction that creates breeding ground for the strategic work with data. The new director, Rane Willerslev, has for example made efforts to eliminate the organization's no-fault culture. Instead he promotes experimentation and cross-departmental project work, which are conditions that can facilitate a data-driven approach to value creation.

Overall, the analysis uncovers the many complexities that exist within the organization, and in light of this, it becomes evident that implementing data-driven initiatives require change in certain organizational dimensions. Here, building a data-mindset among employees and attracting new skills such as business skills appear prominent. The analysis further uncovers supra-organizational dimensions that appear to affect the organization's operations. While financial pressure and bureaucratic processes as a result of the public dimension are perceived to limit the organization, public policies do in fact also stur technological developments and the use of data across the public museum field. Here, the SARA system can be mentioned.

6 Discussion

We have in this thesis sought to provide a better understanding of the phenomenon of Big Data in the context of the public museum field in Denmark. We started by providing an explanation of how the museum field is currently undergoing great change; first of all due to financial pressure, and second of all due to technological development and growing experience economy, which leads visitors to request engaging experiences (cf. chapter 1). With the transformative power that Big Data has proven to hold for industries worldwide, it became relevant to consider whether the power of this technology is a 'tool' for consideration in the public museum organization. While literature on digitization of the museums exist, this is limited to Web 2.0 characteristics and lacks the dimension of the new 'wave' that has come with Big Data. Based on a review of literature on Big Data, organizational change, value dimensions and public museums, we first discussed data-driven value in a museum context, which led us to the dimensions of economic and public value. Secondly, we set forth a model that illustrates the realization of such value, i.e. how a data-driven approach in public museums shapes and is being shaped by organizational and supra-organizational components (cf. chapter 2). This model was used to analyze the case of the National Museum of Denmark (cf. chapter 3) in order to bring practical nuances into consideration for the assessment of our model's practical applicability.

In the following, we will first revisit our model in the light of our analysis in order to critically reflect upon its applicability and hence revise it accordingly. Secondly, we will address the practical relevance of our contributions by raising critical discussion points that challenge our underlying assumption that Big Data is believed to bring value to the public museum field. Lastly, we will reflect on the transferability of our results and hence assess the reach of our thesis.

6.1 Revisiting our Model

Public Value vs. Economic Value

In chapter 2, we discussed and defined what 'value' contains when considering a data-driven approach to value creation in the museum context. This was summarized as the dimensions of public and economic value. Big Data technologies are primarily seen as means to generate economic value for an organization, for example by being able to market products and services in a more targeted and hence effective way to customers. This, as illustrated in the analysis, also applies to a museum context, where museums can gather more detailed data on their visitors in order to present them

with more personalized experiences. However, the competitive situation for public museums differs from most private organizations. While private companies can use their data, analytical capabilities and data insights as a competitive advantage, public museums face a much more challenging situation in regards of establishing a competitive advantage based on their data insights. Private organizations can ensure their competitive advantage by establishing a controlled access to their data (Günther et al., 2017). However, museums are required to choose an open mode of access due to their public nature and the public value they are expected to deliver. As a consequence, the need to generate public value can have limiting effects on museums' ability to create economic value with a data-driven approach. This can also be illustrated with the impact of social risks that lie within the use of Big Data. While private organizations also face social risks, they can choose to neglect them or react on them reactively, as numbers of cases illustrates. Facebook, for example, addressed the social problems that were a result of their negligent use of personal user data after these practices were publicly revealed (BBC, 2018; Forbes Agency Council, 2018). Public museums, however, have to act more proactively in order to deliver on the public value of being a trusted and legit institution in society. Jeopardizing this position through the careless use of Big Data would not only affect the museums themselves, but would also negatively reflect on the government which funds and regulates the museums. In general, the relevance of the public (social) value dimension in terms of data-driven value creation hence appears to be more prominent for public museums than for private organizations.

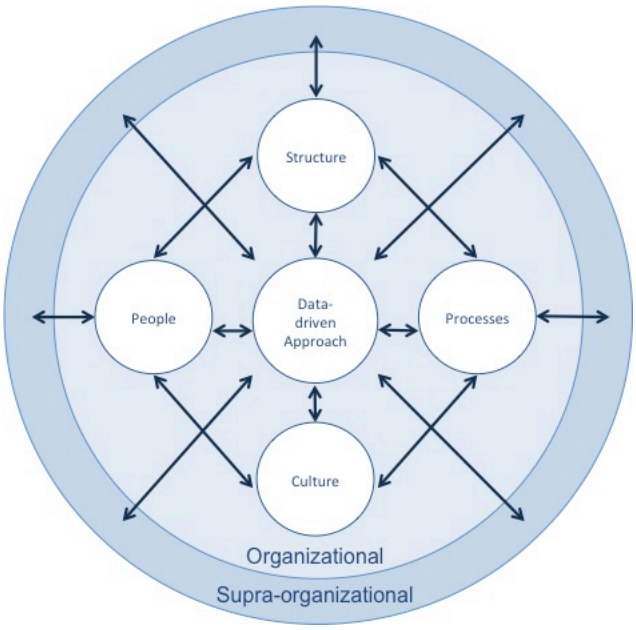
The Strength of Interconnectivity

When we proposed our model in chapter 3, the data-driven approach formed the center of the model, which corresponded to Nograšek and Vintar (2014, 2015) model of organizational transformation, where Technology is placed in the middle. Even though a data-driven approach is not a technology as such, it is facilitated through different technologies as well as built on the foundation of digitization. However, in Nograšek and Vintar (2014, 2015) model, technology takes the central role because the authors understand it to be the driving, deterministic force for the organizational transformation in the different dimensions (*structure, culture, processes, people*). Already in our initial theoretical reflections, we implied that this deterministic force would not apply to a data-driven approach, as we understand Big Data from a socio-technological perspective, i.e. that society is influenced by Big Data and Big Data technologies and practices in turn are shaped by society. In an organizational context, we therefore expected that a data-driven approach could cause changes in all of the different dimensions while the impact of it would highly depend on the other dimensions.

However, what we did not fully account for from the beginning, and what we discovered throughout our analysis, was that the initial change does not necessarily start with the data-driven approach. Changes in the other dimensions can just as well facilitate a data-driven approach. In other words, none of the dimensions can be prioritized over one another as the change can start in any dimension or even happen simultaneously in several dimensions. This, of course, also includes the supra-organizational dimension. While Big Data is a broad and global phenomenon, the translation of that phenomenon into an organizational context is the data-driven approach. In light of this we have revised our model as illustrated below (cf. Figure 4).

The high degree of interdependence does not only apply to the different dimensions, it is also reflected in the elements that we assigned to these dimensions. Throughout the analysis, it became clear that these interdependencies seem stronger than initially recognized in the theoretical conceptualizations. While we clearly assigned the elements to the different dimensions based on theory, applying our classification to the National Museum made it clear that such an assignment is less precise in practice. While some elements can be assigned to one dimension, others could be assigned to several dimensions. We, for example, classified *leadership* as an element of the *people* dimension because the prevalent leadership-style is shaped by the managers in leading positions. However, one could also argue that it is a *cultural* element, as leadership also forms the organizational culture.

The elements cannot only to some extent be assigned to different or multiple dimensions, they can also be extended for different purposes. The dimensions are not limited to the elements proposed by us as other elements might emerge in practice. This became evident from our analysis where we treated *sourcing* as a separate element of *processes* based on its prominence in literature. However, in practice, sourcing did not appear to be more relevant than other processes. In fact, our analysis indicated that processes in research and marketing were more prominent and hence could have been treated as independent elements. In light our empirical analysis and in line with the socio-technological perspective, we can conclude that our proposed model provides a conceptual understanding of how a data-driven approach is likely to form and take form in a public museum. However, it is not exhaustive in its applicability due to the fact that technology is shaped by the different contexts.



Figur 4: Revised model of Big Data value creation

The Iceberg Metaphor

Our focus on the visitor orientation and the business-side of things appeared naturally as a result of the current changes in the museum field, which are, as explained before, characterized by increasing financial and competitive pressure, which ultimately results in the question of how to draw more visitors in. However, all visitor-related activities mostly focus on one of the Danish public museums' tasks - the task of dissemination, leaving the other four tasks collection, registration, preservation and research, largely unaddressed. Furthermore, the visitor experience and other visitor-related activities are primarily visible to the public, but they only constitute the 'tip of the iceberg'. The activities that are related to the other four tasks are in contrast not directly visible from an external point of view - using the same analogy - they form the rest of the iceberg that is hidden underneath the surface of the water. By focusing on the 'tip of the iceberg'-activities and relate them to the use of Big Data, potentials in using a data-driven approach and Big Data related technologies for the other four tasks lie largely undiscovered. So far, Big Data has often been discussed in literature in terms of deriving customer insights and from this point of departure, focusing on visitor-related topics when applying Big Data to the context of public institution seems natural. However, in the course of our analysis, it became apparent that the Big Data perspective could also be used to study the activities related to other tasks, as we for example also draw on the implications of a data-driven approach on research. Studying how to use a data-driven approach to fulfill the other tasks more efficiently, effectively or innovatively, could further enhance value creation for public museum.

6.2 Practical Relevance

Rooted in theory, our thesis is largely founded on two general assumptions. First of all, we view Big Data, as a socio-technological phenomenon meaning that a data-driven approach to value creation must be understood as a dynamic construct that shapes and is being shaped by the organizational context. Second of all, we assign Big Data an important role as we assume that data-driven initiatives carry the potentials of bringing value to the public museums – especially in light of today's increasingly competitive landscape. However, while this might hold true, we allow ourselves to challenge the latter assumption in a critical discussion of the practical relevance of a data-driven approach in the public museum field.

The Investment

When considering to adopt a data-driven approach to value creation, it is natural to raise the question whether it is worth it; what kind of investment is needed and what are the gains? In light of our analysis, we can argue that the investment in a data-driven approach is complex and cannot simply be expressed in monetary terms. It goes beyond investing in physical technologies and knowledgeable consultants, as it requires a holistic investment in the organization as a whole. This finds solid argumentation in the socio-technological view on Big Data, which points to the fact that unlocking Big Data's potentials rely on the organization and the people within it (Scholz, 2017). While technical aspects such as data analytics may be limited to IT functions or, maybe even more realistically, outsourced to skilled specialists, the act of turning insights into actions rely heavily on the rest of the organization. Hence, one can argue that Big Data is more of a 'people issue' than a technical issue for the public museums, which poses the primary implication of facilitating an understanding and acceptance of Big Data in the organizations. With this in mind, one can argue that it becomes crucial to implement data-driven initiatives into the museum's strategy, which can facilitate common ground across functions. In continuation of this, it may also become crucial to include Human Resources (HR), or at least HR initiatives, as a primary driver of facilitating common ground and overcoming resistance that might occur among employees. This includes building skill sets in the organizations that support the work with Big Data. While public museums are built on centuries of history and institutionalized practices, another implication exists in challenging the force of normative isomorphism, i.e. the homogenization of skills (DiMaggio & Powell, 1991), by revising the skills and formal structures that shape organizational practices. While cross-departmental collaboration is encouraged, the museums might be in need of recruiting new profiles due to the

need for skills like innovative thinking, teamwork and business skills that are success factors for data-driven initiatives (Gao et al., 2015; Nograšek & Vintar, 2014).

Speed of Technology

In 2004, the buzz was Web 2.0, which was recognized in literature on public museums in Denmark from 2008 and onwards (Lyck, 2010; Skot-Hansen, 2008). In 2013, Mayer-Schöneberger and Cukier (2013) publish their heavily cited book 'Big Data - A Revolution That Will Transform How We Live, Work and Think' which points to a whole new level of complexity and new technologies. The point here is that technological development accelerates with swift pace, and one can question whether the public museums have a chance to keep up with current standards before they are replaced by new technologies. As we saw it in our analysis of the National Museum, lacking skills, bureaucracy and lack of funding provided some of the reasons for data-initiatives being discontinued. Hence, taking organizational and supra-organizational dimensions into consideration, it appears unlikely that the public museums can reach a state-of-the-art level when it comes to the use of Big Data. However, while this might hold true, it does not necessarily mean that the museums should not aim for keeping up with the development. Big Data will, in line with the socio-technological view, both form and be formed by society (Scholz, 2017), and in light of literature on the Big Data revolution, it appears unlikely that we can choose to escape from its impact on our lives. Hence, neglecting the influence of Big Data will probably be more damaging than investigating its potentials.

Overcoming 'Nobody Knows' vs. Ending Creativity

By gathering more insights on visitors interests, preferences and behaviors and consequently use these to inform decisions, museums might be able to predict the success of exhibitions and other visitor-related activities and hence act accordingly. In this sense, a data-driven approach yield great value in form of overcoming the *nobody knows* property, which reflects the largely unknown and volatile market demands characterizing the cultural-creative landscape (Caves, 2000). However, relying too much on data insights can also pose limits to the organizations' creative and innovative abilities. If for example research and exhibitions are solely planned upon visitors' request, discovery of new creative ideas might become limited based on the rationale that the customer does not know what he or she wants (Lampel et al., 2000). The same scenario is likely to generate organizational implications in terms of motivation. When researchers are limited in their freedom to explore their fields of interests, this could lead to a decrease in motivation. This, however, does not mean that museums should neglect visitor insights when planning research agendas and exhibitions. Instead,

they should acknowledge the polarities of prediction and art and find new ways to reconcile both sides - for example by providing researchers with other, additional platforms to present their findings.

External Collaborations

As outlined in the Danish Museum Act and illustrated throughout our analysis, the public museums enter into multiple collaborations as they are required to collaborate with each other and external parties in order to fulfill the five tasks of collecting, registering, preserving, researching and disseminating cultural heritage. Such collaborations include partnerships with private parties as we saw it with the National Museum and Rambøll. Such initiatives seem to strengthen the commercial potentials of culture that is promoted by Danish politics. However, while some data-related collaborations might be fruitful and help the museums to improve their abilities to fulfill their tasks and run a profitable business, others might pose risks on the museums and their roles in society. We introduced Google Arts & Culture earlier in our thesis (cf. chapter 3), and namely this private initiative that merges Big Data and culture is worth a comment. Public museums can choose to actively collaborate with Google Arts & Culture, and one can argue that this is a great opportunity to reach a larger audience and hence better fulfill the task of disseminating collections and knowledge. However, while some - as uncovered in our analysis - might argue that Google's virtual tours do not serve as a threat to the museums as they cannot substitute the physical and engaging experience, this might not be entirely true. In January 2018, Google Art & Culture's app launched the opportunity to match selfies with museum paintings (Luo, 2018) . This is a clever and innovative way of exploiting huge amounts of collection data to make culture relevant in a new, exciting and engaging way that matches the digital behavior of today's younger generations. Moreover, with for instance virtual reality technologies that in fact enable us to (virtually) be somewhere else than we actually are, it is not impossible to imagine Google's cultural universe posing a threat to the public museums in the long run. While such a reflection might come off a little strong, the point is that museums' decisions to entrust external parties with data-related activities should be strategically driven as it can have far-ranging implications. As illustrated earlier (cf. chapter 2), a dimension of the public value lies in museums' ability to beneficially impact broad social dimensions such as social health and inclusion (Bakhshi & Throsby, 2012; Scott, 2008). Museums need to consider whether Google or other companies can deliver such societal benefits and if potential collaborations will limit the museums in regards to deliver on these value dimensions.

6.4 Scope of Results

In the course of our thesis, we have conceptualized data-driven value creation in the context of public museums. In addition to this, we have proposed an organizational model that provides a conceptual understanding of the implications that can follow as a result of trying to realize such value. Our contributions are derived from theory and then unfolded with an empirical analysis of the National Museum of Denmark, which illustrates a context-dependent example. The fact that we largely build our thesis on theory and not on multiple cases does not mean that our contributions do not yield practical relevance for the museum field. Our proposed model illustrates the components that appear crucial for a public museum to consider in the strategic work with Big Data including thoughts on the organizational level as well as the supra-organizational level. Moreover, our model is built on the universal idea presented by Leavitt (1965); that change in one organizational component leads to change in the other. Thereby, practitioners can apply the model as a strategic, analytical tool to appropriately plan data-driven initiatives, as it will allow the identification of potential implications and hence assist in facilitating the best possible organizational conditions. As it became evident through our analysis, elements assigned to the various dimensions in the model can vary due to context. This illustrates the context-dependency that must be acknowledged in the light of Big Data as a socio-technological phenomenon. Therefore, it should also be kept in mind that the elements we have identified do not constitute an exhaustive list.

If we look outside of the public museum field in Denmark, the transferability – or generalizability - of our results are worth a comment. As we see it from literature, Big Data increasingly impede our society, posing a need for still more actors in the market to approach the phenomenon and its impacts (Mayer-Schönberger & Cukier, 2013). Hence, working strategically with Big Data does not only become relevant for the public museums – it might in fact be relevant for most players 'in business'. However, as we have appointed great attention to the many characteristics that differentiate the public museums from private organizations, our contributions are not designed for the private players. Instead, we argue that the model can likewise be of inspiration to other public cultural institutions in Denmark as these in many ways share conditions with the museums in form of growing competition as a result of experience economy and technological development, decrease in public funding and the challenges related to balancing art and commerce.

7 Conclusion

The overall purpose of this thesis is to contribute with a conceptual understanding of how Big Data can be translated to the public museum field in Denmark as a means to generate value. The rationale behind this is found in the following; the public museum field in Denmark is currently undergoing substantial change due to technological development and a growing experience economy, which leads visitors to demand evermore exciting experiences and leads to an increase in the competitive environment of museums. This, combined with a decrease in public funding, puts the museums in a situation that calls for innovation. Here, we draw attention to the phenomenon of Big Data, which has been widely acknowledged, as a source of innovation in the organizational context. However, while much literature illustrates Big Data's many potentials, little is known about how organizations actually translate such potentials into value. In addition to this, the role of Big Data has been largely disregarded in the museum context, and all together, this leads us to ask the following: *How can a data-driven approach to value creation be understood in the context of the public museum field and what organizational implications can such an approach bring along?*

Through a thorough literature review, we have sought to understand the kind of value that public museums in Denmark can expect to derive from the use of a data-driven approach. In the assessment of different and ambiguous value constructs, we propose two value dimensions combine the promises of Big Data and the characteristics of the public museum field. These are *economic value* and *public value*. Economic value refers to the museum's ability to generate more money through the use of data insights as well as to run more cost efficiently and therefore ensure an appropriate allocation of governmental funding. Public value describes that museums can provide more benefits for individuals and larger society by means of a data-driven approach. Through our case study of the National Museum of Denmark, these value dimensions gain a foothold. Even though we are not in a position to measure such value - partly due to our qualitative approach and partly due to the fact that such values are hard to measure - our case study exemplifies both economic and public value in practice. For example, the National Museum's work with online collections help the museum to fulfill the task of *dissemination,* which contributes to the fulfillment of public value. Moreover, the museum's newly introduced analysis application can help inform decision-making on for example investments and hence contribute to economic value. However, through qualitative interviews with managers in the National Museum, we also learn that the fulfillment of such values depends on many dimensions in the organization. Hence, a data-driven approach to value creation in the public museum field can be explained as the strategic use of Big

Data to generate public and economic value in more innovative, effective and efficient ways. Moreover, it can be understood as context dependent, i.e. varying from one organization to another.

In order to understand the potential organizational implications that a data-driven approach to value can bring along, we revitalized Nograšek and Vintar's (2014) model on ICT as the primary enabler of organizational change in public institutions. With its focus on technology, public institutions and Leavitt's (1965) universal idea that change in one organizational component leads to change in the others, the model created a good foundation for us to understand the implications that may occur as a result of the strategic use of data. In light of our proposed model, implications can occur in relation to all the organization's dimensions (structure, culture, processes, people). However, in light of our theoretical discussion as well as our case study, some implications occur more prominent than others. Here, the acknowledgement (*culture*) of the Big Data phenomenon and its relevance for the organization appears crucial in order for the public museums to realize the value that can be captured with a data-driven approach. In continuation of such acknowledgement comes action. These actions require the organization to ensure that *people*, i.e. employees, possess the necessary skills - technical as well as non-technical. Moreover, they require organizational *structures* to facilitate optimal conditions in order for data-initiatives to thrive. Additionally, organizations need to identify the processes that can be either improved or innovated through the use of Big Data in order to take appropriate actions. This emphasizes the fact that a data-driven approach to value creation should be seen as a strategic matter that needs proper consideration. This is particularly important to the museums as they, due to their cultural-creative nature, already face a number of opposing imperatives related to the tension between art and commerce. Here, the museums need to balance the degree to which data-generated insights are applied in order to overcome uncertain demands while keeping creativity alive.

In addition to the above, other implications occur in interaction with the supra-organizational level. Here, we can again argue that the acknowledgement comes first. As illustrated in theory and exemplified in practice, the supra-organizational dimension influence the museums' ability to work with a data-driven approach. While the use of Big Data is facilitated from the external environment with for example collaborative data-initiatives such as the SARA system, external influences also impose challenges on the museums in this regard. Here, the recognition of social risks becomes important as the museums work as servants of society. This requires them to abide by the highest standards of data governance as handling sensitive data without proper case pore the risk of jeopardizing the museums' legitimacy. Hence, a data-driven approach to value creation is likely to bring along multiple organizational implications as exemplifies in the above.

With our constructivist standpoint and qualitative methods, we cannot provide an exhaustive list of implications that apply across the public museum field. Had we used other methods such as for example a multiple case study, we could maybe have derived more implications. However, these would neither have provided an exhaustive list due to the view of Big Data being a socio-technological phenomenon, which infers that the implications that follow from a data-driven approach appear context-dependent. Hence, it must be expected that the implications following from a data-driven approach to value creation will vary from museum to museum.

Limitations and future research

Grounded in theory and empirical evidence, we contribute with a conceptual understanding of how Big Data can be seen and understood as a tool to value creation in the public museum field in Denmark. While we are among the first to address this specific area, our thesis becomes an initial suggestion of how to approach this. For the same reason, our thesis poses limitations in the light of our theoretical and methodological choices. We have, for example, limited our study to be more of a 'snapshot' in time rather than a continuous study conducted over a longer time period. However, for future research, it could be interesting to follow the implementation of a data-driven approach over time in order to observe how value and implications unfold. Moreover, we have limited the scope of our study to the public museum field and to the study of one specific case. However, for future research, it could be interesting to broaden the scope to address the wider cultural-creative landscape, as the tension between art and prediction remains relevant and interesting.

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Appendices

Appendix 1: Interview Consent Form

Consent Form

Description of master's thesis:
This master's thesis sheds light on the phenomenon of Big Data in relation to public museums in Denmark. More precisely, the purpose is to investigate the potentials of data-driven value creation in public museums. The Danish National Museum is used as a case to illustrate and discuss the above. This is done by assessing different organizational dimensions which can reveal the organization's 'data-readiness' and opportunities and challenges related to a data-driven approach.

Nature and purpose of the interview:

- The purpose of this interview is to collect data on the interviewee's experiences with and perceptions of themes related to the topic of concern.
- The interview is estimated to take approximately 1 hour.
- The interview will be audio-recorded and consequently transcribed for the purpose of analysis.

Terms of consent:

- I voluntarily agree to participate in this interview.
- I have had the purpose and nature of the study explained to me orally and in writing, and I have had the opportunity to ask questions about the study.
- I agree to my interview being audio-recorded and transcribed for analysis.
- I understand that I can refuse to answer any question during the interview without any consequences.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview has been conducted. In this case, any material related to the interview will be deleted.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research, my identity will remain anonymous. This will be done by changing my name and disguising any detail of my interview which may reveal my identity or the identity of people I speak about. I further understand that any report on the results of this research might be publicly available through academic outlets.
- I understand that signed consent forms, original audio recordings and transcripts will be stored safely until the thesis, for which my participation is relevant, has been graded. These files will only be accessible for the authors of the thesis.
- I understand that I am allowed to access the information I have provided at any time while it is in storage as specified above. This is done upon request to the authors of the thesis.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

I have read the above and by signing this form, I agree to the terms put forward.

Name of participant	Date	Signature
Name of person taking consent	Date	Signature

Appendix 2: Interview Guide

Prior to interview: briefing about

- Topic: Potential of data-driven value within public museums in Denmark → NatMus our case
- We are focusing on the organizational aspect
- We conduct interviews, to get an understanding of how the NatMus works and where the organization is in terms of 'data-readiness'
- Recording, transcription and use of data
- We will take you through a couple of different themes that we need information on in order to address our topic. There is no right or wrong, so please just speak your mind and do not think about if that is what we want to hear or not. If you do not understand the question, please just ask us to clarify.
- We will share our results with you

Interview guide:

Researcher questions Theme and aim guiding the interviewer questions	**Interviewer questions**
Theme: Introduction **Aim:** to get an understanding of the interviewee's position in the broader organization	• Can you start out telling us about your position in the NatMus - what is your title, responsibility areas, and daily tasks? • How long have you been working for the NatMus? • What is your professional background - where did you work before?
Theme: Organization (structure, strategies, management)	*We would like to get an understanding of how the NatMus works as organization and how the different departments within the NatMus relate to each other.* • You are a line organization with a lot of different departments - How do you experience the collaboration between these departments? ○ Could you elaborate/give example? • So, do you perceive the NatMus to work more as a whole - one single entity - or as a number of separate entities?

Aim: to get an understanding of the interviewees' perception of the overall strategy and structure of the organization, and to get an understanding of how the departments work together	*We know that the public funding for the NatMus is going down annually by 2% and we see that this change is already reflected in the current strategy from 2017-2020, where the the NatMus states that it wants to run more cost efficiently and increase profits, especially by attracting more visitors* • Could you explain us how your department contribute to this? • On an overall level, how do you experience the efforts made to communicate the organization's strategy or any strategic changes to the different departments?
Theme: Data **Aim:** to get an understanding what types of data are used in the organization and how the interviewees work with data in order to generate value for the organization (this entails collecting, analyzing, applying data and data insights)	*As we explained first, our research focuses on the potential for the NatMus to create value with Big Data. In order to assess that, we need to get an overview of what kinds of data the NatMus uses and how it is used. It could be any data; e.g. visitor data or collection data.* • In your daily work, do you work with any kind of data? o If yes, what types? o What are you using it for? (purpose) ▪ Could you give an example? o Where do you get the data from? [another department, external parties, collect it yourself] o Do *you* analyse the data or is it already prepared for your purposes? In general, for the organization, we now know from you that you use *[X data]* and from other departments that they use *[Y data]* • Could you think of any other kind of data we have not covered yet? [collection-, visitor-, tracking-, social media data, etc.] • Have you ever considered any risks, such as ethical problems or security issues, in relation to your work with data? o Please elaborate
Theme: Innovation **Aim**:	*Now we shift the focus a little and look at the organization as a whole and its ability to change and innovate.* • Where would you place the NatMus on a spectrum, where on the one end you have an organization that allows 'total'

to get an understanding how the interviewees' assess the innovational potential of the organization	freedom to do what you want in relation to your work, and on the other end a very bureaucratic organization that has strictly-defined processes and structures. o Please explain why • Would you describe NatMus as an innovative organization? o Why/why not? • Do you think that there is a need to innovate in any aspects for the NatMus?
Theme: Supra-organizational aspect **Aim:** to get an understanding if the interviewees' perceive the cultural policies as a restriction and how they relate to external parties	*The NatMus is a public institution which means that the organization receives some funding and needs to comply with certain cultural policies.* • Do you experience this as something that affects your job and daily work in any way? • In general, do you experience that the NatMus collaborates a lot with external parties? o If so, how and with whom? • Do you see these external collaborations mainly as an opportunity or do you also think that they bring along some risks?
Theme: Visitor Experience	*On an end-note, we would like to turn our focus to the museum's visitors:* • Do you think that the experience you offer them could be improved compared to now? o If yes, how? (your ideal visitor experience) • How does your department contribute to the visitor experience?

Debriefing:

- Do the interviewees have anything else on their minds or would like to add some additional remarks to the topics or in general?
- Informing the interviewees about the next steps in our process

Appendix 3: Transcription Extracts

Transcription Extract – Interviewee 1

Interviewee: As of right now, we just had an organizational change, very recently, but as of now, we got four departments. One for operations and administration, IT is in that overall department as a unit, then we have the research and collection and preservation department, I am not in that one either, I was early on, and then we have a development department now, it's a new thing, and I am in that department, and then we have the department for [new] museums and sites. The National Museum has around 20 places that you can visit and they are organized in their own department, as of now. So yea, as you say I'm not part of IT in that sense, but I obviously have a lot of collaboration with them. So lot of the prerequisites that is needed to go through different kinds of projects and need the investment of IT as well. But I am located in the business department of the museum, rather than in the support… supportive kind of units, that support the operation of the museum, so to speak.

Interviewee: Yeah, yeah so that's already our next theme, basically, that we get an understanding of how the organization works and how the different departments collaborate, because what we can see from the documents that are available to us, like the strategy and so on, is that the museum seems to be like a line organization with very separate departments. So how do you experience the collaboration between these departments?

Interviewee: There are kind of two realities in that sense, because there is the formal organization and that has a big influence on the way the work works out here, obviously and then the museum also has an ambition of furthering our project organization. So that we want cross department, cross unit collaborations, obviously and that's not necessarily a new thing but it's something that the museum wants to further or develop, but in my view we could do a lot more in that sense. That's also a theme that there is, as I see it in any case, kind of a tendency that some of the new… the new ways of doing work are often developed within the digital domain in many cases, like perpetual data for example, the idea that a project never finishes, but and that you have to build, measure, learn - like agile, those kinds of methodologies tend to be bred, born and bred within the digital domain and then they get transported in different kinds of work, that is not necessarily natively digital. And I think there is a lot of inspiration yet to be drawn from that, because to me, I am, for example, product owner of our collections website and that's a open source project, it's highly agile, the way that we develop it. I have the role of srum mas[ter]… srum product owner in that sense and it's… the work is done scrum-based and stuff like that. So, those kinds of methodologies and theory on how to work and how you are able to go through projects for example, I think we could learn a lot still from those kinds of things…

Interviewer: Okay, yeah yeah

Interviewee: … to kind of develop new ways of organizing projects and stuff like that, because we are in many ways still functioning primarily as a the formal, silo kind of thing, yeah. So tendency that the formal organization works too, so that information kind of moves up in the hierarchies, decisions are made on top of the hierarchies and then kind of in the brain, right? And then the brain has to send out signals throughout the nervous system [laughter] so that the body does what the brain decided. And to me that's a very traditional way of organizing things.

Interviewer: Yeah and what I sense is that you feel the organization is still very much in this process but with your team you are already like a little breaking the barriers there, a little, because you said you also collaborate closely with other departments.

Interviewee: Yeah sure, but it is done in a very implicit way.

Interviewer: Okay, yeah

Interviewee: And you said 'your team'? I don't have a team. [laughter]

Interviewer: [laughter] You're on your own?

Interviewee: Just to clarify, yeah. So it's not that we have a digital team in that sense – we don't.

Interviewer: Ahh, okay, yeah.

Interviewee: That's not like… we haven't reached that like realization of the importance of this area. Like to me, it would be impossible to run a cool, relevant, exciting museum in a twenty-first century without seeing digital as part of the DNA of the organization. To me it's an absolute, central thing that runs through everything. And digital is the biggest difference between how a museum worked in the.., like before, like forever before and now, going forward. But that's a realization, obviously it lives in different kinds of my colleagues, but it is not something that has like [pause] it hasn't impacted the general management here in the museum, as I see it. For example there is a lot of news on like LEGO are doing a huge digital bet or initiative, because that's the future. Then, you know, Denmark's radio, DR, doing a huge digital like investment, because that's the future, like Novo Nordisk is doing it, like you can see it from many different companies, the tendency to draw in digital expertise in the boards, in the board rooms, in the management teams, stuff like that, as a way to show the realization that this is becoming an evermore central piece of the puzzle in terms of running a modern, twenty-first century company, institution, organization. That's not the case here.

Interviewer: Okay! [laughther] So, just that I understand really how you work is that you're just the single person responsible, basically for this and then whenever you need additional skills or work with people from one department, you go to that department and then find your new team basically for this project or whatever aim?

Interviewee: Mhm, yeah… for a project oriented initiative. So you could say that there are two streams running. A stream of operational, everyday stuff happening, the things that we keep doing over and over again, got a lot of those kinds of things building exhibition, doing marketing communication, publishing the knowledge of the museum, doing books, doing research. And then we got a stream of projects that focus on different kind of objectives and they are obliviously, like that's the definition of a project is that it's running for a certain period and then it kind of ends, and in that sense kind of teams emerges around those projects. And my role is to kind of pick out, because there are a lot of initiatives popping up all over the place all the time that has more or less to do with digital and one of my tasks is to have a broad network at the museum being in the know on if there are projects being developed that haven't been funded or activated yet, trying to figure out how, if that's the case at all, like how they contribute to the strategic goals of the museum or trying to kind of nudge them into a place where they do.

Interviewer: Okay, yeah.

Interviewee: So, pick them out and also killing of the ones that don't, is one of my tasks. And it's… There's also a bit of a stretch between, as you say, I would reckon that the image that you get of the museum by reading our official documents on our strategy, there is a… there is somewhat of a difference in that and then the reality, and that's obviously why you are here as well, to kind of scratch into the [unintelligible] as well.

Interviewer: Yeah, yeah. But there you already touched upon the strategy and that would be our next thing, because we know that the National Museum is now in a moment of change, because the funding is going down by 2% annually and the National Museum addresses that in the strategy by saying 'we want to run more cost efficient' and they also want to increase profits by especially focusing on the visitor experience and draw more visitors in. So how do you believe what you do contributes to these strategic objectives?

Interviewee: [pause] Well there's a… all kinds of initiatives pretty much have to contribute to that, but obviously a lot of goals of let's say to democratise the collections and knowledge of the museum, that's been a great, big tendency here is to put up the knowledge and collections for free, putting it into a web [unintelligible] will to make it have the biggest impact possible, because the internet is pretty wild in that sense and also kind of benefit from the creative and the creative potential of web users doing all kind of crowdsourcing projects and stuff like that. So I don't see it necessarily… you could make the decision that all different projects has to feed into that would really change a lot of the main tracks that we are on, in terms of creating free and easy access to the knowledge and collections of the museum as a free resource for anyone to use. We are using [unintelligible] comments as the tool to kind of communicate what you can and cannot do with the collections of the museum and we have a very open policy on images for example, but roughly 1.2 digital images in our media archive and a lot of those are licenced in a very free manner, so that you are actually also able to create business using the content of the museum. And so that would change that in many ways, but obviously there are in terms of the visitor experience, there are a lot of different visions and possibilities of using digital media in the broad sense, to heighten the quality of the visitor

experience at the museum. And we are in the museum over here and if you would put on glasses so that you can only see digital exhibition elements that would be a time machine into the late 90s. [laughter]

Interviewer: oaky, so you are… [unintelligible]

Interviewee: There's a lot of room in that sense of doing stuff that is more relevant in today's general experience. You now people dancing at home in front of Wiis that are able to see how you use stuff. So lot of possibilities

Interviewer: Ahm but do you have a vision for that? Like if you could improve the visitor experience what would you do?

Interviewee: Well to me it falls into two categories, because an integral part of a visitor experience of high quality is also there is a lot of things that has to do with very practical stuff. Finding your way around our museum that's a huge problem to many of the visitors. We've got 12,000 square meters of exhibition space, so nobody id able to visit everything in one day, maybe not even two, maybe it will take three days. So people coming here for two hours, what are they supposed to see, how do they make it more possible for them to actually experience what it is that's interest them. They have to take the… what are they called [Danish word – folder?]…?

Interviewee 2: Yeah, brochure

Interviewee: Yeah, you got brochures on different tours in the museum, so it's very much a one-size-fits-all offers that we do that they could take this tour, or this tour or that tour, but I would suppose that the difference between our visitors are greater than three different tours. So, for example, for you to be able to just on a very basic level find your way around the museum and maybe creating your own tour, like custom-made tour. That you are able to input certain things and then you get printed out the custom made tour, because we know where our stuff is and what it is, so we create that tour for you. So that's one part of this on the practical level and then on the other hand doing stuff that kind of feels magical. I think that's a cool way of approaching it, that a cool way of using digital media is indistinguishable from magic. So like being able to send a message to the other side to kind of the other side of the world or like to Australia with the speed of light – that's kind of magical. [laughter] Right?

Transcription Extract – Interviewee 2

Interviewer: Okay, and to go back to the strategy: How do you feel or what's your experience on the efforts made to communicate the strategy across the organization and any strategic changes? Is there a shared [unintelligible]

Interviewee: There is definitely a strategic change and it has been very, very clear; given out to the whole organization. I would say no one in the museum must have doubts on what the strategy is and it is "visitors first!" That is the strategy. We have – as I said – we have re-organized towards that goal.

Interviewer: Okay, yeah. And because our thesis has this data focus, but more on the organization. How can the organization generate value by using the data they have in order to address that we, of course, also need an overview of what kinds of data are there, in the organization and how are they used. And when we talked last time we learned that your department mainly focuses on the collection data. That is like the main thing. So, that's right?

Interviewee: Yeah! Yeah

Interviewer: So, and from [anymous] now we learned that it is… now it seems like you are still in the stages of digitizing most, because it is so much

Interviewee: Yeah! Yeah, there is so much.

Interviewer: So you are setting up the databases basically?

Interviewee: Yeah, we are dealing with legacy systems, actually, databases based on technologies that's way out of support.

Interviewer: Oh okay

Interviewee: So, we are not so many developers, we are four programmers, so it would take seven years to modernize all collection databases. So, we are struggling with the legacy.

Interviewer: Yeah, and you have several collection databases?

Interviewee: Yeah, [pause] I don't know how many, but maybe… Because a lot of the databases are created by former employees with database knowledge, that could be knowledge on how to create an access database, which is actually a pretty simple tool to create databases, but they are maybe – mainly they are not employed anymore, so we are not able to support these local developed databases. So, we absolutely have to re-program these systems.

Interviewer: Okay, and from last time we also learned that there is an initiative – the SARA system – where you have a collective database for more museums…yeah?

Interviewee: Yeah, actually this project – it is still going on – but it is so delayed, that we must do some, make some initiatives to [pause] – what is that called? Some of, as I said, some of our databases are based on technologies that's way gone out and we are struggling keeping these databases active. So, last week we decided to take one of the most critical databases and modernize it. Even though that there is this project going on, because we are not sure when Sara will be operational for our purpose.

Interviewer: Okay, but what was the idea behind that? Also where was it coming from? Is it that all museums have one database?

Interviewee: Yeah! This idea comes from the ministry.

Interviewer: Okay, yeah, okay.

Interviewee: Ahm, and then what we also learned last time, that you are also like besides the collection data you have a system in place, in the museum for tracking the visitors. Is that right?

Interviewee: Yes! Yeah

Interviewer: But, as far… You are involved in that by supporting the system, right?

Interviewee: Yeah!

Interviewer: And the data that comes from this system are you also analysing that?

Interviewee: We have… The thing is three to four years ago we changed our complete network infrastructure and at that time we then included these tools that gives us ability to track people... We made it as a proof of concept, so that we could show it to the business: we actually have the tools, but it might not be as precise that you actually need for creating value for your purposes. So, right now there is some project going on where we will extend the coverage in the exhibition. So, that the tracking will be more detailed, but we need some funding for that. But we have the tools and we have seen it work. One of the problems is that we are not able to see if a visitor is standing on one floor or another.

Interviewer: Ahh, okay. But in general if, for example, you get the funding than that would be something that would be your task, to analyse the data, to make like heat maps, or…

Interviewee: No, not analyse the data.

Interviewer: okay!

Interviewee: That would be the department creating exhibitions, so the exhibition designers and marketing and so on.

Interviewer: Okay! And does the same apply for collection data, that your task is mainly to provide the data, to digitize the data, but you don't run analysis?

Interviewee: No, no, no… Just create the applications on request from the business.

Interviewer: Okay, so there are also people from other departments addressing you like what do they need in the data, or how they need it?

Interviewee: Yeah, yeah! That could be a screen with a special purpose for transcribing protocols, paper protocols, instead of… Then we can design the screen that fits very precisely what they see in a paper book or if it is scanned in as a picture they have the picture on the right side and then thy can transcribe on the other side. So, the workflow is more efficient.

Interviewer: Mhm, yeah okay, so the idea, the explanation what they need it for would come from the other department?

Interviewee: Yes

Interviewer: And then you prepare it for them?

Interviewee: Yeah

Interviewer: So that then, they can also work with the data that they get out, basically.
Interviewee: Yeah, because we are able to digitize with this OCR – Optical Character Recognition – on all kind of protocols, because it could be some very difficult handwriting.

Interviewer: Yeah, okay and in the museum in general, so we know now okay that there is collection data, there is the visitor data or the tracking data of the visitors. Is there any kind of other data that might exist in the museum, but we haven't covered yet?

Interviewee: Of course a lot of administrative data, that could be employee… files on the employees and project data and all that kinds of stuff that we must also have to run a business.

Interviewer: Mhm, okay, yeah. And because you are stetting up all the systems to collect the data and to digitize the analogue data do you see any challenges in managing the data? You already touched upon that it is … that you have so many different databases and some of them can't like it is hard to support, but also how is,… for example can, do the people, who use the databases have the knowledge for each database?

Interviewee: Not particular, we have been in a process, where we try to create a basic data structure like a data warehouse or something like that, where we can consolidate different kinds of databases. So, actually we could put apples and pears and bananas and convert into the same data structure. That's actually what we have been working on for few years to create this fundament.

Interviewer: Okay, so that is one of the main problems?

Interviewee: Yeah, because if you… if you need some kind of data you must know where this database is. You cannot search across different databases. So, that's actually what we would like to do. Also, so it is easier for [unintelligible] like guest and… So, you can actually access our data from all over the world via the Internet. That's not possible today.

Interviewer: Mhm, okay, yeah.

Interviewee: Well, a little bit but many databases are not only.

Interviewer: And in your work with data do you see any, any risks? That could be any kind of risks, like security risks or ethical risks?

Interviewee: Primary… Well, mostly security. I don't see the museums as a high-end value targets for hackers and so on. Most of all data is available to the public. It might not be online but then they can come here and get it. So, but we cannot effort to lose our data. So, the risk where some malware destroys our databases and where we are not able to recover from our back-ups, that's of course a big problem.

Interviewer: Mhm, yeah because you also mentioned that, and Jacob mentioned it, that all the data is basically open access and open to the public, but then… And you are also in charge of the digital collections, but there it is not all the data is not in the digital collections that are accessible, right?

Interviewee: Correct!

Interviewer: And how is that decision made? Or how do you decide what is in a digital collection?

Interviewee: The biggest problem is that the collection databases are in their technical structure not able to access the Internet, for public access at the moment and that's the transition we are doing right now, where we consolidate databases into the same structure.

Interviewer: Mhm, but would that be then an aim to have in the future, when this is done, to have basically the whole collection also as a digital collection that is online accessible by everybody?

Interviewee: Yeah, of course, yeah.

Interviewer: Okay!

Interviewee: It might not be in my time [laughter], but that's the idea.

Interviewer: Okay, that's the aim, okay good to know. Alright, then that was already our data questions.

Interviewer 2: Actually I have … I was just to say, because after our meeting last time we were a little bit of the impression that you have, also what you said now, that you have some databases left around from employees, who left and that there is a little bit data spread out. Is that a problem? Like is there a lot of potential lying around that there is no overview of, or?

Interviewee: Well, there might be a potential in it. Ahm, we have several PhD students here, they come typically for three years and when they leave their project, there will be of course be some data left behind and we do not always know what kind of data but maybe that could be used related to something different. And that's also something we would like to be able to somehow collect these data, like in a data garbage can and then make it searchable for the rest of the museum. Ahm [pause] There is also, I am sure, there is also databases around that we do not know anything about, that might be created only by one, two persons. And if they are not employed here anymore, it might just lay dead somewhere on a file share.

Interviewer: Mhm, yeah. So now, looking more regards to the National Museum as an organization and that it is right now in a position where it seems to change and we want to find out, basically, what's the potential of the National Museum to innovate. So, if you would imagine a spectrum, where you have on the on end an organization, where you have total freedom, basically to do whatever you want in regards to your work. And on the other end a very bureaucratic organization, where you have a lot of structured processes, strategies. Where would you place the National Museum in that?

Interviewee: Mostly, over here [points to the 'more bureaucratic' end]. The maturity on using digital tools efficiently are not that high. So, there is <u>really</u> a potential on raising the knowledge at the users in using digital tools. Of course, the most employees here have a computer, but maybe use it… the use is not very efficient. They maybe only use the email system and maybe our intranet and that's it.

Interviewer: Mhm, and where… to get them there, that they know what's already possible and what they can use, where do you think would this come from? Like, is that something that you would go into the departments and show them 'Okay, this is possible' or is this something that the management form the top would have to make?

Interviewee: Well, it is important that the top management supports that view. We will try to – let's say – innovate by example. So, we create some solutions to different kinds of problems that we see and try to sell it to different people in the organization and hope that they would like what they see. We have some initiatives going on. One of them is, as I said, to modernize one of the collection databases based on another technology and hopefully [unintelligible] more user friendly and we are

creating a new intranet with a lot of smart features included, that we would hope that the users also would like. So, we try to give the employees some new tools, some possibilities for more flexible use of IT, but it's not going that fast.

Interviewer: Okay, yeah. But you see as an opportunity for your department, that you are able here in this organization to facilitate innovation?

Interviewee: Yeah, yes, yes definitely! The first year I was here we struggled with stable infrastructure and the… If we want to create value to the business, innovate and give examples to the employees how to do their work better and more efficient. The basic infrastructure must be very good and stable. And in the first years I was not that. Now, we have a very few requests to our helpdesk on basic problems on people that cannot log on and so on. So, that gives the opportunities to create more value to the business.

Transcription Extract – Interviewee 3

Interviewer: but you have this seasonal ticket right?

Interviewee: yea, but

Interviewer: it doesn't collect any data or?

Interviewee: no, not really, it is very little. And I'm pretty sure we are not allowed to use the data because we didn't ask for permission so... I mean, when we did the entrance fee, we knew in March that we had to implement it by June, so we had three months to do it. And you simply can't get a system working, collecting all those data, and you can't have a strategy for how you use your data on that short period of time. You just have to pull up a cash register and be able to accept the money when people come in. That's it. So, that's going to change and I think the model is also going to change that. Have you looked into Det Kongelige Teater? The Royal Theater?
Interviewer 2: yea, we actually went to a seminar with them on this topic - how to use Big Data. They are super good at it.

Interviewee: they are good! They are *really really* good! Even though their product is different from ours, people they... they have these subscription models which makes it a lot easier to, or it's more obvious to do it, I still think we could go a long way, because we do know a lot of our visitors are recurring - they come again - and that's actually one of the things that is a problem for us right now is in terms of course it is the Danish visitors that are the most recurring because, but we know that a lot of them chose not to come as often when we had the entrance fee. When we started charging the entrance fee, they simply stayed away. So, the thing is, could we create a little bit of value for them, meaning that it would make sense for them to come more often and use that data to create more personalized experiences and more valuable experiences? It would be solving two problems in one. We had a coverage of the Danish marked and higher turnover - that would be great! Absolutely!

Interviewer: and you say you don't have so detailed visitor data on different aspects. Do you use social media data for example in this department, analyse this and?

Interviewee: yes, we do to some extend. But it is again not as detailed as we would probably want. We can't for instance see how [unintelligable] on social media or even the internet, because we don't have, our website at the moment... hmm... it is not really though as a website that has an infrastructure for commercial activities. It is more of a knowledge- communication you know... stories about artefacts and old times and history, but you can't buy tickets online. Big problem if you want to see how much your marketing spending is creating in ticket sales. Ehm... the same goes for social media. We are a little bit closer there, but still not overall close, because social media is very small in general in the activities we are using. Our big marketing campaigns are usually PR driven because we have a lot of good histories, and that is even *more* difficult to track. So... we do have some [unintelligable], we still have a long way to go. We need a new website basically.

Interviewer: yea okay, so that would also be... some aspects where you are collecting data; the website but you can't really

Interviewee: analytics, it's visits and page views and all that stuff you usually collect. That's the basics

Interviewer: so in the department basically the data you use is visitor data, website data, the social media data - is there anything else?

Interviewee: digital media or in general? Interviewer: yea, social media and do you have any other media?

Interviewee: yea, we do a.. because we have, what do you call it, papercuttings. You know, public relations - how much we are being mentioned in the media, and that is a lot. And each year, we do a - I'm actually able to do it on a shorter basis but - each year we do a collective calculation of how much value in terms of advertising value are public relations activities has created during the years, and this is a three digit million number, this is around 125 million each year. But please do remember, this is 20 places, 20 different attractions and museums, and not just one, but this one accounts for 40-50 percent.

Interviewer**:** alright. You said you use a lot of data and you mentioned it a little when you said you would also share the data from the new analysis with other departments. Do you see any risks associated to working with data - any ethical or security risks?

Interviewee**:** not at the moment. I wouldn't say, cuz at the moment we don't have any personal data. it's all in anonymized form. We don't have any names, we don't have any emails or anything. Well, we do have a little of that but we haven't used our newsletter data for instance in what I've been doing, so no... I mean, I could be worried but as long as I'm not the one who has to worry about how to implement a new GDPR thing... Then I mean, I'm mostly doing the statistics and the forecasts and the insights and not using it for promotional activities. Of course we have to worry about where our data is located... yea, I guess you spoke to X about that. I hope you did.

Interviewer**:** yea, and as I said, we also want to understand how the organization works and how the different departments relate to each other, and what we gather from the documents that are available for us and what we can see online, it seems like the national Museum is the Line organization with separate departments. How would you describe the collaborations between these departments?

Interviewee**:** Well at the moment we are just one month into the biggest reorganization we have had for more than five years so at the moment, it is very much touchy-feely and you know, you see how far you can go and people are little bit cautious because... we are all trying to find out how much this new way of working our new organization will mean for each of us, in terms of work and how busy we'll be and and how many tasks we will each be assigned. So people are a little cautious about

saying yes to too much, but I will also say that in terms of the culture that is here, it is rapidly changing right now. Before - and it has nothing to do with our old director, it was just the way the museum was generally perceived itself – it was very much academic no-fault culture, you know that expression? You know, where you can't take any chances. If you do take chances and you fail, you'll be punished. If you have a success, no one will really recognize it so... it was very very cautious and very much non-experimental, and *that* is changing because of our new director who will say "you *have* to make mistakes, you *have* to make some errors, you *have* to try, you *have* to experiment. I won't punish you, I'll embrace it if you do it, because if you don't try, that is the thing I won't accept". So, that is changing the way we are working together too. We have much more confidence in each other, and we need that. So it is more of a cultural thing, but I think it is important in a very cultural driven organization

Interviewer**:** yea, and what I gather from that is that this organizational change tries to bring the departments more together as one single museum

Interviewee**:** absolutely! If you were organizational consultants and were looking at us from a Herzberg perspective which would be interesting in this, you see that we look more like a university than we look like an amusement park, and we have to find a way in between those two that fits us, and I think it is somewhere in between. At some point, we have to be *much* more like an amusement park. Have you heard about the button you push when you are bored? have you heard about that one?

Interviewer**:** button?

Interviewee**:** we are going to, during this easter we are going to do a big children's event. It's a boredom bottom. When children are bored - and they often are - we have a button for them to push, so something happens right.

Interviewer**:** what happens? (laughs)

Interviewee**:** yea, a lot of different stuff. And it has been criticised and also praised in the media right now which is of course what happens when you do something like that. Some of the guys out there, some of the typical museum guys say "oh, you are going the Tivoli way. That's so wrong, you should just be... you are museum - be a museum" and people are saying "well, this is not about content, this is about the form. Everything we do is still research-based. We are still very serious. All the artefacts we have are still real, but the way you present it to people is another thing. Why is Disney so successful? That's because when they do Hans Christian Anderson adaptation, they don't sell you a 150 year old book, they do Frozen. Right?

Interviewer**:** yea, that's right

Interviewee**:** that's the thing. It's not bad because it's popular and because it resonates with people. Not at all.

Interviewer**:** there, you already touch on the visitor experience and how it could improve. Do you have any other thoughts on that? I gather from what you say that you think the visitor experience can be improved compared to what it currently is

Interviewee**:** absolutely! I should perhaps, I should show you the user survey we do, because you can see there where we need to improve and where we don't. You want to see?

Interviewer: yea, absolutely

[interviewee is leaving the room to pick up a computer]

Interviewer 2: do you still belong to the communications and marketing department or where are you placed in this whole...

Interviewee: well, no, we are all part of a new, I can show you actually how we are organized while I have this one. We are part of a development department now, all of us. So, it's about public program, how we call it - "formidling" in Danish, which is how we translate all the knowledge at the museum into visitor oriented businesses. That's basically what we do and what my boss does

Interviewer 2: alright, is there an official new diagram because I think the website is a little outdated
Interviewee: ooooh, if it's official? I don't know but I can show it to you, and it may be official once you have to put it in to your thesis so. I think it is official but it hasn't really been translated into an external one. It wouldn't make much sense if you put it in your thesis but I can show it to you, yea absolutely. [Typing at computer] And if you are confused, you are not the only ones. This is what it looks like now [showing the computer screen]. This is the new thing, this is the development department which is the new thing - we didn't have that before. What we had before, we had a.. public programs and we had research which were part of the same "forskning og formidling" we were part of the same organization. It didn't work! The idea was that the researchers and the interpreters people doing the activities should be working more closely together, but it doesn't happen. Unless you put people in the same office it doesn't really happen and that's what we did now. Now we just make, made a development department who does everything in relation to the visitor and the organization

Transcription Extract – Interviewee 4

Interviewer: right, and how long have you been working with the national museum?

Interviewee: 25 years

Interviewer: oh wow! [laughs] So you know it quite well I guess
Interviewer 2: did you do your phd here?

Interviewee: yes! The national museum is quite huge so it's 20 different museums and I have been working many years in the open air museum and also in Bredde - it's an industrial factory museum, but the last 15 years I have been here in this museum

Interviewer: alright, and you already said that you are working with the researchers basically, the experts on a topic to build and exhibition. Could you take us through the process of setting up an exhibition, from idea to execution?

Interviewee: yea, it's, let me take a pencil and some paper, it's easier to explain. We have rearranged the way we work with exhibitions and we are working on a new process at the moment. It's quite new in the national museum that we have a person like me, an interpreter, working with the scientists. Just a few years ago, it was very normal that you had a scientist here - they had done research into a topic - and when they were finished doing their research they said "oh, now we are going to do the exhibition", and then they made an exhibition about whatever topic they had been researching into or perhaps a subject that more researchers could work with, and then, the common way was that the researchers did everything. Of course they had designers to design the showcases etc, and then afterwards we, as interpreters or educators, would come and then they said "oh, now you can use the exhibition" and then we had to do educational stuff for schools etc etc, and that was quite difficult because sometimes the very good stories were putten away because they could be very good for an audience but they could be not so interesting for a researcher, and sometimes the researchers did more exhibitions for themselves or their colleagues than they did for a normal audience, so some years ago, and it is not only here at the National Museum, they also have it at the British Museum, and the museum has now made it so that researchers always have a companion from an interpreter to ask all the silly questions or rewrite the text so it gets more readable, not so long sentences and not so difficult words. So, we have been working that way for some years, so there are two new ways of thinking. The first was that normally, the topic was a topic that came from the researchers… Not related to if it was interesting or not interesting [laughs]. Sometimes of course it was very interesting for our users, larger audience... sometimes not. And that has changed. And the other way, the other thing that changed was the way that we organize that now it os not only the researchers, it's a huge group that work together. Normally we have - I just show you - normally we have a project group, we have a steering group [writing on paper to illustrate], and we have one that is responsible for an exhibition, and that depends on who is… that can be a vice director or that can be a director or it could be… steering group is supposed just to be in charge of everything is going smooth and we are planning the right way, and we are not using too much money and that the

exhibition will be finished the right day. They are also often in contact with the foundations and if there are problems - and there are *many* problems when we make exhibitions - they have power enough to decide what to do

Interviewer 2: are they like the project manager in this regard?

Interviewee: no, on top of that. These are only… these are chiefs around the house, leaders, but they are not into the actual… you are reporting to them but they are not working on the exhibition. Then you have a project group. And this is a group where you have a project manager who is supposed to keep track of the schedule, the finances, that everybody is doing what they have to do in time, and are of course sending out schedules for the meeting etc etc. In this group, there are different members. There are the scientist, operators, there are people like me - interpreters - there are members of design and audio visual people, graphics

Interviewer: with design, do you mean architects?

Interviewee: yes, architects and scenographers. There are audio visual people, one, there are graphics and then there is conservator. Ehm… and marketing, public, sometimes also education. Ehm… and public event. These are the basic group, and we meet once a month or something like that. We are keeping track of the whole exhibition but we are not, and sometimes we are discussing, deciding, but underneath this, there is lots of working groups. There is a group for graphics, and of course there is the architect and the graphic designer and there is one of the content people. The content people could be me or the scientists because i'm also working with content. But then there is the content group. And then there is educational group, so you see, we have a lot of working groups and each group has different targets to work on, and of course, this is for a huge exhibition. Sometimes we make very small exhibitions, and of course there are not so many people, but it's very complicated to make exhibitions at a museum like this because you always have to have conservator working with the objects because you have to get them out of the storage. We have to make sure that they are alright or maybe they should fix them or do something about them. You always have to deal with security, with climate, so there are lots of troubles in making an exhibition that you do not see when you are the audience and you are not related to the content and the idea. So sometimes we have *great* ideas to do something for an exhibition, and then they come from the conservators and they say "oh, won't work. It's too fragile, we can't get it out of the storage so we have to use 3 weeks to remove something else. You have to find another way of doing this", so it's a huge compromise when we do exhibitions. You just cannot see it from the outside. The content is what you mostly see, and nowadays we have a new way of working. The content is mostly done in this circle [draws]. In here, we make the idea or the big topic or the big question or whatever is the target of the exhibition, and here we have interpreter, we have the curator or scientist and we have an architect. That is usually the main group. I had a meeting this morning where we were going to do a proposal for rearranging, redecorating something, and then there was me, the scientist and the architect discussing what can we do, and we have each, each of us have our own function of course; the curator knows everything… it was about the danish war with the Swedes in the 17 hundred, so he knows everything about this with the Swedes [laughs]. I do *not*. But we were discussing how we

could get some of the treasures they found after the war in an exhibition, and my purpose is to see what is the good story in this, what's interesting in this

Interviewer 2: from an audience point of view?

Interviewee: from an audience point of view. How can we make this interesting and how can we make them look at this. There is no purpose if they just doesn't see it, and then the architect is trying to make it visual or… so it's a very creative space while we are discussing the, you are allowed to say "oh, that's too boring" or "that won't work" or "oh no, you can't do that" or

Interviewer: okay, so it is your role to translate basically what the curator wants to show into something that you think is accessible to the visitor?

Interviewee: yea. One example; this morning, we discussed should there be more story, should there be pictures coming on a projector on the wall with different people and my opinion could be but people won't understand that some are farmers and some are noble men, they will wonder why are they here and oh yea, that's a good point. So, you are discussing point of views and what could be the most interesting way. So, this is the normal way. We had problems with our exhibitions… It's sometimes a battlefield. Very often a battlefield. It's very fruitful with battles… sometimes [laughs]. Or it can be draining. Fruitful when they make us do the best exhibition. Draining because sometimes it's just a battle between different areas of expertise. Of course we have, the scientist are very much into their way of the story, the designers want to have something looking *extremely* good and I want a good story and if it works, it *really* works. If it doesn't, it's very demanding. And we have had… I have been working with many many exhibitions during the years, and sometimes it's not working that well, so now we are trying to make a new way of doing exhibitions. The main thing is that normally it was the collections that felt they owned the exhibitions... and the space... so, if you go into another collection space... and a job is at the moment to say this is the National Museum. It is not like *this* part is belonging to the middle ages. This part *doesn't* belong to the ethnographic collection, it's the National Museum and we *can* rearrange. That's the first point of view here to make that happen. Another thing was, normally it was the curators and the collections that decided what to do in the exhibition, so it's very frightening for them nowadays. Actually it is *me* deciding, or my boss deciding, or the director deciding what is going on. Of course the collection is their responsibility, but it's not their responsibility what we actually do, and of course it should be a collaboration, and that's something new and that will take some time, but at the moment, it's quite good. The target is at the moment to make the curators realize that it is also good for them and their story. Sometimes it's working… there are many different cultures within a house like this; the museum is more than 200 years old, and many people have been working here for a lot longer than I have, and… so, it's another way of thinking when you come into a museum. What we are doing now is to decide what exhibition has to be done. Normally they would, the collection would apply for money and then they would… But now it's more, it's something that has to be decided in another way, it's not the subject or the collection, it is what is going to be interesting for the audience, because we have to earn money, so nowadays you can't make very narrow exhibitions. You can do sometimes, and you should do sometimes, but you cannot make exhibitions that are only interesting

for a very limited group of people. You *have* to make broader exhibitions. Otherwise we don't earn money. So, at the moment, we have a group that are going to look for different ideas for exhibitions, and everyone is allowed to come with an idea for an exhibition, also people from outside, and if - then there is a group that looks at them - and if it's good enough, they will go to a pitch or… And then there will be a group of directors, the vice director, the director of this place - National Museum of Copenhagen - etc listening and then discussing afterwards what can they see would be interesting. Before that, they had to do a prototype, and sometimes more prototypes. We just did it once where we had this viking exhibition we are going to make in a couple of years, and we are going to.. we have done lots of viking exhibitions, we have several viking exhibitions travelling around the world at the moment. Nothing new in that. So, how can we make a new approach to the vikings so that it is not the same as always? So, there was a seminar where people from in the house - experts etc - and people from outside of the museums, writers, roleplay specialists came together and they were also put into groups like this [pointing to a drawing she has made] with an expert in each group, a writer maybe etc, and then they made three different ideas for a viking exhibition. Very different. And they are all very interesting, but very… not the same. So now the foundations and the museum have to decide which one. But it is a very good way of working, not just to say we have to have something about vikings, and then somebody go ahead. Here you can decide oh, do we want to have it more playful, should it be more traditional, should it be more whatever