



LUND UNIVERSITY
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Managing Art

Digital Asset Management for Collectors and Galleries

by

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Abstract

Background and Objectives:

This project explored the needs of art galleries and collectors for Digital Asset Management Systems (DAMS), in order to fill an existing knowledge gap and help companies to analyse these needs. Bespoke difficulties in the field significantly challenge the development of DAMS and have thus also hampered the evolution of high-quality systems for the art market. There seems to be a large variety of tools that do not sufficiently fulfil their purpose, whilst collectors and galleries interested in using DAMS are left without an efficient tool to manage their art successfully.

This unexplored research area is approached using two stages of data collection. By gathering the insights of both IT specialists and practitioners in galleries and collections, the aim is to gradually better understand the needs for DAMS for the management of art, and shed light on ways to improve efficiency thereof. The objective is to guide software developers towards creating high-quality DAMS for the target group.

Findings:

Using a qualitative design, this cross-sectional research established a common list of needs and identified factors enabling the differentiation between various art galleries and collections. Overall, results indicate similar needs of galleries and collectors for DAMS: Cloud-based solutions and modern identification technologies have been identified as commonly mentioned future needs for certain galleries and collections, however these appear to face the impediment of concerns stemming in part from a lack of IT knowledge in the creative industry, as well as a general hesitation to invest.

Implications and Conclusion:

The findings are merely indicative, but can serve as a broad orientation for the development of DAMS towards a design that is adaptable to galleries' and collectors' needs more targeted than current market solutions. Even though this research is only exploratory, it can be argued that the findings are a crucial first step towards the future development of DAMS.

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Keywords and Definitions

- **Digital Asset Management (DAM) and Digital Asset Management Systems (DAMS)**, also referred to as DAM tools or DAM solutions
- **Collection Management Software (CMS)**
- **Metadata**: data providing information about other data (information on artworks in a database)
- **Modern identification systems**: Technologies for machine-readable codes such as Barcodes, QR codes, RFID tags or iBeacons
- **Stakeholders**: Collectors/collections and galleries
- **Preliminary Study**: First stage of the data collection
- **Second Stage**: Second stage of the data collection
- **Expert interviews**: A qualitative interviewing technique that aims at reconstructing knowledge that is specific and very internalised by practitioners. This research contains expert interviews with a) **Industry experts**, who are the three sources in a preliminary study and work with software development for the creative industry and b) **Experts** defined as people who work in galleries or collections using digital systems to manage art on a daily basis.
- **Deloitte Art and Finance Conference 2016, Amsterdam, NE**: Also referred to as 'Art and Finance Conference, 2016'. Collaboration between *Deloitte Luxembourg* and the *Van Gogh Museum*, Amsterdam. Gathering of art professionals and art market experts, roughly 100 individuals of the world's leading art institutions, art collections and investment companies, CEOs, journalists and academics.

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Chapter 1

1. Introduction

This project is concerned with Digital Asset Management Systems (DAMS) as powerful tools for aiding the management of art, with a specific focus on art collectors and galleries. The process of research originated in the investigation of the market for DAMS within the creative industry and was sparked by the researcher's academic background in the arts. This engagement with the topic, as well as discussions with software developers and art professionals at the *Deloitte* Art and Finance Conference in Amsterdam (2016), have led to the identification of a research gap.

1.1 Contexts and Background: From Digital Revolution to Professional Digitalisation

1.1.1 Managing Art in the Past

Ever-increasing possibilities provided by technological advances have led many industries, including one of the most traditional ones, namely, the art world, to enter the era of digitalisation. The slow embrace thereof by various stakeholders, such as art galleries and collectors, has turned into an increasing appreciation of technology as enhancing the collecting, buying and selling of art. Proliferation of access devices, abundance of cheap bandwidth and increasingly standardised applications have brought about miscellaneous opportunities for providing alternatives to handwritten or the still-in-use Excel spread sheets of artworks. Hence, despite priding itself in the value of its old age, even the creative industry began to acknowledge the potential of managing art digitally.

In the early days of art collecting, the fundamental issues of managing art were not much different from today. In the form of handwritten lists, collectors and exhibitors of art kept meticulous records of the artist, title, year, price, provenance, and any other information required for claiming the value of an artwork. The problems incurred by conflicting, partial and incorrect accounts of early art collections are illustrated by the dispersal of such a collection (McEvansoneya, 1996). The reconstruction of records for validating works of art via history of ownership has become a profession in itself, illustrated by the case of the famous collection of the Duke of Buckingham (McEvansoneya, 1996). The scholar McEvansoneya has devoted his academic career to determining attribution of the Duke's collection to famous artists, history of ownership and history of location retrospectively, without which individual

artworks would be of lesser value today. This little excursion to the 17th century may seem peculiar, yet, it serves the purpose to introduce and emphasise a crucial assumption of this thesis: keeping any information required to validate and track art is essential for the efficient management thereof; the increasing professionalisation of the art market has forced its agents to continually work towards achieving ever more efficient ways of doing so.

1.1.2 Managing Art in the Digital Age

The emergence and sophistication of information technology has translated the issue of detailed record keeping to finding ever-more flexible, streamlined and dynamic systems. These have eased the manual jobs of entering information and enabled the keeping of files together with images of artworks facilitating the identification and tracking of collection holdings. Simple Word documents or Excel spread sheets long sufficed for keeping digital inventory of artworks, but it was the invention of Collection Management Software (CMS) to revolutionise digital art management by offering data linkages (Swank, 2008). CMS can be a powerful management tool and “refers to record keeping, inventory control, create and store records for every object” (Swank, 2008:8). Additionally, CMS functions as an archive documenting all business activities of its users, be that collections, galleries or museums. It can be argued that the implementation of such systems is a must, as saving time and money are fundamental concerns for any business or industry. Although CMS supports most of the stakeholders’ key operations, there have been efforts to move away from static on premises data banks towards developing more adaptable and integrated platforms online.

The possibilities provided by digital delivery have transformed the way in which art is traded, consumed and validated, and art institutions, as well as artists themselves, are increasingly making use of websites and databases (Arora & Vermeulen, 2013). However, it has been suggested that the digital revolution is still taking place in many sectors of the creative economy, as the “largely informal and opaque character of the art market with its continued emphasis on closed dealer-collector networks and face-to-face contacts” (Arora & Vermeulen, 2013:1) is sometimes still preventing capitalisation on the wide-reaching possibilities offered by the internet.

1.1.3 Digital Trends

Existing literature on digitalisation in the art world mainly focuses on implications for the demands of the art market, emphasising the increasing democratisation of art and information. Art is beyond doubt increasingly transferred to virtual spaces. “In the art world, digitalisation has manifested itself through the creation of databases containing tremendous in-

formation regarding prices, the type and characteristics of a work of art, authorship, provenance and records of previous sales which are now available for professionals, art lovers to amateur art consumers” (Arora & Vermeulen, 2013:2). Essentially, the internet provides powerful ways to disseminate digital content (Arora & Vermeulen, 2013). Especially its current “Web 2.0 structure of being participatory and user-driven” (Arora & Vermeulen, 2013:2) has transformed the way in which information can be accessed and distributed. Hence, “literally millions of images of works of art have been digitised” (Arora & Vermeulen, 2013:2). Digitalisation has not only made art more accessible to the public and increased transparency within the art market, but has also generated the need, and thus, triggered the ability, to efficiently and securely manage art via online databases.

These trends are also reflected in findings of the *Deloitte* Art and Finance Report (2016). The highlights of this report list an “increasing investment in art market start-ups in 2015“, “investment in managing, tracking and identifying art objects“, “increasing confidence in technology and online art businesses and their role in the art market evolution“, as well as that “online art businesses and technology can tackle many of the challenges facing the art and finance market“ (Art and Finance Report, 2016:126). Further, the report ranks high profile individuals and companies who are currently investing in start-ups, thinking of new ways for the development of gallery management software such as *Artbinder* or *Collectrium* (Art and Finance Report, 2016). Such cloud-based DAM tools for managing art are believed to play a key role in the evolution of the art and finance industry, using technology to improve logistics and ease other key challenges for art management (Art and Finance Report, 2016). These developments have caused competition to increase in the collection management market. Illustrating this trend are especially *Christie’s* US\$16 million purchase of *Collectrium* in 2015 and *Artbinder* as having raised US\$3.17 million funding in 2014, as well as ever more providers joining the market (Art and Finance Report, 2016).

1.1.4 Digital Asset Management Systems (DAMS)

Essentially, DAMS offer ways to store and manage large amounts of data in the form of digital files and images. These are called digital assets - content(s) or media in the form of binary sources including usage rights (van Niekerk, 2007). Given the explosion of digital assets in a global world, the management of these data presents interesting challenges and possibilities for service providers and asks for efficient and customised solutions (van Niekerk, 2007). DAMS can be considered tools for storing, managing, organising, consuming and distributing of these assets, and both companies and individuals can use them to manage their data (van

Niekerk, 2007). With today's commercial and economic world becoming ever more fast moving, the development of mechanisms to locate assets in a time-saving manner becomes essential for any type of business, to keep pace with the rapidity of managing, searching and retrieving any assets (Kopaliani, 2007).

With early systems emerging around 1990, DAMS have long posed technological challenges and have only recently become affordable due to lower prices for processing, disk storage and ever-increasing bandwidths of networks on a global scale (Austerberry, 2007). Originating from Content Management (CM), DAM is a response to the vast increase in various forms of content creation in modern business (Austerberry, 2007). "Using metadata, DAM enables the linking of content with information" and acts as a "guard (of) confidential information" (Austerberry, 2007:4), as managing content and assets is eased by the possibility of access through one single portal. Some of the various advantages of DAMS are that users can search for relevant information or files fast and easily, whilst remote access enables on-demand availability of any subsets of assets (Austerberry, 2007).

From an IT perspective, the immense potential of DAMS is apparent. Not so obvious, however, is their definition itself. DAMS are powerful tools, which can be used in a large number of ways. Hence, given their varied utilisation and purposes in different industries, the term DAMS itself escaped a clear definition. Whether DAMS are used as mere databanks, for publishing content, or for logistics, the factors outlined above appear common to the use of DAMS in several industries. One example of an industry that has benefited from the use of DAMS is the library business. A study conducted about DAMS for libraries, which also require collection management, highlights some essential aspects to consider for understanding the strengths of such systems (Kopaliani, 2007). The author emphasises that the scalability of systems to track an unlimited amount of assets and required information about them has emerged as central to the architecture of DAMS (Kopaliani, 2007).

Hence, bespoke difficulties in the field significantly challenge the development of DAMS and have thus far also hampered the evolution of a high-quality management system for the art market. To complicate matters more, there are considerable overlaps with CMS, as the three basic functions of DAMS are already included here (Degenhart-Drenth, 2012): DAMS have to provide for the storing and retrieving of metadata about the object's digital characteristics, sustainable storage of digital assets, as well as conversion and mobilisation of derivative digital media (Degenhart-Drenth, 2012). Powerful CMS such as the Swedish software company *Axiell's* 'Adlib' fulfils most of those functions. However, one cannot expect CMS to provide images of photo studio quality; similarly, several crucial exporting functions are

missing (Degenhart-Drenth, 2012). Hence, questions regarding users' overall need for a system, and more specifically what kind of a system, are not easy to answer - if one asks one of *Axiell's* software specialists, he will likely say: "It depends" (Degenhart-Drenth, 2012). CMS has been and still is extremely useful, nevertheless, the increasing diffusion of the borders between physical and digital objects bears increasing possibilities and challenges. What is needed therefore 'depends' on several factors, for example, whether a user merely needs to manage a collection's inventory or wants to use digital prints and publishing functions, or needs to export data on a regular basis. These questions will resurface throughout this report, which will demonstrate that it is the needs of users that ultimately determine what DAMS have to be capable of.

Whether used separate or as an integrated solution with one's existing CMS, DAMS are available as on premises, web-based or cloud-based solutions. All are currently in use for the purpose of managing art, however, the decision as to which one is implemented is very business specific. This thesis considers cloud solutions as bearing immense potential for the art world. However, little to no research, to the author's knowledge, has reached this area. Within and as a result of this research gap, several challenges came to light.

1.2 Problem Discussion

The first challenge begins with the lack of a single definition as to what DAMS actually are. When asked, even software specialists cautiously say 'it depends.' Essentially, many have used some form of DAMS, as even very primitive systems such as *Spotify*, *Flickr* or *iPhoto* could be labelled DAMS. The Swedish company *Axiell*, one of the world's leading providers of CMS who are also providing DAMS, maintains an on-going internal debate as to what, or whether there even is a single definition for DAMS, and has yet to reach a conclusion. If software specialists struggle with defining what DAMS are, it may also be unclear to potential and current users supposed to know, which system to choose or how to use it in the most beneficial way. Research on the difficulties with choosing suitable DAMS established that this choice can be an overwhelming task (Kaplan, 2009), suggesting that meeting the requirements of users is paramount.

This problem appears to be linked to a second challenge, as there is no existing research on what collectors and galleries expect from digital tools to manage their art. Thus, software developers are unable to provide truly helpful systems that answer the needs of their target group. On the one hand, the sheer multitude of systems that can be found online testifies to the lack of clarity as to which systems are suitable for individual users. On the other hand, no

gallery or art collections across the world is the same, as each and every one of them has different areas of focus or interests, which can be expected to in turn influence their needs. Importantly, DAMS have developed from Content Management Systems, for which today only few big providers exist. The market for DAMS, however, is still very young. According to industry experts, the market is flooded with different tools; pricing and functionalities, whereby the oftentimes huge gaps between offerings and prices can cause frustration for users.

Thirdly, there is no research on how existing systems could be transformed into high-quality tools to serve the art world. The creative industry has been slow to embrace digitalisation and the art market is still abundant with players who eschew considering ever more modern and sophisticated technologies. Nevertheless, the art world does express an overall interest into engaging with the increasing possibilities offered by the internet and information technologies as discussions of leading organisations and individuals present at the *Deloitte* Art and Finance Conference 2016 have shown. Yet, the question as to which features are attractive to individual users, and that could be added to increase efficiency of current market solutions, remains unanswered.

From considering these challenges, the following implications have become apparent: there seems to be a large variety of different tools that do not sufficiently fulfil their purpose, as there are too many providers, both experienced and inexperienced. Further, collectors and galleries interested in using DAMS are left without an efficient tool to manage their art successfully.

1.3 Aims and Objectives and Research Questions

Whilst this thesis cannot - and does not seek to - provide a revolutionary definition of DAMS, the aim is to shed light on the needs encountered when thinking about DAMS for collectors and galleries, as well as improving the capabilities of current market solutions. The task of aiding the development of new DAM tools is an attractive opportunity for the combination of knowledge in the fields of both the arts and management. Such collaboration between industry experts and research promises to positively affect the professional understanding of either party, by further advancing the comprehension of how solutions for DAM can become more efficient in the future.

Bearing in mind the bespoke gap in previous research on collectors' and galleries' needs for and within DAMS, one has to consider that this project has little to no prior knowledge it can build its research on. However, the many different tools available on the market testify to the

great potential of exploring this area, with a focus on how the needs for DAMS may differ for various collections and galleries. The auction house *Christie's* recent acquisition of *Collectrium*, a widely used DAM tool for collectors, shows that there is a great interest in “enhancing the digital market for art”, as it is a major growth area of the industry (Paton in *Financial Times*, 2015:1). Therefore, this project will fill a research gap that can be of interest for collectors and galleries, as well as developers and researchers in wealth and collection management, by exploring the following research question:

What are the needs of collections and galleries for Digital Asset Management Systems to manage art?

This research takes the first crucial steps to combat the above discussed challenges and implications caused by the lack of existing knowledge. In order to find out what is actually needed to answer the main research question, the author first conducted a preliminary study guided by a non-directive research question to explore the needs of galleries and collectors. Usually previous research knowledge or findings of previous studies are able to guide research projects towards factors that have previously been found to have a moderating effect. However, as this field of investigation has not reached research, the conduction of a preliminary study aims to establish factors influencing the stakeholders' needs for DAMS. In order to gain a preliminary understanding of what is at stake, the researcher contacted three industry experts who substantially contributed to the development of knowledge around the target group's needs for DAMS and ways of improving the efficiency thereof.

Preliminary findings following allowed for conducting a second exploratory study with a more in-depth investigation of factors identified as influencing these needs, in order to ultimately answer the overall research question.

From the preliminary study, the following four sub-questions evolved:

1. *How are characteristics of stakeholders influencing their needs for DAMS?*
2. *What are the characteristics of data/assets that need to be stored?*
3. *What is expected of systems, and thus stakeholders' reasoning and willingness to invest into a system?*
4. *How do perceptions of cloud-based systems and technologies for improvement influence the needs for DAMS?*

The second stage of this research crucially relies on preliminary findings due to the significant research gap on this topic. The stakeholders are galleries and collectors, who are con-

fronted with the task of managing large numbers of artworks both physically and virtually. These represent a strongly differentiated target group for the investigation of needs that require consideration when developing DAMS. Collectors' and galleries' insights are therefore explored through further expert interviews, which allow for the gathering of detailed, in-depth data that truly captures current needs and expectations in the field. Thereby, this research generates knowledge that enables the mapping of needs of galleries and collectors. Ultimately, the findings may be used to translate this list of needs into features of a new tool, which in turn has the potential to majorly benefit collectors and galleries in managing their art.

1.4 Research Purpose

To summarise, the purpose of this research is to fill a knowledge gap and help companies to analyse the needs of collectors and galleries for DAMS. The findings will aid identifying and understanding the needs for DAMS for the management of art collections and galleries, and shed light on ways to improve efficiency. In order to provide in-depth knowledge that could be used to develop a new application, this research aims to account for the differences amongst various collectors and galleries. Additionally, it makes specific use of them to highlight the diversity of the field, and to address challenges that emerge from it. By including the perspectives of both industry experts and empirical insights of practitioners, this project aims to produce new knowledge that will help developing and customising DAMS in the future. Crucially, the findings will further provide expert knowledge for galleries and collections about key aspects that require attention when looking for ways to improve their digital management of art.

This project is backed by and indebted to the interest of software companies and developers, who have shared their insights and expressed their interest in the relatively new market for DAMS, and customers in the creative industry in particular.

1.5 Thesis Outline

This thesis will be laid out in five chapters.

Chapter 1 presented an introduction, consisting of contexts and background on the historical development within managing art. The problem discussion as well as aims and objectives have guided the reader towards the identified research questions. The purpose statement subsequently summarised the overall aim of this project.

Chapter 2 outlines the methodology developed for this project. Beginning with the research philosophy and research approach, the study design will be explained in order to introduce

the choice of data collection methods. In line with this, the method for data analysis as well as evaluation of research will be presented to conclude this chapter.

Subsequently, **Chapter 3** will present the preliminary study conducted with three industry experts. This study looks at the overall research question from an IT perspective and aims to establish factors that influence the needs for DAMS. Further, the expert's opinions on how to improve DAMS are gathered. This is presented as a mixture of data and analysis in conjunction with literature and insights from the Art and Finance Conference in Amsterdam (2016). The chapter closes with a brief summary of the key findings that serve to construct the framework for the second stage.

This second stage is laid out in **Chapter 4**. This study investigates four sub-questions that emerged based on preliminary study findings. The findings for each question are successively presented as mixtures of data and analysis.

Chapter 5 contains the discussion and conclusion. First, an overall discussion of key findings and overarching themes summarises the research outcomes. Second, a critical assessment of the strengths and weaknesses of this research and overall evaluation by the researcher is presented. Hereafter, directions for further research are outlined, followed by the presentation of the overall conclusion.

1.6 Chapter Summary

This chapter situated the identified knowledge gap in DAMS development within the broader context of the historical developments of digitalisation of the art world, from which the problem of a lack of research on the needs for DAMS of the target group could be established. Therefore, the aim to develop a solid foundation of knowledge by approaching this research area with exploratory methods was explained and led to the definition of clear research questions, which serve to ultimately establish a list of needs for DAMS.

Chapter 2:

2. Methodology

2.1 Research Philosophy

This research is based on an interpretivist epistemology, as it is sought to develop knowledge from studying the needs for DAMS by gathering data from the social actors involved (Saunders, Lewis & Thornhill, 2009). The actors involved in this project are the researcher and industry experts, as well as galleries and collectors, which constitute a highly differentiated group containing multiple perspectives on the research phenomenon.

Such a phenomenological approach has several methodological implications for this research. Firstly, the role of the researcher cannot be seen as excluded from the studied phenomenon (Easterby-Smith, Thorpe & Jackson, 2012). The researcher is to be aware of being part of the observed phenomenon and is committed to mitigating potential biases arising from personal opinions that might undermine the value of research outcomes. Secondly, the interests of individuals who are seen as driving the research, and explanations derived from their insights, are believed to enhance understanding of the research field (Easterby-Smith, Thorpe & Jackson, 2012). Accordingly, the process of research evolves by gathering data from which conclusions are drawn, centring fundamentally on the inclusion of stakeholder perspectives (Easterby-Smith, Thorpe & Jackson, 2012). This means that the researcher adopts an empathic stance, and tries to understand the world of research subjects and their unique settings from their specific viewpoints (Saunders, Lewis & Thornhill, 2009). Hence, the project is not concerned with drawing generalisable conclusions, mainly as the research subjects' unique and fast-paced environments render generalisations futile (Saunders, Lewis & Thornhill, 2009).

The interpretivist position holds that the researcher must explore the subjective opinions that generate social actions, as reality is socially constructed (Saunders, Lewis & Thornhill, 2009). Therefore, what is seen as real arises from fundamentally subjective, individual perceptions of reality (Easterby-Smith, Thorpe & Jackson, 2012), and can only be understood by accounting for how individuals experience this reality. Hence, this research accepts the view that there is more than one truth, which is dependent on the observer's viewpoint (Easterby-Smith, Thorpe & Jackson, 2012). Based on the aim to gather knowledge and meanings that are communicated by art collectors and galleries, this research project acknowledges that this knowledge base derived from individual experiences, and is actively constructed and co-created (Lincoln & Guba, 2000). Hence, this project expects to establish diverse needs for

DAMS, and gather a range of subjective opinions. The findings of this research are further subject to the interpretation of the researcher. This research approach hence allows the author to take into account various different opinions and viewpoints that require consideration when thinking about the development of new DAM tools. While some may critique that the inclusion of multiple accounts poses more of a challenge and confuses the issue, the author argues that precisely this foundation is key for this study's validity and ability to draw powerful conclusions.

2.2 Research Approach

The overarching goal of this exploratory research project is to deliver findings that describe the needs for DAMS of collectors and galleries. This project approaches this specific unexplored research area through an inductively oriented perspective. Grounded in the interpretivist assumption that the knowledge sought to develop here is "made" (Knoblauch & Schnettler, 2007:130), this research is shaped by both the contextual understanding of the researcher and that of the interviewees. New insights on how industry experts view the needs for DAMS will be scrutinised in a comparison between the visibility of these claims in existing knowledge in the art world, found in insights from the Art and Finance Conference (2016) as well as literature and case studies on the studied phenomenon. Following, the attention will shift to the views of those working with gallery and collection management on a daily basis. Consequently, the fundamental aim to gradually build an in-depth understanding of the stakeholders' needs requires a flexible structure that allows the researcher to actively incorporate the background, experience and subjective opinions of the various different instances in this field (Saunders, Lewis & Thornhill, 2009).

The market research project for DAM solutions takes place within the context of discovery, where the lack of knowledge is sought to be eliminated by gaining insights and findings within the defined problem area of investigation (Srnrka, 2007). The significant gap in previous research crucially requires this project to develop an almost unprecedented knowledge base. Nevertheless, the importance of prior notions cannot be ignored; although minimal, previous knowledge lays an important foundation for this project to build on (Srnrka, 2007). Due to the yet lesser known terrain, the classic literature review has been replaced by providing an extensive context and background as well as conducting a preliminary study.

2.2.1 Implications

Bearing in mind the bespoke gap in previous research on collectors' and galleries' needs for DAMS, one has to consider that this project has little to no prior knowledge it can build its research on. Several implications follow this challenging gap: First, any initial research question cannot take a directive approach, as common directions in findings have yet to be outlined. Second, the implementation of any data collection methods is likely novel in the area, and cannot be expected to be flawless due to too many unknown confounders. Third, research results cannot be placed into direct comparison with other findings, and thus, will only ever bear a limited amount of generalisability, validity and reliability.

2.3 Research Design

In order to combat some of those implications, this research includes results of a preliminary study, which aims to provide more direction in the research question of what the needs of collectors and galleries are regarding the development of high-quality DAMS. The exploratory design of this project serves the purpose of examining a unique and new research field, and is directed as well as influenced by the investigative nature of the research question. These considerations have been essential for developing strategies of inquiry as well as methods for data collection (Denzin & Lincoln, 2003).

The preliminary study aims to develop an initial understanding of factors and topics that require consideration when thinking about the needs of collectors and galleries for the development of DAMS. Its cross-sectional design seeks to portray the needs of galleries and collectors at the given moment in time and does not seek to account for changes over time based on the limited time frame available for this project (Saunders, Lewis & Thornhill, 2009). The study implements open interview strategies with industry experts in order to gather a broad range of information and knowledge, which will guide the more directive approach in the second stage of the data collection. The preliminary study further seeks to synthesise theoretical and empirical insights, by incorporating knowledge from recent literature and case studies that verify and complement the findings obtained within the first round of interviews. Hence, the first study provides a preliminary contextual understanding of the research topic and identifies more specific directions for the following research process. The second stage embarks on a more thorough qualitative investigation of specific needs, by focusing on the areas and factors identified by the preliminary findings. This allows delving deeper into the specific needs expressed by individual experts in the field of galleries and collections. This study implements semi-structured interviews, which heavily build on the findings of the pre-

liminary study, in order to be able to enhance the general understanding of the area of investigation, and ultimately provide a list of more specific needs.

In order to best be able to answer the research questions, a qualitative research strategy was deemed most appropriate, as this allows for the gathering of detailed individual accounts of the current state of affairs in the field (Holzmüller & Buber, 2007). Further, it enables the dynamic integration of various viewpoints and backgrounds, which can be argued to be pivotal for the final discussion of the stakeholders' needs.

The object of research is approached via understanding individual opinions, experiences and perceptions that constitute it (Schwandt, 2000). Hence, this approach "sees people as a primary data source" to conceptualise how these needs are constituted in people's individual understandings (Mason, 2002:56). The need for DAMS is thus explored by reconstructing it from insights gained through extracting qualitative data from suitable mediators (experts), enabling an in-depth understanding. Hence, results are expected to reflect a dynamic and powerful interplay between a multitude of individual expert perspectives and the integration and subjective interpretation of the researcher.

2.4 Data Collection

The following describes the process of qualitative data collection for both the preliminary and the second study.

2.4.1 Method

Qualitative data collection methods are closely tied to the interpretative paradigm of social research, aiming for the production of text to obtain information of high quality (Aghamanoukjan, Buber & Meyer, 2007). This research aims to understand the needs for DAMS within a clearly defined area of the market from the perspective of immediate stakeholders. Thus, a qualitative interviewing method was chosen in line with the philosophical approach of this project, which posits that meaning arises mainly from people's opinions and statements (Easterby-Smith, Thorpe & Jackson, 2012).

Hence, the chosen method aims to relay knowledge situated in the individual situation of participants, by aiming to ensure the inclusion of all relevant contexts through the conduction of interactive interviews (Mason, 2002). The method ensures the "maximum opportunity for the construction of contextual knowledge" (Mason, 2002:64) by asking participants to share stories and examples illustrating their experience with using digital systems, and thereby "focus(es) on relevant specifics of each interview" (Mason, 2002:64). As this research tries to understand the needs for DAM tools and aims to filter out the stakeholders' requirements,

qualitative interviewing will ensure holistic data for the generation of valuable conclusions, rather than a “superficial analysis surface comparability” (Mason, 2002:65).

This project’s main research question further aims to explore new scientific ground and therefore implements the process of research itself as a frame of reference (Meyer & Reuterer, 2007). Hence, the interviews contain open questions without pre-defined answers to stimulate free associations and narrative answers (Kleining, 2007).

More specifically, primary data for both the preliminary study and second stage is collected by conducting expert open and semi-structured interviews, which are a “form of exploratory conversation” (Aghamanoukjan, Buber & Meyer, 2007:422). The main aim of this technique is to reconstruct expert knowledge that is implicit in the practical work of people within a given work environment (Pfadenhauer, 2007). It has been suggested that practitioners “simply have” this special knowledge; it is thus not “clearly and explicitly” (Pfadenhauer, 2007:451) present within the minds of these individuals, as it involves habitualised and automatically performed work tasks. However, the implementation of expert interviews can explicitly surface this knowledge, as it is remembered as something previously learnt (Pfadenhauer, 2007). Further, this interviewing technique relies on two specific characteristics: Firstly, experts are seen as a medium: they are not the objects of research themselves, but rather are witnesses of the observed phenomenon (Gläser & Laudel, 2010). Hence, this research seeks to explore the needs of galleries and collectors, by engaging with and diving into the viewpoints, thought processes and experiences of practitioners (Gläser & Laudel, 2010). Secondly, experts of the field have a special status within the observed industry, which must be clearly defined (Gläser & Laudel, 2010).

The expert status hinges on research goals, and therefore, is defined by the researcher (Aghamanoukjan, Buber & Meyer, 2007:422). The knowledge sought to be obtained is practical knowledge, which is strongly internalised (Döring & Bortz, 2016). Hence, this study defines the experts of the first round of data collection as *industry experts*, who have a profound IT knowledge and work for and with the creative industry. *Experts* within the second round of interviews are defined as those occupying a professional position in galleries and collections, who are exposed to and work with digital management of art on a daily basis.

2.4.2 Sampling Strategy

This project employs purposive sampling, by which selection of the sample follows a strategic logic to ensure that the data collection involves stakeholders relevant to the field and research aim (Bryman & Bell, 2011). A purposive sampling technique was chosen in line with

the goal to explore the needs for DAMS of individual galleries and collections. Firstly, industry experts provide specific insights based on their main area of expertise. Secondly, collectors and galleries represent a large population, thus constituting a strongly differentiated group. Hence, maximum variation sampling here ensures the heterogeneity of the sample in order to get a grasp on the diversity of the population of collectors and galleries (Meyer & Reuterer, 2007). The aim is to represent a thick description of individual cases within this population (Meyer & Reuterer, 2007). That way, this research aims to produce results that reflect a broad coverage of knowledge from individuals of a highly differentiated group, and thereby, to thoroughly inform the field. Therefore, the recruitment of participants was devoted to ensuring this heterogeneous selection, as outlined below (Meyer & Reuterer, 2007).

Name	Mother Tongue	Perspective
Source 1	German	Manager of art collector & software development specialist
Source 2	Swedish	<i>Axiell</i> management team, business development specialist
Source 3	Dutch	<i>Axiell</i> management team, software development & technical specialist

Table 1 Preliminary Study Participants (Industry Experts)

The three industry experts recruited for the preliminary study were chosen based on the research aim of gathering information and opinions from different viewpoints. Source 1 is the manager of a high-profile art collector with a background in IT and software development, who is also familiar with the daily work processes of managing an art collection, including acquisitions, transportation activities and storage management, using a digital tool. Source 2 is a member of *Axiell's* management team, who has a diverse background in various industries including business development. Source 3 is a further member of the *Axiell* management team, with a background in electrical engineering and collection management software development.

In order to ensure confidentiality of participants, all identifiable data was removed from the data set and analysis, and all data is kept strictly anonymous. By explicit approval, the company name *Axiell* may be used in this research project (Appendix A).

Name	Type and Size	Mother Tongue	Perspective
Gallery 1	Multiple locations; five-digit number of artworks	German	Manager
Galerie Villa Köppe, Germany (Gallery 2)	Multiple locations; ca. 100 artworks	German	Manager
Gallery 3	Multiple locations; ca. 100 artworks	Swedish	Manager
Gallery 4	Multiple locations; 70-100 artworks	Danish	Assistant to gallery owner
Gallery 5	Single location; 1400 artworks	English	Assistant to gallery owner
Gallery 6	Multiple locations; 4-digit number of artworks	Danish	Manager (owner)
Gallery 7	Single location; unspecified small number of artworks	German	Manager (owner)
Gallery 8	Multiple locations; five-digit number of artworks	German	Curatorial Director
Gallery 9	Multiple locations; 2000 artworks	Danish	Registrar of artworks

Table 2 Second Stage Participants (Galleries)

Galleries were chosen based on the type of gallery defined by preliminary study outcomes as the number of locations involved (gallery locations as well as storage facilities). Further, they are defined by size, meaning the number of artworks that illustrates the scope of their business (small/large). Both characteristics are expected to cause differences within the scope of their operations that may affect their needs. This was ensured by consulting the information on galleries' websites prior to contacting them as well as brief telephone or email conversations prior to the interview. Interviewees were thereafter chosen based on their role within the gallery as someone working with the digital management of art.

Participants' confidentiality was ensured by the removal of and identifiable data of both the individual and the gallery, unless the respondent offered and explicitly approved the naming of themselves and/or the gallery they work for.

Name	Type and Size	Mother Tongue	Perspective
Collection 1	Multiple locations; ca. 800 artworks	German	Manager
Collection 2	Single location; ca. 20 artworks	English	Collector
Collection 3	Multiple locations; 375 artworks donated to State + ca. 5000 owned by collector family	German	Assistant to Collector and Manager
Julia Stoschek Collection, Germany (Collection 4)	Multiple locations; ca. 700 artworks	German	Manager/Acquisitions/Research
Sammlung Hoffmann, Germany (Collection 5)	Multiple locations; three-digit number	German	Assistant to Collector and Manager
Collection 6	Multiple locations; 2000-3000 artworks	German	Manager

Table 3 Second Stage Participants (Collectors)

Collectors were chosen based on inclusion of private individuals as well as publicly accessible art collections, whilst covering those with multiple locations as well as different sizes from 20 to a five-digit number of artworks. The choice of participants and insurance of the criteria followed the same procedures as described above. Confidentiality was ensured by the removal of and identifiable data of both the individual and the collection, unless the respondent offered and explicitly approved the naming of themselves and/or the collection they work for.

2.4.3 The Two Stages of the Data Collection

Preliminary Study: Open interviews with industry experts

The classification of expert interviews occurs by degree of standardisation, and can take a standardised, semi-standardised and unstandardised form (Gläser & Laudel, 2010). The first round of interviews took place using an unstandardised form, which merely relies on the introduction of a particular topic and leaves room for both interviewer and respondent to formulate questions and answers freely (Gläser & Laudel, 2010). These open interviews thus were more informal and rather constituted brainstorming sessions with industry experts with the purpose of gathering a large pool of information.

Second Stage: Semi-structured interviews with galleries and collectors

Galleries and collections from various countries including Sweden, Denmark, England and Germany were selected. Subsequently, interviews were scheduled at a suitable time for par-

ticipants. These received the interview guideline roughly one week before the interview. The final interview lasted between 20 and 40 minutes (see Appendix C for interview guidelines). The guideline interview is a specific form of expert interviews, which is semi-structured and consists of a list of open-ended questions that must be asked to obtain necessary information (Gläser & Laudel, 2010). The questions consisted of both fact and opinion questions, aiming for extracting both knowledge and attitudes from participants (Gläser & Laudel, 2010). The guideline was developed in line with the nature of the exploratory research question and the influencing factors established in the preliminary study (Bryman & Bell, 2011). The structure of the guideline is fluid and flexible, enabling the sharing of unexpected themes by both respondents and researcher (Mason, 2002:62). At times, the researcher adapted the order of questions, or made use of sub-questions, to ensure the correct understanding of both questions and answers on either side.

2.5 Data Analysis

Collected data were consistently evaluated by listening to recordings immediately after the interviews for a selective transcription of respondents answers. Through a variation of content analysis (Cassel, 2015), the data was analysed for emerging topics, rather than using a coding system. Similar answers or salient statements were highlighted in bold. Hereafter, all interviews were read in comparison to one another and categorised into topics and themes in light of the respective research question. This enabled the use of a grid for analysis, that took the form of a matrix in Excel, which contained the responses relevant for each of the research questions. The chosen method allowed topics and themes to develop naturally, and to adjust them throughout the process in order to allow for the data to answer the overall research question. This ensured the systematic eliciting of comparable information from the texts obtained through data collection. The matrix allowed to detect overarching themes, that emerged when observing the similarities and differences between respondents' answers in relation to the respective research question and overall area of investigation. While minimal reference to the original text remained in the analysis and data presentation through insertion of quotes, later analysis was conducted using purely extracted and categorised information as well as emergent themes for discussion. These were then synthesised with preliminary study findings and interpretations of the researcher in light of the overall research question.

2.6 Evaluation of Research

The scientific criteria employed in quantitative research are often regarded as problematic for evaluating qualitative research methods (Mason, 2002:38). However, it has been suggested

that broader conceptualisations of these criteria could be useful to establish whether obtained data deliver “evidence” (Mason, 2002:38). The two most salient criteria used within business and management research are reliability and validity (Bryman & Bell, 2011), which have been argued to also be relevant for the evaluation of qualitative research (LeCompte & Goetz (1982), cited in Bryman & Bell, 2011). Accordingly, reliability is concerned with the replicability of a study, referring to the extent to which the chosen methods and techniques are stable and produce accurate data so that the study could be replicated by independent researchers (Bryman & Bell, 2011). In other words, reliability ensures the internal consistency of the research method.

Even more attention is paid to validity, which in qualitative research is the testing of whether a study is observing, identifying or measuring what is defined as the object of research (Mason, 2002). Internal validity refers to the level of correspondence between what is observed and the ideas or theories subsequently developed. This may be particularly useful in qualitative research, as the direct engagement with the objects of observation provides a good basis to argue for a high level of correspondence (LeCompte & Goetz (1982), cited in Bryman & Bell, 2011). External validity, on the other hand, appears rather problematic for qualitative researchers as it concerns the extent to which findings are generalisable, which is difficult due to the smaller samples used (LeCompte & Goetz (1982), cited in Bryman & Bell, 2011). A study conducted in a real-world setting, as opposed to a laboratory setting, will most likely not be able to perfectly meet these criteria initially originating in quantitative research. However, this need not negatively affect the quality of qualitative research. Several scholars have established related concepts that can be used to defend the quality of research (Bryman & Bell, 2011). It has been argued that the evaluation of qualitative research should turn to the concepts of trustworthiness and authenticity, which may consist of equivalent criteria to their quantitative counter parts (Guba & Lincoln (1994), cited in Bryman & Bell, 2011). Referring to these criteria, the author argues that this research is of high value based on both the partial fulfilling of important quantitative criteria for reliability and validity, and the delivering of trustworthy and authentic results.

2.6.1 Trustworthiness and Authenticity

Trustworthiness was used as one of the main evaluative criteria, based on the assumption that quantitative criteria are not directly applicable to qualitative research. This is due to the fact that these claim singularity and absolute truths, which is not the aim of qualitative research

that allows for several realities to coexist (Guba & Lincoln, 1994, cited in Bryman & Bell, 2011).

Credibility

Paralleling internal validity, this criterion concerns the acceptability of the findings based on whether they are feasible or credible (Guba & Lincoln (1994), cited in Bryman & Bell, 2011). This project argues that its findings are convincing. The research employed a richness of sources in a process based on continual observation. Credibility can further be ensured through triangulation, which can mean the cross-checking of informants' answers against each other (Bryman & Bell, 2011). Within this project, the researcher was careful to include various perspectives by conducting two rounds of data collection, which heightens the credibility of findings. Although the opinions of industry experts have provided important insights, the researcher mitigated biased results by including the views of people actually working with their products.

Transferability

This refers to the extent to which this research is transferable to other contexts, which, according to Guba & Lincoln (1994) as cited in Bryman & Bell (2011), is “an empirical issue“ given the very nature of qualitative research. Concerned with “contextual uniqueness and significance of the aspect of the social world being studied“, (Guba & Lincoln (1994), cited in Bryman & Bell, 2011:398), qualitative research should strive for the in-depth description, which in this research was ensured by the heterogeneity of the sample.

Dependability

Relating to reliability in quantitative research, dependability of qualitative results is achieved through transparency of the research process in terms of how the researcher arrived at certain decisions, theories and interpretations that influence the outcome (Guba & Lincoln (1994), cited in Bryman & Bell, 2011). The researcher is aware of her role in the construction of findings. However, considerable effort was devoted to ensuring the transparency of the research process by providing detailed descriptions and explanations for decisions throughout this project. Furthermore, the development of this project was peer-reviewed weekly by colleagues conducting similar studies within business and management research, as well as supervised by a professor at Lund University.

Confirmability

Rather than fuelling an eagerness to provide purely objective results, confirmability accepts the futility thereof in qualitative research and acknowledges the potential involvement of the researcher's values (Guba & Lincoln (1994), cited in Bryman & Bell, 2011). This means that

the process of research and the knowledge produced should be as free as possible of the overt intrusion of subjectivity and opinionated theoretical inclinations. Throughout the process, the author therefore aimed to remain in the position of the scientific observer.

Authenticity

Despite admitting awareness of the unresolvedness of such quality criteria, a further concept for quality assurance within qualitative research proposed by Guba and Lincoln (1994) is authenticity, which revolves around the wider impact of the research findings on the observed environment. The author argues for the findings to be worthwhile for the population under investigation, and thus, entail benefits for the communities of the art world and software development (James, 2008).

2.7 Chapter Summary

This research draws on exploratory methods grounded in the interpretivist paradigm in order to develop an almost unprecedented knowledge base. Due to the yet lesser known terrain, this project implements a qualitative research design including first a preliminary study that allows for delving deeper into the matter within a second stage of the data collection. Open expert and semi-structured interviews were chosen to combine multiple perspectives on the research phenomenon. It is argued that the selection of a heterogeneous sample for industry experts and the population of galleries and collectors will serve to establish a trustworthy and authentic list of needs for DAMS.

Chapter 3:

3. Preliminary Study

This chapter presents the preliminary study conducted with three industry experts. The findings are presented as a mixture of data and analysis and discussed in light of the overall research question and aims. The structure follows the exploration of the needs of collectors, galleries, and exploration of technologies for improvement.

3.1 Introduction

This preliminary study serves the purpose of exploring this under-researched topic and producing a preliminary knowledge base through gaining a deeper understanding of stakeholders' broader needs for DAMS (Srnrka, 2007). Preliminary studies using very open methods of investigation allow for the gathering of very broad data that can be indicative of a rough direction for more in-depth research (Gläser & Laudel, 2010). Such studies are therefore particularly suitable to explore field that present a significant research gap. As previously established, the research base on the needs of galleries and collectors is negligible. Hence, in order to establish a better understanding of such, professional opinions and themes were approached using open interviews. This preliminary study expects to find several factors that influence the individual needs of galleries and collectors, which can aid the construction of a framework for the later establishing of needs in the subsequent round of data collection.

Explanation of Main Sources

Three Industry Experts (refer to Table 1, Preliminary Study Participants).

Deloitte Art and Finance Conference 2016, Amsterdam, NE: Gathering of art professionals and art market experts, roughly 100 individuals of the world's leading art institutions, art collections and investment companies, CEOs, journalists and academics. The researcher attended the Deloitte Art and Finance Conference 2016 in Amsterdam, NL, shortly after having conducted all three interviews with industry experts. Conflict of interest was not given and bias avoided, as all interviews for the preliminary study had ended before the researcher gathered additional information at the conference.

Art and Finance Report, 2016: This report by *Deloitte* Luxembourg and *Arttactic* was presented at the conference and contains art market insights, surveys and reviews on recent developments and discussions within the creative industry, and digital collection management in particular.

3.2 Industry Experts on the Needs of Galleries and Collectors

The following presents a mixture of data and analysis of three open interviews with industry experts who work with digital management systems for the creative industry. The interviews were conducted via Skype (Source 1), whilst the researcher met the two members of *Axiell's* management team in their offices in Lund, Sweden (Source 2, 3). The interpretations by the researcher were further informed by literature deemed relevant for the purpose of validating individual viewpoints, as well as insights from the Art and Finance Conference (2016). Here, the researcher was able to collect information by note taking on the overall consensus of panel discussions as well as private conversations with art collectors and other art professionals. The analysis of empirical data was approached by eliciting opinions on the needs of collectors and galleries. In order to more specifically investigate these in the subsequent study, the data was further scrutinised for factors that could be seen as influencing the needs for DAMS.

3.2.1 Industry Experts on the Needs of Collectors

Two prominent themes were established from the preliminary study results. Hence, the management needs of collectors can be divided into two salient categories that emerged when reading and comparing respondents' answers: accessibility and safeguarding. According to the interviewed experts, there is an increasing demand for art related services within these realms, and digital systems commonly offer powerful ways of managing resulting needs.

Accessibility

All sources highlighted accessibility as key to managing art, referring to access to the art itself and to information on its precise location. According to Source 1, an art collection requires “*to have a large online data bank to assemble, search and extract different kinds of information in a timely manner.*“ It was further mentioned that current market solutions lack the ability to adapt to individual needs, which is exemplified by the case of Source 1. Source 1 is the manager of a collection belonging to a wealthy family business; artworks are stored in multiple locations and displayed in private holdings, offices, as well as exhibitions around the world. The source highlighted that access to information in the database is essential in order to keep an overview over the current location of each individual work. Especially in the case of such a large collection, multiple people require access to information about artwork within the collection “*from anywhere in the world*“ (Source 1), as the collector frequently travels, and numerous employees are involved in arranging transports and exhibitions. Hence, in summary, mobile access to the data bank as well as multiple-user access accounts with different types of user rights were identified as pivotal for digital tools to cater to the aspect of accessibility. Crucially following this is an implication for the necessity of considering both a potentially large variety of individuals involved in the management of a collection, as well as the consideration of those individuals’ tasks and work processes. Results highlight that these factors likely play a key role when aiming to determine the needs of for DAMS.

In line with this, commentaries and conclusions of the Art and Finance Conference 2016 emphasise that “*every collection is different, as some collect for intellectual appreciation and others for investment*“, as captured in the opening words by Jessy van de Klundert-Verhoeven (Business Manager of the Van Gogh Museum, Amsterdam) when emphasising the relevance of discussing collectors widely varying needs (Art and Finance Conference, 2016). Importantly, sometimes both the collection for intellectual appreciation and investment may be relevant for one case. When art is collected for intellectual appreciation, and thus, emotional purposes, accessibility may also refer to making a collection visible to the public, as in the case of the company ING. The head of this corporate art collection emphasised the company’s aim to increase the visibility of their collection by using a digital tool to realise their vision of bringing art closer to the general public (Art and Finance Conference, 2016). Digital systems acting as more than data banks by offering the possibility to make the digital content publicly available for the purpose of marketing the collection or increasing its audience, thus may have to cater to entirely different needs. Hence, it appears essential to also investigate the needs of publicly accessible collections in further studies.

To summarise, the theme of accessibility in the current context appears to mainly refer to making art visible, as well as to knowing artworks' precise locations, which emphasises the importance of considering the unique purposes of the art to be managed with the help of digital tools. This indicates that systems may have to be scalable in order to adapt to the needs of individual users, which all three source have highlighted as crucial aspect. Consequently, it appears relevant to consider the characteristics of the content that is supposed to be stored as a factor directly influencing the specific needs for DAMS.

Safeguarding Physical and Digital Art

Whether art is collected for investment or emotional purposes, the protection of art is one of the most important factors and crucially centres on good documentation of each artwork. Source 1 stressed that some of the key issues of managing a collection refer to logistics and storage problems that might be aided using a digital tool. The respondent referred to a collection that includes over 1400 artworks, either displayed or stored. Simultaneously, issues of storing and managing works that are already part of the collection, continuous sales and new acquisitions lead to a high fluctuation of artworks that have to be registered in the data bank. This aspect highlights a further identified factor that likely influences individual needs for DAMS: Size of the collection (number of artworks). Hence, the tasks associated with managing collections involves (a) dealing with physical storages containing miscellaneous objects, and (b) using different storage systems to maintain, expand and alter collection's holdings (Source 1). Thus, digital file management opportunities are increasingly essential for collections to keep an overview over their entirety and trace the movements of individual objects.

Another factor potentially influencing the needs came to light when considering collections that have a sole purpose of investment. Here, the option for minuscule documentation, organisation and tracing of individual works and entire collections is paramount, as the constant uncertainty of pricing of individual art works requires the ability to always keep track of an artwork's performance on the market (Beckert & Rössel, 2013). Hence, it can be inferred that collectors must have detailed information about an artwork readily at hand, including authentication and ownership documents, in order to keep track of both the artwork's performance on the market and the management of the private collection in terms of matters such as insurance and inheritance (Mandel, 2009), which adds value to their art (Ross, 1999). This highlights again, that the characteristics of documents and files, which are to be deposited in DAMS, are important to consider as influencing the needs for DAMS.

A further notion emerged that highlights why the characteristics of data are an important factor to consider. Whilst the above concerns revolve around the preservation of the physical

objects, the professionals at the Art and Finance Conference (2016) discussed that it is increasingly important to think about the preservation and protection of the digital art. Permanence of art thus not only refers to safeguarding the artworks, but also looking after the software used. Therefore, software developers may have to consider issues revolving around compatibility of data when it comes to digital preservation of art assets. The conference raised the question as to what happens if a collector dies; with technology constantly changing, it is key to make all data easily accessible and data transfer as well as extraction should be made as easy as possible.

Another factor that surfaced during a panel discussion at the Art and Finance Conference (2016), as well as during the interview with Source 3, is that users commonly appear to lack expert knowledge about technological functionalities. Accordingly, digital tools have to be designed so that they are simple and easy to use. It may be tentatively suggested that cloud-based services will become increasingly attractive for enabling the required user-friendliness that all three sources highlighted as advantageous for the simplicity of use, higher security and low cost. However, these deliberations imply that the level of expertise of the variety of people using a system play a significant role in determining the needs for DAMS.

3.2.2 Industry Experts on the Needs of Galleries

Not only collectors rely on data banks for managing artworks. Investigating the needs of art galleries provided important insights into the extent to which DAMS may have to be able to cater to different ends when being used by galleries. The company *Axiell* has vast experience in CMS development, mainly for museums and libraries. They now also provide DAMS functionalities for the art world, and within this context both sources highlighted that specifically galleries constitute an interesting market, as their needs are likely entirely different from museums. Hence, the company recently started to consider this market, but is unsure as to what kind of business model could work for galleries, “*as it is not quite clear what (a) DAMS (are)*” (Source 3).

The conversations with the two members of *Axiell's* management team around the topic of DAMS provided valuable insights into galleries' needs from an industry expert perspective. Both sources stressed that needs for CMS as well as DAMS fundamentally depend on the type of gallery. The management of artworks involves a variety of tasks, including transportation and storage. Thus, a gallery's needs may depend on how the art is managed, and therefore, for example “*whether you have to move things around a lot*” (Source 2). Hence, the ex-

tent of transportation activities, and thus, the number of locations used for exhibitions or storage, likely influences needs for DAMS (Type).

Early on in the conversations with the experts it became apparent that galleries need better management systems. Specifically, CMS emerged as potentially still effective solution for art management, as *“it is a matter of controlling what you have and where you have it“* (Source 2). Most importantly, however, technical specialist highlighted the need for *“images in high resolution, many images per object, and the possibility to use these images in different ways, for example for the web, but also for publication, and metadata for both digital and physical objects, which has to be linked“* (Source 3). Similarly, Source 2 added that *“one is talking about access, quality, storage, keeping the art safe, easily operable to feed in data and to share it with the crowd, whatever that crowd is.“*

The most salient theme emerging in conversations with Source 2 and 3 was that galleries - as well as collectors - need a simple solution. According to both sources, the instalment of a system within the galleries' own servers may not be the best solution. *“The problem with galleries and collectors is that they often do not have the technical knowhow to do this well in-house, so for these cases, a public or private cloud-based solution is really the best option“* (Source 3). Adding to this argument, Source 2 stressed the aspect of high security, speed and low-cost of provided cloud-based services in comparison to when on premises solutions are used. It may therefore be reasonable to further investigate the level of expertise of those working with digital systems in galleries, as well as collections, and their perceptions of cloud-based solutions, as these factors may influence their needs for DAMS.

Another important factor to bear in mind appears to be cost. When providing DAMS, one must consider that galleries need both the capital and the willingness to invest into the system one offers. Source 3 underlined that *“another important thing to consider with galleries is how much it can cost, you have to be willing to invest.“* This factor could play a major role in developing new systems. Additionally, for users to adopt a new system will depend on not only the willingness to invest money, but also the time it takes to transfer data. Specifically, the latter may vary significantly depending on the extent to which the individual completing this task has previously worked with digital management systems. Hence, users' previous experience may be an important influence factor to consider. Lastly, it seems reasonable to assume that design may play a major role for galleries. Other than galleries potentially expecting a solution that *“also looks good“* (Source 3), the system's design may also influence the extent to which inexperienced individuals easily adapt to the system.

3.2.3 Industry Experts on Improving Efficiency of DAMS

The following section presents preliminary study findings on integrating new technologies for improving the efficiency of DAMS. In order to establish to which extent these findings relate to the wider field, beyond the subjective opinions of the three interviewees, it is worth incorporating findings of previous research, specifically case studies. Results from the interviews highlight that the ability to trace art may be a crucial factor for the development of DAMS. Research supports this claim, and many papers describe the usefulness of technological inventions such as RFID-based management systems in business environments with similar management requirements.

The conversations with the industry experts, as well as the discussions during the Art and Finance Conference (2016), suggested novel ways of improving DAMS. Current market solutions crucially fail to pay attention to highlighted needs and concerns (Source 1). This inefficiency further refers to the lack of integration with modern identification systems. Hence, by interviewing Source 2 and 3, the researcher consulted two members of *Axiell's* management team regarding these issues to present a broader perspective. The company is experienced in implementing technologies such as barcode or RFID readers for museums and libraries. *Axiell* is interested to find out whether this could also be of interest for galleries, the use of modern identification systems is increasingly seen as “*big business*“ for the industry (Source 2). Source 2 especially highlighted the efficiency of using modern identification systems, as “*today one should be able to read labels without touching objects*“ and “*you know what it is, and also from a logistics perspective, you know where it is located, it saves time and objects are secured.*“

The role of technology within the rapid expansion of the global art market is also a very prominent topic of discussion among art professionals and art market experts. The art professionals present at the Art and Finance Conference (2016) discussed the potential of using technology to enhance collection management practices. Moreover, the Art and Finance Report (2016), found that “*investments in managing, tracking and identifying art objects*“ (Art and Finance Report, 2016) have increased in recent years. What is more, a major trend in collection management systems has developed towards the use of technology for the authentication and attribution of art, while technology is also implemented for the tracking and tracing of artworks (Art and Finance Report, 2016). Interestingly, the report further states survey findings showing an increasing confidence in such technologies, as 73% of art professionals and 69% of art collectors believe that online art businesses and technologies will revolutionise the art market within the next two to three years (Art and Finance Report, 2016).

Results of this preliminary study suggest that managing art may become more complicated if a collection is dispersed to multiple locations (Source 1), which implies the significance of having the possibility to trace the location of artworks. Especially when managing large-scale collections, such as the one managed by Source 1, administration involves an international network of individuals. Efficiency in the flow of management work, including administering transport and updating relevant information, becomes crucial (Source 1). It is therefore understandable why industry experts express the need for high-quality technology that can aid the management work of art galleries and collections. However, it appears reasonable to consider their claims for the necessity to utilise these technologies as influenced by their IT backgrounds as well as subjective viewpoints.

Therefore, their opinions are to be cross-examined with literature on the usefulness of the features suggested to improve digital systems. The findings presented by the selected case studies are based on extensive empirical tests of the technologies, which took place within the work environments of museum collections that are related to the intended environments for implementation. Furthermore, the suggestions made by Source 1, as well as the findings of the following case studies, are complemented by those of the Art and Finance Report. Accordingly, “the globalisation of the art market means greater mobility of artworks as they are displayed at fairs and exhibitions around the world“ (Art and Finance Report, 2016:132). Moreover, the subjection of art to “complex logistical operations with pieces handled by various fine art logistic companies, exhibitors, and other custodians“ (Art and Finance Report, 2016:132) requires monitoring the exact location and condition of works of art at all times.

In line with increasing the efficient managing of collections and galleries, one of the key factors mentioned by Sources (1, 2, 3) is the possibility for digitally tracing art. Recent studies on the successful implementation of identification systems such as barcode tracking, QR-codes or Radio Frequency Identification (RFID) technology support the attractiveness of digital registering, managing and tracing of artworks. Most importantly, such digital identification systems could ease the problem of location determination, which is encountered in the context of museums and galleries, as well as general inventory management practices.

The use of technologies such as RFID is nothing new. Logistics and inventory management research describes the potential of these technologies for digital warehouse and inventory management systems in various industries. Their usefulness for efficiently managing inventory and storage is illustrated by a case study in the tobacco industry (Wang, Chen & Xie, 2010). The authors investigated introducing an RFID-based management system to improve operation efficiency. The study found that the use of the technology improved the use of

warehouse capacity, enabled more accurate inventory as well as reducing workload (Wang, Chen & Xie, 2010).

A similar issue persists in the context of the art world. Over the past decade, few companies have tried to develop systems that aid the management of collections, and a recent case study highlights the positive results in terms of efficiency and effectiveness such implementation of digital management systems might bring. The collection management software company *GallerySystems* published a report (Archer, 2013) on a case study of Barcode Manager integration with their software 'The Museum System'. The case study was conducted by the California Department of Parks and Recreation in 2013, and found that the use of this technology has substantially eased collection management (Archer, 2013). The museum used barcode tracking integrated with its CMS, which enabled easy synchronisation of scanned data with the system. It can therefore be argued that this is a crucial factor that requires further investigation when exploring the needs for DAMS.

Another crucial aspect to bear in mind is that of security (Source 2), specifically with regards to integrating systems with machine-readable codes. Technology and art security is an issue that recently received a lot of attention (Art and Finance Report, 2016), due to the ever-increasing value of art assets. Providers are looking to offer ever-more innovative solutions for safeguarding art, and technology is seen as great facilitator of enhancing the major concern of keeping art safe (Art and Finance Report, 2016).

In addition to the above described case studies, more research into existing technologies reveals that a variety of tracking options are available that can ease the work of identifying, securing and locating artworks (Helicon Conservation Support (HCS), 2008; SmartTrack RFID, 2010). These range widely in pricing and suitability for artworks (Source 3), factors that directly relate to collectors' and galleries' willingness to invest. It may thus be relevant to this research study to further investigate what this willingness to invest is influenced by, and the extent to which it may increase with the provision of high-quality systems to be integrated with DAMS.

3.3 Conclusion and Summary of Findings

This discussion of preliminary data shed light on the needs of galleries and collectors from the industry expert perspective. Overall the needs of galleries as can be summarised as:

Overview over inventory, storage and logistics; Scalability of system; Easy operable to feed in, transfer and export data; Easily share/publicise content; High-resolution images, many

images per object, possibility to use images in different ways (web and publication, media conversion); Metadata for digital objects and physical ones that have to be linked; cloud-based solutions for mobile access; Configuration for modern identification systems, low cost; and visual appeal.

Similarly, the preliminary study suggests that the needs of collectors are as follows:

Overview over inventory, logistics and loans; Assembling, searching and extracting different kinds of information in timely manner; Tracking: Configuration for modern identification systems; Easy and quick access to information, and cloud-based solutions for mobile access.

This preliminary list of needs will serve as a tool for evaluation of second stage data and will be revisited in the overall discussion (Chapter 5).

Further, the attractiveness of using technology to improve efficiency of DAMS was investigated and the implied usefulness thereof for galleries and collectors was established, which will be further investigated during the second stage of the data collection.

However, it is also important to bear in mind that Source 3 doubted the suitability of tracking devices for the purpose of galleries due to short distance for code readers, but suggested using iBeacons. This will be addressed in the overall discussion.

Importantly, the discussion of data yielded several factors that may influence the needs for DAMS of individual users, which are summarised as follows:

Eight Influencing Factors
Type of gallery/collection (number of locations)
Size of gallery/collection (number of artworks)
Individual tasks and work processes (key operations)
Previous experience
Characteristics of what is stored
Individual reasoning for choosing a system
Perception of technologies for improvement and thinking about cloud solutions
Expectations and willingness to invest
Level of involvement and expertise (variety of people involved)

Table 4 Influencing Factors

These influencing factors are considered to provide a solid foundation for developing a more specific framework to collect data from galleries and collectors. The factors were also used as a framework for structuring the questions used in the interview guideline during the second stage of the data collection (Appendix B, Table 8).

3.4 Framework for Second Stage of the Data Collection

In order to allow this research to answer the overall research question in more detail, a second study delves deeper by investigating four key categories that influence individual needs. The eight identified influencing factors appear to be subcategories contained in the following four

categories that allow for the generation of four more precise research questions. In line with preliminary study findings, these appear to be:

1. *Characteristics of stakeholders (These cover: Type of gallery/collection (number of locations); Size of gallery/collection (number of artworks); Individual tasks and work processes (key operations); Previous experience as well as level of involvement and expertise (variety of people involved))*
2. *Data/Asset characteristics*
3. *Stakeholders' reasoning as well as expectations and willingness to invest*
4. *Perception of cloud-based solutions and technology for improvement*

These categories can be assessed by the following research questions targeting the influencing factors these contain:

RQ 1. How are characteristics of stakeholders influencing their needs for DAMS?

RQ 2. What are the characteristics of data/assets that need to be stored?

RQ 3. What is expected of systems, and thus stakeholders' reasoning and willingness to invest into a system?

RQ 4. How do perceptions of cloud-based systems and technologies for improvement influence the needs for DAMS?

3.5 Chapter Summary

This study explored the main research question and concluded with a preliminary list of needs. Further, the analyses and discussion of empirical data and further research allowed for identifying factors that appear to influence stakeholders' needs for DAMS, from which a more specific framework for the second stage of the data collection could be established.

Chapter 4:

4. Second Stage

The following chapter is laid out in four separate sections. These contain the presentation and analysis of data addressing the previously established four sub-questions (RQ1, RQ2, RQ3, RQ4), aiming to help answering the overall research question.

4.1 RQ1: How are characteristics of stakeholders influencing their needs for DAMS?

Based on the purpose of research to help companies analyse the needs for DAMS, the individual characteristics of galleries and collectors were elicited from the data and analysed with regards to how these may influence the needs for DAMS.

4.1.1 Findings

The individual characteristics *type (number of locations), size (number of artworks), key operations (individual tasks and work processes), previous experience as well as level of involvement and expertise (variety of people involved)* were found to impact the way in which DAMS have to cater to stakeholders' needs. Therefore, the dimensions of systems that are impacted may be important for software developers to consider when thinking about developing a tool designed for this target group. The dimensions were identified based on the indication of the connections between these characteristics and the needs of galleries and collectors by preliminary study findings. The dimensions that appear to be affected by stakeholders' characteristics are *inventory management and logistics; degree of integration and mobile access; adaptability; and user access type and rights and complexity of the system.*

The table below illustrates how the characteristics may influence these dimensions for all participants and aims to prepare the reader for the subsequent in-depth analysis, which draws on these considerations.

Participants	Type	Size	Key operations	Previous experience	Level of involvement and expertise
Gallery 1	Multiple locations	five-digit number of artworks	Transportation, CRM, Marketing, Publications, Print, Inventory	Individually programmed software ("Organise")	Similar responsibilities
Gallery 2	Multiple locations	ca. 100 artworks	Transportation, CRM, show works to clients, publish content on website, frequent travels, Inventory	No specific tool	Different responsibilities, varying levels of expertise
Gallery 3	Multiple locations	ca. 100 artworks	Sales offers, transportation, frequent travels, Inventory	Individually programmed software ("Artbutler")	Different responsibilities, varying levels of expertise
Gallery 4	Multiple locations	70-100 artworks	Transportation, CRM, Marketing, Inventory	Individually programmed software ("Artbutler") and	Similar responsibilities, similar level of expertise
Gallery 5	Single location	1400 artworks	Transportation, Inventory, producing editions, sales	Individually programmed software and Artsy for online inventory management	Similar responsibilities, similar level of expertise
Gallery 6	Multiple locations	4-digit number of artworks	Inventory, transportation, loans, CRM, customer visits	Individually programmed software	Different responsibilities, varying levels of expertise
Gallery 7	Single location	unspecified small number of artworks	Inventory, Print	No specific tool	Similar responsibilities, similar level of expertise
Gallery 8	Multiple locations	five-digit number of artworks	Transportation, sales and exhibitions, print,	Individually programmed software and cloud-based tool for photographs	Different responsibilities, varying levels of expertise
Gallery 9	Multiple locations	2000 artworks	Inventory, Marketing, transportation, frequent travels, CRM,	Individually programmed software (GAS ("Gallery Administration System"))	Different responsibilities, varying levels of expertise
Collection 1	Multiple locations	ca. 800 artworks	Transportation, inventory, digitising collection, increase audience	No specific tool	Different responsibilities, varying levels of
Collection 2	Single location	ca. 20 artworks	Permanent display (private),	Excel	Similar responsibilities, similar level of expertise (1 person)
Collection 3	Multiple locations	375 artworks donated to State + ca. 5000 owned by collector family	Transportation, inventory, expansion of collection	Individually programmed software ("Filemaker")	Different responsibilities, varying levels of expertise
Collection 4	Multiple locations	ca. 700 artworks	Transportation, inventory, expansion of collection, print	Individually programmed software ("Filemaker")	Different responsibilities, varying levels of expertise
Collection 5	Multiple locations	three-digit number	Inventory, transportation, redecoration, handling old formats, catalogue publications, print	Individually programmed software	Similar responsibilities, similar level of expertise
Collection 6	Multiple locations	2000-3000 artworks	Inventory, transportation, frequent travels, print, CRM	Individually programmed software ("Museum Plus")	Different responsibilities, varying levels of expertise

Table 5 Stakeholder Characteristics

4.1.2 Data Presentation and Analyses

The following paragraphs contain a mixture of data and analysis to illustrate how the aforementioned factors and respective dimensions are related. In order to further demonstrate *how* these factors may influence needs, effects of the various factors are discussed in detail for

some cases.

A) Type and Size

Type and size were found to influence stakeholders' needs for inventory management and logistics. Varying types and sizes of galleries and collections, appear to determine the degree to which inventory management and logistics constitute an essential part of the way in which a system is going to be used.

To exemplify, gallery 1 is a large gallery managing artworks up to a five-digit number. Concerning inventory management, such a large amount of works involved in "*regular exhibitions, sales, acquisitions*" means a high fluctuation in the data bank and the system must regularly be accessed for updating data on objects existing in the database or new entries for new acquisitions. Further, the gallery has two locations and multiple storage sites. According to the respondent, "*it is essential to be able to access the works stored there when we need them.*" The fact that a large amount of artworks is stored as well as displayed in different locations means that location determination is essential to keep an overview, and thus, the ability of the system to support the issue of logistics appears to be vital.

Contrarily, gallery 7 has "*not so many works here, (the respondent has) a small gallery which is why (he) tr(ies) to keep storage low, as (he does) not want to lose exhibition space.*" Essentially, this gallery pursues no acquisitions and accumulation of artworks as in the case of gallery 1. Therefore, there is less of a need for inventory management resulting in a lower fluctuation in the data bank and less frequent access needed to the system to update information. Similarly, logistics play a different role as the respondent merely receives artworks sent by international artists, or sending those sold to collectors with whom the respondent collaborates, which the respondent does manually as "*(he) can perfectly trace the few works (he) receive(s) by keeping an Excel file.*"

Hence, it can be argued that large galleries and collections with multiple locations have a higher need for inventory management and logistics, which digital systems should be able to respond to. It is apparent that the tracking of art and location determination is crucial here, whilst these features may be less needed by smaller galleries and collections with single locations for exhibition or storage.

B) Key Operations

When participants were asked to talk about their individual tasks and work processes, overlaps with the need for inventory management and logistics were detected, as the transportation activities are often part of the key operations performed in galleries and collections.

However, additionally, crucially impacted dimensions of a system appear to be the degree of integration (with other services) and mobile access.

To exemplify how key operations may influence degree of integration users may need, it is important to consider that crucial activities for both galleries and collections are Customer Relationship Management (CRM) and general marketing. Collection 4 organises two annual exhibitions as well as pursues corporations with international institutions. Besides the general use of the database “*to manage all artworks*“, the respondent described the database as containing all addresses of artists, visitors and partners as “*the other most important column of (our) database.*“ Hence, in order to advertise their “*exhibitions, events, performances and installations*“, the integration of the system with the address database appears essential.

The integration with address databases was also often stressed by galleries, such as gallery 1, which may even require a higher degree of integration. Here, the gallery management centres on “*sending invites, publications and catalogues*“ to buyers, artists and all other clients in the gallery’s address book. The respondent described the usefulness of their current system allowing for integrating the artwork database with the address book, but also referred to direct integration with their website as “*even more useful to directly manage the orders of publications through our website.*”

The importance of different levels of integration was especially emphasised by collection 6. The respondent had set up the system for this private collection and stressed its capability to integrate various databases, thus allowing for the linking of a variety of different fields, as “*the most helpful*“ aspect. Accordingly, “*location determination and administration can be done just the same with Excel, but it is precisely the linking between artists, addresses and images, which is exciting. Further, it would be essential to link our library database with the artists as well, so that you can determine: this book contains something on these three artists, so that everything is interlinked, this is the key benefit in general that data banks should provide.*”

Contrarily, gallery 4 demonstrates that different key operations may require lower levels of integration. The respondent described the use of the current system for daily operations by saying that “*it is just on a day to day working basis that we are using it. If there’s a problem, it’s just very basic concerns that we have, for example to send out our newsletter.*“ Hence, for this gallery, simple publishing functions may suffice.

Further, stakeholders’ key operations were also found to influence stakeholders’ needs in terms of mobile access. Several galleries as well as two collections frequently mentioned operations suggesting a need for mobile access, which is often not granted by their current sys-

tems.

Gallery 6 often has to visit customers, where *“having mobile access would be so relevant, that’s when I would really like to have everything in the cloud, right now we don’t but that’s my plan for the future.”* Thus, mobile access to the system appears to be *“really valuable when you are in the field.”* Also the manager of gallery 2 described the gallery management as involving *“frequent travels, showing images of artworks to clients both in gallery space and on the move, which is why for (him) and (his) four colleagues (who) often travel for example to art fairs, mobile access would be great to have.”*

Also participants managing collections, and are not required to travel, touched upon the issue of access when talking about daily work tasks. Collection 3 currently uses a system that allows for *“accessing the data bank via mobile devices such as an iPad, as mobile access from multiple locations is essential when you have some people working in the office, others in storage or with logistics.”* Similarly, the manager of collection 6 emphasised problems arising from merely local access: *“Speaking about the daily work, if I am in the depot, and I would like to directly write something into the system, e.g. if there are location changes, then I have a tablet but the software is not installed there. So then I have to use team viewer to set up a remote connection, and then it would be useful to have an online system as then I could follow changes from any device.”*

The author believes that respondents’ answers indicate that several galleries and collections could benefit from having mobile access to their systems. This may further point to a need for mobile device site compatibility and responsive web design.

C) Previous Experience

The analysis of answers regarding participants’ previous experience with using digital systems to manage art revealed that these seem to influence the needs towards an expected adaptability of the system.

Gallery 1 works with a software, which was *“individually programmed for (their) purposes”* and has been used *“for a very long time.”* Throughout the interview, the respondent particularly stressed the system’s adaptability, *“whenever a new feature or field is needed that could improve how (they) manage (their) data.”* The scalability of the current system may thus significantly influence the expectations should the gallery consider a new tool for managing their art. Also the previous experience of gallery 5 revolves around expectations of adaptability. The gallery uses their *“own bespoke software and Artsy for online inventory management”*, which the respondent highlighted as vital as *“it has to be completely bespoke (as) one size does not fit all.”*

Contrarily, gallery 2 uses “*classic data management as well as a tool by Artsy allowing to show works to clients, but this is not suitable to manage art. (They) work without a specific tool but use folders for individual artists to store all required data and information that are sorted by artist.*” This was described as “*cumbersome indeed*”, as one easily loses the overview as the lack of a proper system causes a “*huge data chaos and time inefficiencies.*” However, the biggest challenge here appears to be caused by the fact that the manager has to explain this “*data chaos*” to the gallery owner, who “*has to be able to search for information as quick and easy as possible, so it must be easy and simple to use.*” Hence, based on previous experience, this gallery may expect from a system that it is easily operable, thus requiring a simple solution.

Previous experience appears to have the same impact on collections. Particularly when merely Excel spread sheets and simple folders are in use, as in the case of collection 1, previous experience appears an important factor to consider. The experience of such “*unsystematic management*” seems to generate expectations for a high level of adaptability and simplicity of use should the collection invest in a new system, as “*many attempts have been made to order the chaos and (they) must work on this problem urgently.*” Further, collection 3 uses the software “Filemaker”, which has been continually expanded and customised over the years. The respondent emphasised the importance of the scalability of the system based on the continual expansion of the art collection by the owners.

Consequently, previous experience appears to influence both galleries’ and collections’ expectations towards a need for adaptability. Eight out of 15 participants use specifically designed software allowing for customisation and scalability. Therefore, previous experience appears to exert a powerful influence on the needs of both galleries and collectors, which appear to be simple and adaptable systems.

D) Level of Involvement and Expertise

Lastly, level of involvement and expertise were found to influence stakeholders’ needs with regards to user access types and rights, as well as the allowed complexity of a system. Level of involvement refers to the variety of people using a system whilst expertise describes their degree of familiarity with the system and IT.

In collection 3, “*full access is limited to few employees*”, as employees working in storage do not require and should not have the same access rights, as these have to be determined based on specific areas of responsibility. Also collection 5 exemplifies the importance of considering the variety of users: “*Erika Hoffmann does not use the system herself, I am the only one who is working with it really. So we are not a large organisation, and therefore we do not*

need multiple accesses, there is only the collector and me as her assistant. And if there are other people coming to work with us they might have to work with the system, we are in charge of that ourselves.” Hence, in this case single user access and the possibility to determine user rights suffice based on the low variety of people involved. A different case is collection 6 using a system that has these options. The respondent underlined that the variety of people involved *“of course (requires to) limit that, and we have done so, there are three or four people working with the software, some with the collection, some with addresses, and this is a further difference to Excel, that I can determine who can access or view which module, which is very helpful.”*

Additionally, the expertise of the people working with the system seems to significantly influence the allowed complexity of the system, as *“especially talking about address administration, here one is especially tempted to work in Excel, as it is more fluent and people are more familiar with it, so the more the areas of responsibility have to do with normal office work, the more important it is for the software to be very easy to work with”* (Collection 6). Similarly, gallery 2’s management *“mainly concerns four persons, and all need access to the system. But the art historians we have really avoid the computer. Therefore, the main people using the system are the owner and myself. We work hand in hand and we have to have a system that we both understand.”* Lastly, gallery 9 currently uses a tool that allows even artists and clients to access their database besides all four employees: *“In this gallery, really everyone is working with it, so if there is an artist coming in to exchange art with another artist, and they want to see what the other one has, they can get access to a limited part of our system, and also clients can do this, but of course only to a limited extent. So we have multiple user access but distinct user rights, which is very important.”* However, the respondent further reported that *“we are all very happy with the system and we all work well with it as there is someone specifically responsible for it.”* Hence, gallery 9’s system currently used requires an in-house IT position, which emphasises the importance of having an easy operable system when the expertise of the people required to use it is low.

The following tables shall serve to illustrate the findings.

Stakeholder characteristics	Needs
Type	
Single location	Low need for logistics mgnt.; location determination & tracking less important
Multiple locations	High need for logistics mgnt.; location determination & tracking
Size	
Small number of artworks	low need for inventory mgnt.; low fluctuation in the data bank and less frequent access
Large number of artworks	high need for inventory mgnt.; high fluctuation in the data bank; regular access
Key operations	
CRM and Marketing	High degree of integration: website & address database integration
Managing publications, catalogues etc.	High degree of integration: website & address database integration
Basic concerns	Low degree of integration - simple publishing functions
Frequent travels	Mobile access
Staff relocation between offices, storages etc.	Mobile access
Previous experience	
Used to individually programmed software	Adaptability/Scalability
No specific tool	Simplicity of use and/or Adaptability/Scalability
Dissatisfaction with features of current system	Adaptability/Scalability
Level of Involvement and Expertise	
Many employees with varying responsibilities	Multiple user accounts & distinct user rights
Few employees; similar responsibilities	Single user accounts & no distinct user rights
Low IT expertise & varying responsibilities	Simplifyity of use & distinct user rights

Table 6 Stakeholder Characteristics' Influence on Needs

The implications of this analysis of individual characteristics will be further discussed in the overall discussion in chapter 5.

4.2 RQ2: What are the characteristics of data/assets that need to be stored?

Based on the preliminary assumption that the needs of galleries and collectors are influenced by the characteristics of what is to be stored in DAMS, empirical data were analysed for this factor and thus evolving needs.

4.2.1 Findings

The analysis of empirical data yielded the following results. Participants have shared common insights into basic requirements of what DAMS have be able to store. Emerging topics were *efficient linkages of digital assets and metadata, import and export functions*, as well as *supporting different file formats and several views of single artworks* and the *ability to sort by artists*. Further, by exploring the emergent themes concerned with *image quality* and the constraints posed by limited *storage capacity*, the findings suggest that there is a common interest into using systems as more than mere data banks for searching and retrieving digital assets and data.

4.2.2 Data Presentation and Analysis

The analysis provided insights into what DAMS must be able to store in order to satisfy the more obvious needs of both galleries and collectors with regards to the more fundamental requirements. All participants referred to the basic requirements of storing images as small jpegs, some also need to store larger formats such as tiffs. Moving images are seldom required, and participants referred to the use of stills when requiring to store video art in order to keep storage low. Only gallery 3 appears to also store web-formats and press-formats, whilst the majority of respondents merely referred to using word documents, pdfs or excel files in order to store essential documents. The documents both galleries and collectors referred to were: consignments, insurance documents, artist biographies, certificates, price lists and contracts. Whilst the insights into commonly stored assets are not novel, the analysis also yielded the following themes, which emphasise the relevance of DAMS for both galleries and collections as these constitute major strengths thereof.

Both galleries and collections emphasised efficient linkages between their digital assets and the information required for clear labelling and identification. Gallery 6 stressed that one essential aspect of a system is that one can equip any images of an artwork that is registered with “*a unique number and info on artists, material, title, price, insurance documents, so (they) know exactly what it is.*” Also collection 3 maintains that the regular updating on information is “*a must to keep an overview.*” Accordingly, it is “*especially helpful to have a linkage to a library containing information such as provenance, insurance amount as well as the location that is entered manually.*”

Especially one respondent emphasised the importance of efficient linkages. According to collection 6, “*where really the software comes into play, is the linking of image data with the text data, as simply the labels and text data I could also do in Excel, but this combination is*

exactly the exciting thing.“ Further, the respondent stressed the importance of enabling the seamless importing and exporting of data. *“It is crucial to be able to create print templates, that there can be several images per page or one image per page, and so I can export hundreds of artworks by one click. Also the labels for artworks that are on the back of paintings, I just have to create this once with the image or without image and click on one button and have it all there.”* These functions have also been stressed by another respondent, as for gallery 2 it would be interesting to be able to *“deposit the full documentation of the history of collaborations with artist, so that one can see at one glance what has been done with specific artists over time, if one could enable the sorting of press articles into the database, to assemble press portfolios for artists and save everything that has been published about this artist.”* Further, the importance of being able to sort entries by artists was emphasised by several galleries.

When further analysing the answers within which some participants talked about limitations imposed by currently used systems, the analysis showed that supporting different file formats as well as several views of single artworks could be an essential aspect for DAMS to consider. Based on the lack of a *“good tool”*, gallery 2 *“often (ends) up having around five different file types of one image saved to the different locations on the hard drive, as there is no central management system that enables to have everything assembled in one place.”* Especially the concern with *“also hav(ing) a digital photo file, and sometimes it is necessary to have it from different angles to get the whole feeling of it”* (gallery 6), indicates that conventional data banks are limited, suggesting that there is a great potential for DAMS to offer ways to combat these limitations.

A striking observation was that few respondents raised limitations when it comes to storing data/assets. Only one respondent emphasised forward thinking by saying that *“the database is regularly updated, as especially if you collect media art, technological advances there are always new formats that have to be integrated”* (collection 4). Nevertheless, the overall impression is that respondents tend to emphasise the current possibilities for storing. It could be argued that respondents appear to lack the ability to think of other possibilities that could be useful and realisable due to technological advances, which will be addressed in the overall discussion of findings in Chapter 5.

A further theme emerged as crucial for seven out of nine galleries. It appears that especially galleries experience the limits imposed by currently used systems in terms of image quality and storage capacity.

This is illustrated by both subtle descriptions of quality allowed by currently used data banks

as well as specific references to insufficient quality of images that appear to limit the efficient use of systems. According to gallery 9, *“there is a specific picture size you have to use (72dpi/700px).”* Especially gallery 7 emphasised image quality when naming it as reason for managing digital assets by using simple data management in folders stored on the gallery computer: *“I have experienced that such systems often lack the ability to consider image quality, which is crucial to me. Sometimes I get prints from artist’s databanks, that always look very automatised, they might have all relevant information on them but the pictures themselves look terrible in print.”*

The issues with image quality further appear to be linked to problems with storage capacity of common data banks. These seem to prevent users from storing high-resolution images due to limited data volume allowance. According to gallery 1, they *“have to make sure to feed the system economically”*. The data stored are only images or stills of videos (small jpegs), as *“we can of course not upload tiffs there, as the biggest what we would extract from the system would be a dossier we send to clients with a small image (below 1MB). But we of course also need larger image files for print, but these have to be stored in an extra image archive.”*

Several other galleries highlighted limited storage capacity as problematic. Gallery 7 *“need(s) high quality images for the website, to have full views of exhibition rooms, which (they) keep in large and small formats, and in print quality for postcards and all this amounts to quite high data volumes.”* This was also emphasised by gallery 8 that uses a cloud-based system as they *“have to be able to use high-resolution images, but the data bank you can only feed with small formats, these unfortunately don’t have printing quality, which is why we have the separate online system for our images, where we keep them as tiffs. And sometimes you have several different images, sometimes older versions like dia positives, and this is of course what makes the data bank very large and cumbersome.”*

Hence the author believes that issues with image quality are caused by insufficient capacity for high data volumes. As previously emphasised by gallery 1, the problems could stem from the natural tendency of *“feed(ing) the system economically.”* However, the disadvantages brought about by saving money, and thus storage capacity, became evident. A variety of participants have emphasised their need for high-quality images for print and related purposes, which further implies a need that cloud-based DAMS could leverage, which is further investigated in RQ4.

Whilst the concern with image quality seems to be especially relevant for galleries, also two respondents speaking for collections talked about the issue of image quality. In collection 4, *“the database does not support print quality images, we have simply zoom views that serve*

the mere purpose of orientation, but we have printable data which are not stored in the database but on our server.“ Also collection 5 *“of course always (has) the respective image material with the works, and (they) are of course interested in appropriate image quality, so, high-resolution images. When (they) have a loan contract with a museum, and the museum wants from artist X the painting X, then we provide the image material for potential catalogue publications.*“ However, these two collections are private collections managing permanently displayed art, and therefore, may have similar concerns as galleries.

The implications of this analysis for the overall research question will be further discussed in the overall discussion in chapter 5.

4.3 RQ3: What is expected of systems, and thus stakeholders' reasoning and willingness to invest into a system?

Based on the preliminary assumption that stakeholders' reasoning as well as expectations and willingness to invest may influence users' needs for DAMS, respondents' answers were analysed for emerging topics and thus evolving needs.

4.3.1 Findings

Common expectations appear to be systems' *adaptability* and *simplicity of use*. These seem to be the most salient aspects participants seem to reason with when choosing a system. Less salient expectations are the *availability of free testing* as well as *monthly subscriptions*. *Visual appeal* seems to play a role especially for galleries. Two themes emerged when analysing the data: Participants' reasoning seems to be divided into display of either open-mindedness or short-sightedness and there may be a positive correlation between willingness to invest and easy data transfer.

4.3.2 Data Presentation and Analysis

Common expectations of both galleries and collections appear to be adaptability and simplicity of use. Collection 3 *“could never work with a predetermined template as the collection is still expanding.*“ Also gallery 8 stressed that *“what mattered to the owners was that it was entirely customised to their needs.*“ Further, collection 4 elaborated on the decision process for use of a scalable system as: *“This was decided in a dialogue with the programmer, who said from his experience that at the time, in 2005, there was no adequate software that met our needs.”* With regards to simplicity of use, respondents answers around expectations of systems ranged from *“functions that would be nice to have to limit the amount of clicks*“ (gallery 4), to collection 6's explanation for why simplicity is crucial: *“Because 90% of these*

functions can be done in Excel, and the more complicated the system, the higher is the hesitation to train more staff, and the more inflexible it becomes too.“

Further, the analysis revealed that several participants would appreciate the options to test systems on a free basis and to choose monthly subscriptions. For example, gallery 2 has *“looked at other tools but they were in terms of what they could do not worth that kind of money. We also looked at more expensive ones, but especially the very expensive tools were sometimes not even available for testing, which is essential if you want to use it a lot.”* Similarly, collector 2 would base his decision for a tool on it being *“available to test for free and offer the possibility to have a monthly subscription as these systems often are not that special and one would have to be sure that this is exactly what I need.”*

Lastly, and specific to galleries, the analysis found that visual appeal appears to be an expectation that requires consideration. For gallery 7, *“this is about working with something that is intuitive, as this is important for creative people rather than someone with technical skills. It has to look good, it must be nice, and it must be presentable when a collector who cares about aesthetics sees it when I show him something.”* Similarly, gallery 3 has decided to use the software *Artbutler*, based on the assumption that *“it is the iMac amongst all of them.”*

Further analysis suggests that it is vital to evaluate these expectations against the emerging theme that participants appear to either exhibit open-mindedness or short-sightedness when talking about their expectations.

For example, gallery 5 emphasised adaptability: *“Bespoke is good because it completely fits our purpose“* and *“yes, we tried other software that other galleries use but it wasn’t fit for our purposes, it has to be completely bespoke. One size does not fit all.”* Yet, throughout the interview this respondent did rather express disinterest in technologies, and thus, a short-sighted focus on expectations of systems. This is in contrast with other respondents, whose ability to reason may be seen as more useful for this research. Some who also emphasised adaptability or simplicity of use, have however exhibited genuine interest in finding an efficient tool by actively seeking and engaging in a dialogue around decision criteria. To exemplify, gallery 6 holds that *“you have to be very confident about the people that produce that system, so I looked around and I know that other Danish galleries operate with American systems and they are quite content, as I am asking around for opinions, so I am in the process of deciding what to do. It depends on the qualifications, on the abilities of the tool, but I would definitely be willing to invest the money.”* Also collection 4 emphasised adaptability, and the respondent’s reasoning appeared to be based on genuine engagement, as even IT experts had been consulted about the decision for a system, and *“the most important aspect for*

him (IT specialist) was revision safety.”

Therefore, it appears relevant to explore the theme of whether expectations such as testing systems, monthly subscriptions or visual appeal are real needs to consider, or rather wishes expressed by short-sighted participants.

Gallery 2 and collector 2 had especially emphasised these options. Collector 2 is a private individual collecting art on a small scale, and thus, may have been guided by economic reasons, as his collection does not amount to the scale of business such as large scale collections backed by corporations or wealthy family businesses. In the case of gallery 2, the respondent however expressed a variety of functions that would be “*nice to have*“, and thus, the validity of this claim could be questioned. However, overall the respondent was very engaged into the topic of DAMS and elaborated on his search for a truly helpful tool, which may render his suggestion more relevant.

Regarding visual appeal, gallery 7 and 3 had emphasised this aspect as impacting their reasoning. Whilst the manager of gallery 3 used the wording “*iMac amongst them*“, which appears to be a superficial claim, the respondent exhibited strong interest into the market for DAMS and elaborated on his views and conversations with colleagues about this topic. Contrarily, the manager of gallery 7, who had “*looked into Artbutler, but was appalled relatively quickly, something was annoying or too slow, if something only has a Windows look I do not like it, as I care much about aesthetics*“, rather appeared to be appalled by the extensive use of technology and digital media in general. Therefore, his claims could be considered less critical.

Based on the careful evaluation of participants answer with regards to their open-mindedness as opposed to short-sightedness, the study finds that simplicity of use and adaptability are expectations to consider relevant based on the emphasis placed on these factors by a variety of respondents who exhibited open-mindedness. The expectation of testing systems, monthly subscriptions or visual appeal may have to be carefully considered as wishes than real needs, which will be addressed in the overall discussion.

Lastly, many reported of the high costs involved in installing and maintaining of software. Overall, both galleries and collectors appear to be willing to invest in systems, which meet certain expectations. The extent to which respondents are able to clearly define these is a larger theme that will be addressed in the overall discussion. Nevertheless, what could be detected is a relationship between the willingness to invest and individuals’ reasoning about their expectations arising from the thought about changing to a new system or data transfer in general.

The analysis suggests that participants' reasoning about new tools reveals concerns with data transfer. Arguably, these may result in a hesitation to change and potentially, a lower willingness to invest. To exemplify, gallery 3 "*would be willing to pay up to 100€ monthly*" for a tool that "*integrates with (their) current system and allows for using identification systems such as RFID or barcodes, as (the respondent) know(s) that integration costs money.*" Similarly, gallery 4 cannot imagine using a different system as "*moving all the data, and learning the system is not very desirable.*" This aspect was also emphasised by collection 6, as "*this of course is a problem for any new provider, that one tends to be hesitant towards changing from (ones) existing system, as there is much expense to this and so (they) are not discussing that now, as (one) cannot simply transfer the data to another system.*"

This aspect appears relevant for developers to bear in mind, even if these concerns could be argued to be not specific to DAMS, but a larger concern for all data bank providers.

The implications of this analysis for the overall research question will be further discussed in the overall discussion in chapter 5.

4.4 RQ4: How do perceptions of cloud-based systems and technologies for improvement influence the needs for DAMS?

Based on preliminary study outcomes suggesting that cloud-based solutions and modern identification systems may constitute a need of the target group, empirical data were analysed in light of stakeholders' perceptions of these topics.

4.4.1 Findings

Overall, the analysis suggests that perceptions of cloud-based systems and technologies for improvement influence participants' focus on present concerns versus the ability to see potential future needs. This was found to be related to respondents' IT knowledge or lack thereof, as well as genuine interest in new technologies as opposed to a lack thereof, based on the critical evaluation of participants' backgrounds and overall attitudes. The analysis of statements regarding cloud-based systems generated the theme of *security concerns*, whilst participants' perceptions of the discussed technologies conjured up the themes *perceived usefulness* and fear of high workload for implementation.

4.4.2 Data presentation and Analysis

A) Perceptions of Cloud-Based Systems

The analysis showed that both galleries and collectors appear divided into high and low security concerns with regards to cloud-based solutions. Several participants demurred safety and

security concerns with storing data in the cloud. Gallery 1 was sceptical about implementing cloud-based DAMS: *“We have quite sensitive data here, about who bought respective works.”* Similarly, the manager of gallery 7 *“read a lot about cloud-based options, but (is) rather old-school given (his) generation, and (is) rather sceptical of how secure this is.”*

Contrarily, other participants were enthusiastic: *“If there was a cloud solution by the provider, then I think I would prefer using that, as it is always more secure“* (gallery 2). Although this was the only respondent who explicitly referred to cloud-based tools as more secure, others were equally enthusiastic or lacked security concerns; Gallery 3’s manager thinks that *“the galleries high up are still surprisingly analogue”*, and believes that *“mobile access to a cloud-based system as well as multi-user access will become inevitable.”* Also gallery 6 *“would really like to have everything in the cloud, right now (they) don’t but that’s (their) plan for the future.”*

Especially one gallery (7) illustrates how radically some members of the creative industry express disinterest, which arguably results from and reinforces their lack of IT knowledge: *“I think this will be the future, even if I will try to escape these sort of things as long as possible. I know that others think a lot about cloud-based systems and other technical advances and people in my generation still have old versions on their computers and hold on to them, but probably we cannot avoid having it all in the cloud at some point.”*

Further analysis of other statements suggests a positive correlation between IT knowledge and lower concerns with security, based on taking into account respondents’ educational backgrounds and attitudes towards IT. All participants from galleries who expressed concerns with security and referred to data protection issues had expressed an overall dissenting attitude towards IT development (gallery 1) or explicitly used words such as *“old-school“* (gallery 7). Conversely, respondents who expressed no concern with security were found to either have referred to consultation of in-house IT personnel (gallery 9), or expressed an overall IT enthusiasm (gallery 3). Lastly, the respondent who explicitly endorsed the higher security level of cloud-based storage was found to be knowledgeable in IT development based on his background in informatics (gallery 2). Hence, the theme of security concern appears to divide participants working with digital systems especially in galleries, suggesting that the hesitation towards cloud storage is related to a lack of IT knowledge. This could arguably imply these respondents’ lower ability to judge their own needs accurately.

Especially striking was concern expressed by respondents working in art collections, who referred to in-house IT personnel when explaining their perceptions. Collection 3’s respondent mentioned the collection’s IT specialist, when reporting that *“(they) have decided against*

cloud-based solutions due to security concerns. Both (their) IT specialist and conservator are against this, so (they) do not want to hand this to third parties.” Also collection 5 “*would never, what often is being done today, have this in the cloud, because this would not be safe enough.*” Lastly, even collection 6’s manager: “*think(s) Museum Plus (their current system) offers an upgrade to the cloud, so if (he) was setting up right now, it would be more tempting to have it online - but this is then the question of data security and privacy, as to where are the data reside and who else can see them, as there is of course a great deal of confidentiality to our work as an art collection.*” It appears that with regards to collections, lack of IT knowledge and security concerns may not be related.

B) Perceptions of Modern Identification Technologies

When analysing empirical data, especially one statement stood out. One manager of a gallery (3) showed enthusiasm for the topic, criticising his current system for “*not offer(ing) an integrated solution for tracking devices such as barcode readers.*” The respondent further stated that “*it is on (his) agenda for the coming years to have a platform with an integrated solution like this. (He) would love this, (he) would just have that little tag stamped to the crate and all information is in there, (he does not) need to sit in additional phone calls, (he) simply click(s) the tagline.*” Contrarily, one gallery was entirely opposing the topic (gallery 4). The respondent reported of the long standing relationship with the company responsible for transportation and stated that they and “*we know by heart exactly where everything is and we keep regular inventories as well.*”

Overall, however, the analysis suggests a perceived usefulness by the majority of participants. Apparently, the topic is being discussed by some, who appear to generally engage in forward thinking towards implementing ever-newer technologies. This is illustrated by the genuine interest expressed by the respondent of gallery 6: “*We have not actually concluded what our opinion is right now, but think that it is a very interesting topic. I have recently spoken with another Danish gallery who are using a database with some way of tracking device, that I am curious to hear more about in the future.*” Similarly, gallery 2 can imagine the benefits of implementing these technologies as “*this is thinkable indeed, especially if works are in package and I only have to hold a reader and have it all in there, this would be useful. For us, transport lists are important, to know which work has been delivered, which we write up manually and print lists, so having a code or even better a sort of chip, that would of course be interesting.*” Whilst also exhibiting open-mindedness, gallery 8 questions the need for using the technologies: “*I think this is useful if all transport boxes have a barcode. But I’m not sure whether we would need this, even if you could get all the information by reading the*

code. But I am definitely open-minded, perhaps in the future. Well, if someone comes up with something that is reasonable, then there is the question whether you're not faster if you write it by hand, and you also need the reader...but if there was the perfect tool so I can use the code easily, then that would be interesting.“

When critically evaluating participants' statements, it became apparent that respondents who endorsed using the technologies exhibited an overall impression of forward thinking and genuine interest in IT development (gallery 2, 6, 8). Contrarily, the respondent of gallery 4, who explicitly opposed the topic, had referred to the gallery's general disregard of using digital means, as the owner is *“very fond of paper.”*

These insights generate the theme of there being an interest, which may be hindered by the fear of workload as a result of thinking about implementation. To exemplify, gallery 9 mentioned that *“the codes, well, that would be an obstacle for large galleries like (them) with over 2000 works, but then again once you have done it, it would be useful. But it always takes time to introduce a system, it is not the first thing that people think about.”* Similarly, collection 4 stated that they *“do not work with modern identification systems, such as barcode scanning, but (they) found this very interesting and would be open for working with this, but in the realisation of it (they) are a little behind. This is to do with that some colleagues already have a high workload, but this is something that could be done in the future, so we are definitely interested in this topic.”* Also collection 6 has *“thought about putting QR codes with the inventory numbers when (they) had to label all works initially, but then it turned out that (they) do not need this, as (they) are too small of a business.”*

It thus appears that the perceived usefulness of the technologies, and even genuine interest in some cases, is inhibited by participants' focus on negative aspects as well as a lack of imagination of possibilities offered by technologies to reduce overall workload. This could be argued to result from a focus on present concerns as opposed to an ability to foresee potential future needs.

The implications of this analysis for the overall research question will be further discussed in the following chapter.

4.5 Chapter Summary

This chapter investigated the needs of galleries and collectors using four separate analyses. Each has provided a more in-depth understanding of the needs for DAMS by addressing the effects of previously established influencing factors. The analyses shed light on how the stakeholders' needs for DAMS may differ along the dimensions of individual characteristics,

data and asset characteristics, individual expectations and reasoning as well as perceptions of cloud-based systems and new technologies. The main findings showed that there are specific needs and security concerns. All findings and overarching themes will be discussed in more depth in chapter 5.

Chapter 5

5. Discussion and Conclusion

5.1 Overall Discussion of Key Findings and Overarching Themes

5.1.1 The List of Needs

Based on preliminary study results, the findings of the second study provide an indication of the needs of both galleries and collectors, which surprisingly appear to differ less than one might have expected. Nevertheless, it is important to bear in mind that the findings are only indicative. Rather, they are intended to serve as a broad orientation for the future development of DAMS.

The following list contains a summary of all needs identified during the four separate analyses. Hence, the findings of this research suggest:

Common Needs of Galleries and Collectors:	Common Needs Specific to Galleries:
Inventory and Logistics management	High-resolution images
Tracking and location determination; <i>especially large galleries and collections, and/or multiple locations</i>	Visual appeal
Integration with other services; <i>Different levels: e.g. website integration vs. simple publishing functions</i>	Ability to sort by artists
Scalability/Adaptability of system	Support of different file formats and several views of single artworks; <i>e.g. 3D image-viewing</i>
Linking of digital assets and metadata; <i>Integration of various kinds of information</i>	
Optional mobile access; mobile device site compatibility; responsive web design; <i>Especially large galleries and collections; multiple locations</i>	
Simplicity of use; <i>Especially large variety of users and varying levels of expertise</i>	
Easy data transfer	
Import and export functions	
Free testing and monthly subscriptions	
Optional multiple user access and user rights determination; <i>Especially large variety of users and varying levels of expertise</i>	
High storage capacity	

Table 7 The List of Needs

The following discussion of results and themes obtained through the in-depth investigation of needs by using four specific research questions serves to bring together all findings in light of

the overall research question. First, the implications of each for the overall research question are discussed, based on the contextual interpretation by the researcher. This is followed by the critical evaluation of overarching themes, which emerged during the process of analysis.

5.1.2 Second Stage Key Findings and Implications

RQ1: The main dimensions of systems affected by stakeholders' characteristics are *inventory management and logistics; degree of integration and mobile access; adaptability; user access type and rights* and *complexity of the system*. These in turn appear to influence stakeholders' needs and should thus be taken into account for DAMS development. The overall findings suggest that these might influence the needs less than expected following findings of the preliminary study. However, the *way* in which these influence the needs could serve as a guideline for software developers.

Based on the purpose of this research - to help companies analyse and better understand the needs of galleries and collectors - this research question aimed to clarify the differences between various characteristics of galleries and collections. Firstly, all interviewees reported a certain need for functions that allow the tracking of artworks and determine locations. Empirical data suggested that this might be more important for large galleries and collections, especially if there are multiple exhibition or storage locations. In addition to that, high degrees of integration, for example with websites, address books or other publishing functions appear to be needed by most, whilst these functions seem less relevant for users who do not make extensive use of digital media. Mobile access appears to be needed especially by galleries whose staff travels frequently or collections with external storage facilities. Interestingly, the adaptability of systems was a feature that was fundamentally expected and appears to be a crucial requirement for the majority of participants. Lastly, galleries and collections with several employees, who have varying areas of responsibilities, may benefit from a multiple user access feature and the ability to determine distinct user rights in the system's settings. Simplicity of use appears increasingly relevant the more people with varying responsibilities and levels of expertise are involved in using the system. Overall, these differentiations can be argued to be important guidelines for developing a business model that comprises distinct plans for users according to the above considerations.

Similar to the findings suggested by the preliminary study, emergent from this investigation is that offering mobile access and more efficient ways of tracking artworks to enable smart location determination could benefit a variety of users. Hence, the attractiveness of those features was further investigated in RQ4. Moreover, individuals' expectations constitute a very

subjective, and hence, important influencing factor, which was explored in more depth in RQ3. The challenges arising from the subjectivity of answers is an overarching theme, which is addressed later in this discussion.

RQ2: The results indicated that, besides a common need for efficient *linkages of digital media and metadata*, as well as good *importing and exporting functions*, the system's ability to *support different file formats and several views of single artworks* as well as *image quality* appear especially important for galleries.

It could be argued that most functions emphasised as essential by participants are rather basic, which would not necessarily require using DAMS, but could be managed using CMS. However, the apparent need for high image quality suggests that cloud-based DAMS are required to specifically combat stakeholders' issues with limited storage capacities. The perceptions of cloud-based solutions were further investigated in RQ4, in order to get an idea of general responses to this suggestion. Upon critically evaluating participants' responses, it became apparent that one must address an overall tendency to talk about current possibilities for digital storage. Arguably, this finding implies a lack of creative imagination or the ability to think of other possibilities, which may be both useful and realistic in light of recent technological advances. Whilst such short-sightedness in given answers is discussed as an overarching theme, the implication for the characteristics of data and asset storage is that there may be better options for storing contents. However, stakeholders may currently be unable to imagine the extent to which technological advances provide such possibilities. Therefore, this research was unable to establish opinions or comments on the need for such system facilities.

RQ3: The study found that common expectations are a systems' *adaptability* and *simplicity of use*, as well as *free testing of systems and monthly subscriptions*, whilst *visual appeal* may be relevant especially for galleries. Overall, the importance assigned to systems indicates a high willingness to invest. Nevertheless, the findings suggest that concerns about *transferring data* to a new system may prevent users from the actual implementation of a new tool.

Besides meeting stated expectations, it seems that DAMS development has to pay specific attention to enabling easy data transfer. This may be a larger inquiry that may have to be directed at the main providers of data banks (CMS or DAMS) to consider using standard exchange formats in the future. Further, due to the fact that individual galleries and collectors cannot be expected to know and state their needs explicitly, it appears reasonable to establish potential needs beyond common expectations. An example might be determining potential perceptions of new cloud-based technologies for their attractiveness for the target group (RQ4). The divide in responses between future orientation as opposed to short-sightedness,

and a distinction between expression of wishes as opposed to needs, that emerged with regards to free testing of systems, monthly subscriptions and visual appeal, appear to be overarching themes. These are discussed with regards to the overall research question later on.

RQ4: The analysis of respondents' answers did not allow for concluding on an overall strong need for cloud-based solutions and technologies. However, results do indicate that perceptions of cloud-based solutions and technologies for improvement differ strongly along the dimensions of participants' level of IT knowledge as well as a general interest for new technologies. Security concerns and hesitations towards new technologies were found in both galleries and collections, whilst a lower number of participants endorsed these features.

In line with that, it can be argued that the emergent theme of a lack of IT knowledge in the majority of participants, as well as a focus on present concerns versus ability to see potential future needs, implies that cloud-based solutions and new technologies could be more valuable to consider for DAMS development than initially thought. As previously established, there is an overall impression that the majority of participants might be unaware of potential future needs. Arguably, the security concerns especially with galleries result from limited IT knowledge. This appears to apply to a large share of the creative industry, which may have generated an insufficient awareness of the advantages of cloud-based solutions. This becomes especially apparent when contrasting the accounts of individual galleries and collectors to the opinions of industry experts and art professionals (Art and Finance Conference, 2016). These explicitly emphasised the advantages of cloud-based solutions and opposed security concerns. Similarly, the perceived usefulness of implementing for example barcode readers could be seen as influenced by a fear of workload. Arguably, this may again be related to participants' short-sightedness regarding technological possibilities and advances. This further emphasises the extent to which people tend to focus on the present and may be unable to imagine how this could be solved very easily by modern technologies.

Moreover, the present findings indicate a positive correlation between security concerns and hesitation towards implementing new technologies. Nine out of 15 participants were found to both oppose cloud-based systems and be hesitant towards modern identification technologies. Contrarily, four participants endorsed cloud-based solutions and were also more interested in using new technologies for location determination. The fact that fewer respondents supported both cloud-based systems and new technologies suggests that developers have to actively communicate both the benefits and risks involved in cloud-based as well as on premises solutions. Further, for new technologies to be embraced by the target group, developers may have to directly advertise the long-term benefits of accepting an initial workload. Potentially creat-

ing a client services team that eases such a workload could further convince customers to invest. Nevertheless, it seems reasonable to emphasise that technologies for location determination might be better suggested for use to larger galleries and collections. These are the ones that on the one hand have to manage considerable amounts of artworks in multiple locations, and on the other hand may also have both the financial and man power to invest in such.

5.1.3 Overall Evaluation of Themes: Respondents' Answers in the Bigger Picture

A) Forward Thinking versus Short-Sightedness

The apparent divide of participants' answers into either forward thinking or short-sightedness especially came to light in RQ3, but was also encountered when discussing RQ4. Nevertheless, the implications of this theme also extend to the overall research question. Short-sighted answers were identified throughout conversations with all participants. While some statements explicitly expressed disinterest in the extensive use of technologies per se, others relayed their satisfaction with the currently used system, and had difficulties imagining technological advances and improvements. Additionally, some thought of the creative industry as still being fairly traditional, despite emphasising a personal enthusiasm for digital means and technology to manage art in the future.

One of the most crucial implications to be taken from such statements is that an exploration into users' unfulfilled needs may quickly come to a halt, resulting in the ability to recognise potential future needs being crucially limited. Not only appear stakeholders unable to predict their future needs in line with changing technologies and changing contexts of the art market, or specific challenges arising from such, but this likely also impacts their expressed needs. These short-sighted answers may therefore provide less in-depth insights than this research expected. Nevertheless, it is precisely the discovery of this divide, which enabled the researcher to distinguish between respondents' answers and pay specific attention to answers given by those who exhibited forward thinking. They had endorsed, for instance, cloud-based solutions, implementation of machine-readable codes, or were able to imagine future levels of integration for databanks with other services such as art news websites.

Given today's rapid developments within the possibilities of technology, it may be reasonable to argue that less well-known options for simplifying digital systems are available. These may in turn help inexperienced clients to adjust to new DAMS, and allow for the setting up of user-friendly features. To exemplify, such could be enabling 3D image-viewing or zoom options to combat identified stakeholder problems such as storing different views of single artworks. Bearing the short-sightedness in mind, the list of needs established in this project

might best not be regarded as finalised, but as extendable. By offering most recent technologies and optional functions within DAMS, users' expectations could easily positively be exceeded. These deliberations are vital for developers to bear in mind, specifically against the backdrop of a rapidly changing and increasingly competitive landscape of the creative industry and art market, which requires forward thinking and keeping pace with technological advances.

B) Lack of IT Knowledge

The divide found in participants' answers between IT knowledge, or at least a genuine interest in new technologies, and a lack thereof, was a prominent theme when discussing RQ4, which may have larger implications for the needs of galleries and collectors. A comparison of participants' demographic information highlighted the (non-)existence of an IT background from an educational perspective. In turn, such presence or lack of IT knowledge or enthusiasm was repeatedly implicit in responses, enabling the researcher to detect differences in attitudes, discussed in RQ4. Finally, industry experts interviewed in the preliminary study had highlighted this as an issue they reportedly encountered continuously working within the creative industry.

It could be argued that participants without an IT background may have a lesser ability to judge their needs, especially with regards to cloud-based solutions and technologies that embrace a thinking-ahead mind set. This lack of IT knowledge further implies that many users of digital systems may lack the ability to assess technological developments, for instance within the field of data security of cloud-based storage. With regards to the overall research question, this may mean that a large share of galleries and collectors may have a limited capability to estimate the possibilities of DAMS. This emphasises the importance of initiating closer collaborations between industry experts, research and stakeholders, in order to account for future needs and provide secure and high-quality, yet, easy to use systems that put worrisome minds at ease.

C) Separating the List of Needs from Wishes

This theme especially emerged when discussing RQ3, in particular concerning the visual appeal of digital systems. The distinction between wishes and needs is vital for the purpose of this research, as it is a general concern for qualitative market research to prioritise needs over wishes. Systematic research aims to predominantly explore potential needs that can directly be addressed in subsequent system development, as those are features that crucially relate to the functionality of a system and the extent to which it is ultimately supporting clients' work. However, particularly when working within the realms of a market that is crucially concerned

with the visual aspect of objects and other pieces of work, it is advisable to not disregard comments that do not directly relate to the systems practicality and functionality. Rather, the consideration of wishes regarding the development of a new system could ultimately increase the product's appeal. The example of visual appeal illustrates the extent to which wishes could be critical for developers to consider. Whilst developers mainly focus on the target group's needs, the aim for implementation of such management systems in the art market might require developers to pay attention to wishes such as the system's visual appeal in order to extent market reach. Hence, the goal may be to offer galleries and collectors more than they think they need, whilst striking a crucial balance between expanding needs and incorporating wishes.

5.1.4 Evaluation of Preliminary and Second Stage Findings

The distinction between wishes and needs appears to remain diffuse. In order to nevertheless critically assess and validate participants' exclamations of wishes or needs, it thus appears reasonable to compare the findings with those of the preliminary study. The critical evaluation of results obtained from both studies showed that there is a relatively high correspondence between the needs identified by galleries and collectors, and industry experts. Especially with regards to visual appeal, it is interesting to highlight that industry experts recognised this as a wish of galleries before the interviewer detected this in interviews with galleries and collectors.

Arguably, the main contribution of this research, however, is that second stage findings can serve to emphasise differences and further demonstrate the significance of drawing on both perspectives to grasp the complexity of the research area. Industry experts had estimated the needs of galleries to be very specific. Yet, the material obtained through the second stage of data collection indicates that the gap between the needs of galleries and those of collectors is not very large. Conversely, the importance of needs such as high storage capacity and easy data transfer were not as prominent in the preliminary study as opposed to the second. These discrepancies in findings crucially highlight the importance of (a) conducting inclusive research projects that explore the opinions and needs of a large variety of individuals within the target group, and (b) the extent to which communication between various stakeholders, research and development is pivotal in order to create high-quality DAMS.

The second stage further yielded insights into galleries' and collectors' perceptions of cloud-based solutions. The finding of security concerns with regards to cloud storage appears critical, as it strongly contradicts the opinions voiced by the three industry experts. Emphasised in

the preliminary study were its many advantages, including mobile access, simplicity of use, no maintenance costs and no IT personnel. Crucially, security concerns were explicitly regarded as irrelevant based on state of the art data protection possibilities within recent technological advances. During later stages of the research process, the researcher enquired about the finding of security concerns in the second study during an informal conversation with one of the industry expert interviewees (Source 1) from the preliminary study. Interestingly, the source, who has an extensive IT background, reported being entirely unaware of galleries' and collectors' concerns. From an IT perspective, this was difficult to imagine and comprehend. This further testifies to the importance of encouraging more communication around the topic of security between IT experts and those who are less experienced. Further emphasis also needs to be put on the importance of software developers being aware of the challenges that may arise from a pervasive lack of IT knowledge in the creative industry. As this likely plays an ineligious role in the creation of high-quality DAMS for the art world, this research can be regarded as taking the one of the first crucial steps to pave the way for a dialogue.

Finally, the industry experts highlighted modern identification technologies as a potential need for galleries and collectors regarding more efficient location determination and security. Research supported the usefulness for implementation thereof in the creative industry (HCS, 2008; SmartTrack RFID, 2010; Art and Finance Report, 2016; Archer, 2013). While results of the second research stage overall indicated a perceived usefulness of such a feature, this commonly appeared to be outweighed by the fear of too high of an initial workload. Thus, the findings do not confirm the initial expectation of a highly positive response to the suggestion of this feature. Based on the previous discussion of some participants' unawareness of their needs, the findings nevertheless indicate a potential future need for these technologies. In particular, this may be relevant for large galleries and collections with multiple locations and a high frequency of artwork transports. However, in order to combat hesitations towards implementation, developers may be advised to actively work on cheap and easy solutions that reduce the workload for potential users. In this regard, it may be interesting to consider the implementation of iBeacons as suggested by Source 3. This new technology might be especially suitable for management systems in the art industry due to affordable pricing and simplicity of implementation (Source 3).

5.2 Strengths and Weaknesses

The main limitation of this project stems from the author's inability to rely on an established knowledge base in the literature. Hence, this research heavily relied on the construction of a

framework out of preliminary and exploratory results in a research area that mainly presents a significant research gap. This methodology crucially impacts the quality of this project, as there is an increased risk of bias throughout the research process. Nevertheless, significant bias was avoided where possible: method and tools were judged as systematic and reasonable based on critical awareness of the high level of subjectivity and potential consequences thereof. Further adding to the risk of bias is the fact that this study was conducted by a single researcher; the lack of a second set of eyes may therefore increase the level of bias involved in the process of data collection and analysis.

Another weakness is that the participant group of the second stage represents individuals from a highly specialised field causing difficulties in recruiting interviewees from the creative industry population. Commonly, collectors remain very private and are not easily identifiable, whilst galleries tend to not be open to disclosing in-depth details about the management of their art. Thus, the researcher was obliged to base the selection to a great deal on the availability of respondents, which impacts the generalisability of the overall results. Another factor to consider here is that due to the time constraints and the scope of this project it was not feasible to include equal amounts of galleries and collectors. Similarly, the scope of this project did not allow for the researcher to expand the second interview round beyond private collections to more than one individual private collector. Other private collectors whose art is not on public display may have different interests and needs, which thus may represent unknown factors that this study was unable to account for. This warrants attention when using these findings to inform the developmental process of DAMS. Additionally, although the impact of this research is arguably limited to the population of galleries and collectors, the findings can nevertheless serve as an inspiration for future studies also investigating the needs of museums or artists.

Finally, it is important to highlight that the list of needs presented in this research's outcome cannot be seen as conclusive on the basis of bespoke limitations, the cross-sectional study design, as well as the short-sightedness of respondents. Further, the study cannot account for future changes to the established list of needs due to rapidly changing technologies, contexts or any arising challenges. The limitation of the latter has been discussed in-depth in the overall discussion and was thus taken into account to the author's best abilities.

Language and Translation

In order to enable a heterogeneous sample and extend the geographical reach of this project, the researcher had to conduct interviews in two languages (English, German), and thus, had to make use of translation. This project consists of nine interviews conducted in German with

German participants, which is the researcher's mother tongue. Statements were subsequently translated into English to the researcher's best abilities. Two interviews were conducted in English, where English was the respondents' mother tongue. Seven interviews involved Danish or Swedish nationals. The conversing in the English language therefore required both parties to talk in a language other than their mother tongue. It could be argued that these language differences may increase the overall risk of bias. However, the author has previously lived in the United Kingdom for four years and completed two university degrees in English. This allows to argue for a sufficient proficiency level of the English language, and hence, for the researcher's ability to both phrase questions and understand answers correctly.

It is important to consider that the issue of language represents a general challenge within qualitative research, as it is directly concerned with the translation of subjective meanings placed on original statements. Thus, originality easily gets complicated by using a second language or is lost in translation (Nes et al., 2010). However, "qualitative research is considered valid when the distance between the meanings as experienced by the participants and the meanings as interpreted in the findings is as close as possible" (Nes et al., 2010:314). The author ensured to meet these criteria to the best of her abilities.

Utilisation of Research

The research was conducted first and foremost out of the author's academic and professional interest in the topic. However, additional parties expressed great interest in the research, including the manager of an art collection (Source 1) and members of the *Axiell* management team. These parties arguably had a predisposing insight into the needs for DAMS, as both their own perspectives as managers or software specialists and their clients' feedback may have previously provided an indication of required digital management functions. Hence, the parties may have had certain expectations about the outcome of this research, which was accounted for by seeking to include the possibility to disprove these assumptions (Easterby-Smith, Thorpe & Jackson, 2012). This was further considered in the process of sampling through the inclusion of a great variety of collections and galleries as well as the interviewing of individuals both with and without extensive IT backgrounds who are using digital systems for managing art. This allowed for the contrasting of opinions and assumptions made by IT specialists versus those hesitating towards new technologies.

Interested parties and companies involved in the development of DAMS may make use of the findings generated by this research for their own purposes. Despite the close working together with specialists, the researcher recruited participants and selected research methods inde-

pendently. Crucially, this left the process of research and interpretation of data in charge of the researcher alone (Easterby-Smith, Thorpe & Jackson, 2012).

5.3 Overall Evaluation and Future Research

The author anticipated establishing a differentiated list of needs, around which to cluster individual galleries and collectors. However, throughout the process of research significant overlaps between galleries and collections were uncovered, which directed the findings towards an increased understanding of the influences on needs. Yet, this does not necessarily represent an issue; rather, the results of this research delved deeper into the complexity hidden within the development of DAMS, and outlined underlying perceptions and arguments of stakeholders.

Moreover, the discrepancy between expectations and reality regarding this project's outcomes has crucial implications for further research, as it highlights important points of departure for new efforts. To clarify, parties interested in DAMS development in the future may have similar expectations without realising that those do not reflect reality. Hence, the bespoken difficulties this project dealt with can be taken as a source of inspiration to guide primarily future research in the field, and ultimately, software development.

Future research should therefore specifically go into more detail on features combating some of the identified concerns regarding, for example, the enabling of 3D image-viewing. That way, developers might be able to eliminate issues surrounding different file formats. Further, future studies are advised to address other stakeholders within the target population, such as artists or museums, in order to establish a more comprehensive list of future needs. Such efforts could in turn encourage the development of features aiding the work of stakeholders across the creative industry. Finally, future research is advised to further explore the potential of modern identification technologies, such as iBeacons, in order to establish the extent to which these could help mitigating concerns with additional workload and costs.

5.4 Conclusion

The purpose of this research was to identify the needs of galleries and collectors for DAMS. This project is among the first to systematically explore this field of research, and aimed to set founding stones for the establishment of a profound knowledge base from which high-quality DAMS can be developed. The material supports the development of digital systems for the creative industry through the engagement of experts on both IT and the daily operations in work contexts. A list of needs was established based on an exploratory methodology, which delivered valuable findings through the consideration of diverse understandings of

crucial system functionalities for the facilitation of easy, yet, high-quality digital management of art.

The research involved a preliminary study, which crucially provided the factors influencing stakeholders' needs for DAMS. In a feed-forward motion, these served the creation of a framework for the second study, which investigated four evolving sub-questions targeting *stakeholders' characteristics, data and asset characteristics, reasoning and expectations* as well as *perceptions of cloud solutions and new technologies* in more detail. By capturing the insights of experts working with digital management systems in galleries and collections, the author collected and critically evaluated their needs. In summary, the exploratory findings of this project indicate a "list of needs", where galleries and collectors reportedly need DAMS that respond to their needs by providing for:

Inventory and logistics management as well as tracking and location determination, integration with other services, scalability, the linking of digital assets and metadata, mobile access (mobile device site compatibility; responsive web design), simplicity of use, easy data transfer, import and export functions, free testing and monthly subscriptions, optional multiple user access and user rights determination as well as a high storage capacity.

In particular, galleries were identified to have specific needs, especially regarding *high quality images and visual appeal*.

Through qualitative interviewing of industry experts, galleries and collectors, this project delivered insights into the differentiation between the needs of galleries and collections. Despite being of exploratory nature, it can be argued that the findings are crucial first step towards enabling subsequent research, the creation of a profound knowledge-base on the topic, as well as ultimately, the development of high-quality DAMS.

Further, this research project has crucial implications for practice. In particular, its findings could guide the design of different user plans within DAMS, which would enable the satisfying of the needs of various galleries and collectors. Thereby, addressing specifically the prominent needs for scalability of DAMS could be one of the primary implementations of this project.

Despite the lengthy consideration of risk of bias, the research findings are limited in their generalisability and meaningfulness. This specifically refers to the identified short-sightedness of participants, as well as cross-sectional study design of this study. Nevertheless, the data allowed for a confident interpretation in light of the implemented systematic approach developed for the progressive production of knowledge. Although the conclusions

drawn may only present incremental improvements of existing knowledge among software developers, this report significantly contributed to a better understanding of underlying motives and factors that are crucial for (a) differentiating between various types and sizes of collections or galleries, (b) including considerations on uncovered challenges regarding security concerns, (c) distinguishing between stakeholders' needs and wishes for features to be incorporated in DAMS, and (d) considering stakeholders' willingness to invest both financially and in terms of effort of changing existing management systems. Finally, the findings initiated the reasonable advice for software developers to enhance their communication both among each other and with stakeholders of the creative industry regarding common concerns and hesitations on issues such as the use of standard exchange formats in the future, cloud-based solutions, as well as modern identification systems. Whilst CMS appears to remain relevant based on its fulfilment of the most common requirements, especially the uncovered need for high-resolution images emphasises the great potential of DAMS, whose design promises the implementation of various technological advances to ease the digital management of art collections and galleries.

Concluding, the question as to what DAMS are may still be that 'it depends'. This question thus remains unanswered, and likely continues to be causing fruitful discussions within the *Axiell* management team. However, this research shed light on what '*it depends*' can mean when designing DAMS for this defined area of the art market. Whilst a single definition of DAMS is yet to be established, this research provides a more in-depth understanding of the expected, needed and wished for capabilities of DAMS, as well as the underlying motives and thought-processes that drive these opinions.

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Appendix A

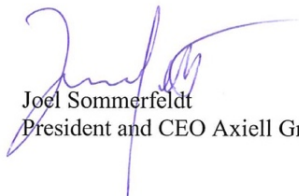


TO WHOM IT MAY CONCERN

Two members of the *Axiell* management team have participated in the study for the Master's Thesis *Managing Art. Digital Asset Management Systems for Collectors and Galleries* by Katharina Johanna Feulner. The student was asked to remove confidential information as well as the participants' names from the report.

However, we hereby state our approval that Katharina Johanna Feulner may refer to the company's name in the final version of the report.

Lund, 18th May 2016



Joel Sommerfeldt
President and CEO Axiell Group

Appendix B

Influencing Factor	Information sought to obtain	Question	Potential Range of Subquestions
Type and size of gallery/collection	Individual circumstances and capabilities	To begin with, I would like to ask you to introduce yourself, describe your background, your experience in the field and the specialisation of your art collection/gallery.	For how long have you been working in your field and have been working with such systems? / How many artworks have to be managed?
Tasks and work processes (key operations)	What/How much do needs to be stored	Could you please use examples to describe what managing your collection/gallery involves?	Is your art stored in one or multiple locations? /Is your art displayed in one or multiple locations?
Previous experience	Required capability of systems (expectations)	Which digital management system do you currently use to manage your collection/gallery? Could you give examples that illustrate your positive experiences and the benefits such systems bring?	What are rather negative experiences? / What would you say, when do such systems reach their limit?
Characteristics of the things that need to be stored and intended use	What should a system be capable of, should there be an approval/legal system	Further, it would be nice if you could elaborate on how you are using the system to illustrate how integrated it is into your daily operations. What does a system have to be capable of to be truly helpful to you?	Which types of assets do you use? / Who will be the primary users of the system? / Who should have access to your digital assets?
Reasonings for choosing a system	Unique decision factors for a specific system	My previous research suggested that the factors impacting the usefulness of a tool, and therefore the decision for a specific one, are strongly differentiated for individual collections/galleries. What is your thinking about this? Can you explain your answer using an example?	Have you previously tested other systems (cloud-based)? / According to which criteria have you made your decision?
Perception of technologies for improvement and thinking about cloud solutions	Attractiveness of integrating new features	This question aims at your individual needs. One further perception is that cloud-based DAM tools are not designed for the use of modern identification systems, which however could be seen as useful for organising physical storage and tracking individual art works or entire parts of collections. What are your thoughts about these themes?	To what extent do you need access to the system from different/multiple locations? / Do you think integrating such identification systems with the system would be advantageous?
Expectations and willingness to invest	Expectations and willingness to invest	What is your view on what needs to be communicated to web-developers for a newly developed tool to appear attractive for you to invest in it?	How important are factors such as costs?
Level of involvement and expertise	Variety of people involved	Lastly, do you think that your perspective is in line with that of your colleagues or could you point to differences dependent on the type of work a person performs?	How does the level of engagement with the system vary within your business?

Table 8 Framework for the Second Stage of the Data Collection

Appendix C

Interview Guidelines

Guideline for Expert Interviews with Art Collectors



LUND UNIVERSITY
School of Economics and Management

Introduction

The following standard questions shall be flexibly adapted to individual respondents in due course of interviews. For each of the following questions the researcher will have a range of sub questions to follow up on answers, which she will draw upon depending on the direction taken by respondents.

1. To begin with, I would like to ask you to introduce yourself, describe your background, your experience in the field and the specialisation of your art collection.
2. Could you please use examples to describe what managing your art collection involves?
3. Which inventory management system/ digital asset management system do you currently use to manage your collection? Could you give examples that illustrate your positive experiences and the benefits such systems bring?
4. Further, it would be nice if you could elaborate on how you are using the system to illustrate how integrated it is into your daily operations. What does a system have to be capable of to be truly helpful to you?
5. My previous research suggested that the factors impacting the usefulness of a tool, and therefore the decision for a specific one, are strongly differentiated for individual collectors. What is your thinking about this? Can you explain your answer using an example?
6. This question aims at your individual collecting behaviour. One further perception is that available digital asset management tools are not designed for the use of modern identification systems, which however could be seen as useful for organising physical storage and tracking individual art works or entire parts of collections. What are your thoughts about these themes?
7. What is your view on what needs to be communicated to web-developers for a newly developed tool to appear attractive to you?
8. Lastly, do you think that your perspective is in line with that of your colleagues or could you point to differences dependent on the type of work a person performs?

Guideline for Expert Interviews with GALLERIES



LUND UNIVERSITY
School of Economics and Management

Introduction

The following standard questions shall be flexibly adapted to individual respondents in due course of interviews. For each of the following questions the researcher will have a range of sub questions to follow up on answers, which she will draw upon depending on the direction taken by respondents.

1. To begin with, I would like to ask you to introduce yourself, describe your background, your experience in the field and the specialisation of your art collection.
2. Could you please use examples to describe what managing your gallery involves?
3. Which inventory management system/digital asset management system do you currently use to manage your gallery? Could you give examples that illustrate your positive experiences and the benefits such systems bring?
4. Further, it would be nice if you could elaborate on how you are using the system to illustrate how integrated it is into your daily operations. What does a system have to be capable of to be truly helpful to you?
5. My previous research suggested that the factors impacting the usefulness of a tool, and therefore the decision for a specific one, are strongly differentiated for individual galleries. What is your thinking about this? Can you explain your answer using an example?
6. This question aims at your individual needs. One further perception is that available digital asset management tools are not designed for the use of modern identification systems, which however could be seen as useful for organising physical storage and tracking individual art works or entire parts of collections. What are your thoughts about these themes?
7. What is your view on what needs to be communicated to web-developers for a newly developed tool to appear attractive to you?
8. Lastly, do you think that your perspective is in line with that of your colleagues or could you point to differences dependent on the type of work a person performs?

German Versions



LUND UNIVERSITY
School of Economics and Management

Leitfaden für das Expertengespräch mit Galerien

Einstieg

Einige der folgenden Standardfragen mögen Ihnen irrelevant erscheinen, dies bitte ich zu entschuldigen, denn diese sollen im Laufe des Gesprächs an den individuellen Gesprächspartner angepasst werden und gegebenenfalls durch spezifischere Nachfragen vertieft werden.

1. Zu Beginn würde ich Sie gerne erst einmal bitten, mir etwas zu Ihrer Person, Ihrem Hintergrund und Ihrem Fachgebiet zu erzählen.
2. Könnten Sie mir beispielhaft beschreiben was die Verwaltung Ihrer Galerie beinhaltet?
3. Welches Verwaltungssystem/Digital Asset Management System benutzen Sie aktuell? Können Sie einige Beispiele nennen die Ihre positiven Erfahrungen und den Gewinn den ein solches System bringt illustrieren?
4. Des Weiteren wäre es nett, wenn Sie mir den Umgang mit Ihrem System genauer beschreiben könnten. Was muss ein System können um wirklich hilfreich zu sein?
5. Im Laufe meiner Studie wurde mir klar, dass die Faktoren welche bei der Auswahl eines solchen Systems eine Rolle spielen, von Galerie zu Galerie stark differenziert sind. Was denken Sie über diese Annahme? Können Sie Ihre Antwort beispielhaft erläutern?
6. Diese Frage zielt auf ihr individuelles Sammlerverhalten/individuellen Bedürfnisse ab. Des Weiteren hat meine Recherche ergeben, dass derzeit erhältliche Digital Asset Management Tools wenig auf moderne Erkennungssysteme ausgelegt sind, was jedoch sehr hilfreich für das Organisieren von Lagern sowie das Lokalisieren von Werken oder Teilen der Sammlung erscheint. Was denken Sie über diese Thematik?
7. Was muss aus Ihrer Sicht zudem an Entwickler kommuniziert werden, dass ein neu entwickeltes Tool Sie ansprechen würde?
8. Wie denken Sie, dass Ihre Meinung über dieses Thema im Verhältnis zu anderen Mitarbeitern steht? Können Sie sich vorstellen, dass Kollegen mit anderen Aufgabenbereichen diese Probleme und Erfahrungen anders sehen?

Leitfaden für das Interview mit Kunstsammlungen



LUND UNIVERSITY
School of Economics and Management

Einstieg

Einige der folgenden Standardfragen mögen Ihnen irrelevant erscheinen, dies bitte ich zu entschuldigen, denn diese sollen im Laufe des Gesprächs an den individuellen Gesprächspartner angepasst werden und gegebenenfalls durch spezifischere Nachfragen vertieft werden,

1. Zu Beginn würde ich Sie gerne erst einmal bitten, mir etwas zu Ihrer Person, Ihrem Hintergrund und Ihrem Sammlergebiet/Fachgebiet zu erzählen.
2. Könnten Sie mir beispielhaft beschreiben was die Verwaltung Ihrer Sammlung beinhaltet?
3. Welches Verwaltungssystem/Digital Asset Management System benutzen Sie aktuell? Können Sie einige Beispiele nennen die Ihre positiven Erfahrungen und den Gewinn den ein solches System bringt illustrieren?
4. Des Weiteren wäre es nett, wenn Sie mir den Umgang mit Ihrem System genauer beschreiben könnten. Was muss ein System können um wirklich hilfreich zu sein?
5. Im Laufe meiner Studie wurde mir klar, dass die Faktoren welche bei der Auswahl eines solchen Systems eine Rolle spielen, von Sammler zu Sammler stark differenziert sind. Was denken Sie über diese Annahme? Können Sie Ihre Antwort beispielhaft erläutern?
6. Diese Frage zielt auf ihr individuelles Sammlerverhalten/individuellen Bedürfnisse ab. Des Weiteren hat meine Recherche ergeben, dass derzeit erhältliche Digital Asset Management Tools wenig auf moderne Erkennungssysteme ausgelegt sind, was jedoch sehr hilfreich für das Organisieren von Lagern sowie das Lokalisieren von Werken oder Teilen der Sammlung erscheint. Was denken Sie über diese Thematik?
7. Was muss aus Ihrer Sicht zudem an Entwickler kommuniziert werden, dass ein neu entwickeltes Tool Sie ansprechen würde?
8. Wie denken Sie, dass Ihre Meinung über dieses Thema im Verhältnis zu anderen Mitarbeitern steht? Können Sie sich vorstellen, dass Kollegen mit anderen Aufgabenbereichen diese Probleme und Erfahrungen anders sehen.