TRANSLATING LAYERS OF MEANING

A study of interdisciplinary processes in museums for the creation of multilayered educational media

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ABSTRACT

Museums are widely accepted as social institutions with the main mission to generate public value and educating the society. However, with the advance of new technologies and a more liberated visitor, as well as decreases in governmental funding, museums find themselves in a complex and competitive environment. In order to appeal to a diverse and broad audience and to generate educational value, museums create multilayered educational products, to translate artefacts' myriad layers of meaning. The museum, hence, is in need of different professionals form different fields of expertise to grasp this complexity and create a holistic translation to the public.

The main purpose of this research was to investigate how museums can generate multilayered educational media through the process of interdisciplinary collaborations. Professionals engage in a collaboration with co-workers from different disciplines, educational backgrounds, often contrasting department goals and perspectives. These complex team processes as well as the creation of such multilayered educational products have been analyzed within three case studies. The case studies involved different interdisciplinary project teams concerned with the creation of abovementioned products. By collecting data through expert interviews and desk research, a current phenomenon and its context could be examined in-depth.

The analysis was solved by thematic analysis and oriented on the conceptual framework of this research paper. The data analysis revealed, multilayered educational media in museums are likely to be oriented on current events and the collection of the museum, on the specific audience to be reached. Moreover, the products aim at transferring complex multifaceted information in a comprehensible language. The main overall purpose of these products was found in the inclusion of a wide audience, a higher engagement of visitors and a multilayered knowledge transfer. In terms of the interdisciplinary processes, the value of a clear coordination and guidance, assertive communication skills, flexibility and openness towards other disciplines, mutual respect, as well as prior experiences with interdisciplinary processes, were outlined as effective.

KEYWORDS: *museum, interdisciplinary, collaboration, educational products, co-creation*

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1. Introduction

Nowadays, art museums are re-evaluating their mission and their roles in what has become a rapidly changing and complex environment. In the twentieth century art institutions in Western Europe took over the task of the church to authentically display cultural objects in the so called "white cube exhibitions" (Grøn, 2012, p. 204). However, today this collection-oriented view seems to shift, and cultural institutions increasingly consider the needs of a more liberated audience (Cameron, 2008; Kotler, Kotler, & Kotler, 2008). Scholars attribute this transfer of attention inter alia to the advent of new media technologies, resulting in a more emancipated visitor, as well as to an economic rationalism (Hooper-Greenhill, 2010; Scott, 2016). What is more, museums find themselves in a competitive environment which demands the adoption of innovative features in order to distinguish them from other cultural institutions (Kotler et al., 2008). In fact, museums have to compete for audiences, governmental support, private investment and other resources (Kotler et al., 2008). Consequently, a museum aims at succeeding and distinguishing itself from competitors by generating experiences, benefits and shared value to their visitors (Black, 2016; Hooper-Greenhill, 2010; Kotler et al., 2008). In fact, museums as cultural organizations carry a mission to serve the public, hence, to generate public value and are not categorized as for-profit companies (Kotler et al., 2008; Scott, 2006; Snowball, 2008; Yocco, Heimlich, Meyer & Edwards, 2009). This notion is in accordance with Porter (2006), who defines the value for museums as a surplus of social benefits rather than what buyers are willing to pay.

Many scholars argue, educational goals are a significant part of a museum's societal purpose (Falk, 2006; Hooper-Greenhill, 2004; 2010; Vartiainen & Enkenberg, 2013; Wong, 2015). Indeed, cultural organizations offer an object-based experience for visitors encoding different cultures, histories and identities resulting in short- and long-term knowledge and hence, educational value (Hooper-Greenhill, 2010; Breward, 2011). The task of encoding these myriad meanings and identities can be rather complex, since a museum's audience is as diverse as the objects within the collection of the museum (Cameron, 2008).

Therefore, in order to translate the multilayered nature of museum objects and generate a holistic perspective for the visitor, museums engage into interdisciplinary collaborations (Breward, 2011). Indeed, museums host professionals from diverse disciplines, ranging from art history, archeology, anthropology, conservation science to technical sciences (Maroevic, 1995). Eventually, these professionals engage in collaboration to create a product for the museum visitor. The expertise, skills, knowledge and experience of these professionals are synergized within the project team in order to produce the best outcome possible. In order to fully understand, how the process can generate

abovementioned informational products, stimulating factors of organizational, socio-emotional and environmental nature have to be conceptualized in this research paper. In a nutshell, these collaborations lead to the generation of learning outcomes and, hence enable the museum to meet one of its main missions (Breward, 2011; Cameron, 2008; Maroevic, 1995; Vartiainen & Enkenberg, 2013).

Certainly, it is the collection and the exhibited objects that are the main assets of a museum to attract a large audience (Breward, 2011; Kotler et al., 2008). Hence, in order to maintain and increase visitor numbers as well as fulfill educational purposes a dialog has to be created between exhibited objects and a diverse audience. Research centered around objects can be challenging, since general theories are tested on specificities of artefacts and the resulting outcome rarely corresponds to the researcher's expectation (Breward, 2011). Equally problematic to research is the dynamic nature of objects undergoing constant change through modification, wear and repair (Breward, 2011). Interdisciplinary cooperation within museums might serve as a new international exchange of knowledge and according to Breward (2011), is the only valid approach to grasp the whole complexity of cultural artefacts. Furthermore, by creating more engaging approaches and narratives towards cultural heritage, experimental learning among a participatory audience can be achieved (Black, 2016; Breward, 2011; Hooper-Greenhill, 2010).

In fact, Graham Black (2016) claims, that the exhibition style and concepts are in need of a new and innovative reorganization in order to suit the twenty-first-century audiences. Dropping visitor numbers can be understood as a plea for museums to question the traditional display of its artefacts and to consider their visitors' individual knowledge (Black, 2016; Hooper-Greenhill, 2004; 2010).

My thesis, therefore, aims at conceptualizing interdisciplinary collaboration between professionals within a museum in order to investigate their multilayered nature.

Accordingly, the leading research question and sub-questions were formulated as follow:

RQ: How can museums generate multilayered educational media with interdisciplinary processes?

SQ1: How is an interdisciplinary process executed in museums?

SQ2: How are multilayered educational media created in museums?

Building upon the main research goal, this study contains both theoretical and societal relevance that are to be highlighted in the following paragraph.

Academic literature around museum studies is centered around visitor research (Black, 2016; Coffee, 2007; Hooper-Greenhill, 1994) and the educational mission of museums (Falk, 2006; Hooper-Greenhill, 2004; 2010; Wong, 2015). Moreover, in the past five decades, plenty of empirical research on the formation and benefits of interdisciplinary collaboration has been carried out (Billups, 1987; Bronstein, 2013; Ducanis & Golin, 1979; Klein & Falk-Krzesinski, 2017; Mason, 2015). Nevertheless, the research studies focus on health care professionals (Körner, Bütof, Müller, Zimmermann, Becker, & Bengel, 2016; Lewin, Espin, & Zwarenstein, 2010; Sicotte, D'Amour, & Moreault, 2002; Zwarenstein & Reeves, 2006). Accordingly, there is limited research about interdisciplinary collaboration and its added value within museums (Breward, 2011; Vartiainen & Enkenberg, 2013). More specifically, there is a limited understanding within the literature of the complex relationships between professionals of different disciplines within museums and their organizational constraints. Furthermore, co-creational collaborations within the museum discourse and their effect on multilayered educational media has not yet been clarified.

What is more, the majority of research about the educational value in museums was carried out in the United States, with a strong focus on science museums (Hooper-Greenhill, 2010). Thus, this research project aims at analyzing the matter in form of three comparative case studies centered around two art museums. An important part of the research consists of the data gathered through interviews of museum professionals.

Interdisciplinary collaboration outcomes in the context of cultural knowledge are, however, elusive and not easily measurable (Breward, 2011). Therefore, this research aims at reporting an in-depth perspective by strongly focusing on the conceptual framework outlined in the following section.

From a social perspective, this study is valuable for museums and their shareholders, since the study provides a better understanding for professionals on how to engage in collaborative processes (Hooper-Greenhill, 2004). Moreover, the study might possibly provide the actors with impulses for future strategies.

2. Theoretical Framework

The following paragraphs of literature review the nature of museums as non-profit organizations with a mission to generate public value and to operate as a cultural organization. Special attention is drawn to the museum as a host of diverse professionals, engaging in interdisciplinary collaborations. Therefore, it is highlighted how the practice of interdisciplinary collaboration might function within the museum institution. Impacting factors have been clustered and allocated to different stages of interdisciplinary work practices in museums. The last sub-section is dedicated to multi-layered educational media and how they can be generated through interdisciplinary collaboration.

2.1. Museums and their missions

Museums are as diverse and different as they are numerous. Hence, there is no universal definition given in the literature. The definition provided by ICOM, the international council of museums based in France, a revised formulation of 2007, words as follows:

> A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment (ICOM, 2007, art.3 para.1).

Museums distinguish themselves by their focus, some museums are research oriented, activity oriented or devoted to one single subject (Kotler et al., 2008). Similarly, the core purpose of museums is controversial within the literature. There is a discrepancy among scholars whether a museum should focus on a visitor-centered approach (Black, 2016; Falk & Dierking, 2000; Grøn, 2012; Lang, Reeve, & Woollard, 2006; Wong, 2015) or whether the collection is the main concern of museum work (Cuno, 1994; Breward, 2011). In practice the audience-centered approach is often advocated by educators and the collection-oriented view is held by curators (Grøn, 2012). Kotler et al. (2008) express the museums' common goal as both the mission to expand and conserve their collections, as well as exhibit and interpret pieces of the collection to public audiences. Prior research by Porter (2006) outlined a similar view. The author differentiated museums' goals into collection and curation, education, research and visitation (Porter, 2006).

The perspective of museum visitor studies has been drawn the attention on the audience and their diverse demands and needs. According to scholars from this field, the museum offers multiple learning opportunities at different levels (e.g. Falk & Dierking, 2000; Hooper-Greenhill, 2000; 2010; Grøn, 2012; Vartiainen & Enkenberg, 2013). Significantly, according to the generic learning outcomes, defined by the Arts Council England, learning in museums includes besides mere knowledge creation, skill achievement, enjoyment, inspiration, creativity, but also affects behavior and attitudes of visitors (Arts Council England, n.d.). This holistic approach of learning has been emphasized as well by Karen Grøn (2012). In light of this, she suggests a museum shall enhance these different dimensions of learning experiences by considering "more than just the objects on display" (p. 205). Hence, the museum takes over the role as a communicator and experiences generated to visitors become subject of a careful analysis (Hooper-Greenhill, 2000). Indeed, one important goal of museums' operations is the inclusion of a diverse and broad audience (Falk & Dierking, 2000). According to Falk & Dierking, 2000, this is especially challenging since individuals vary in their expectations, knowledge bases and preferences.

Traditionally, scholars have been individuating the museum as a cultural institution and a non-profit organization, receiving governmental support and funding (Hooper-Greenhill, 1994; 2006; Hudson, 1971; Kotler et al., 2008). In view of this, museums are more and more seen as generating an economic value as well (Bambagiotti-Alberti, Manetti, & Sibilio-Parri, 2016). According to the authors, a museum has to operate economically effective, since the use of public funds needs to generate benefits for the wider community (Bambagiotti-Alberti et al., 2016). Accordingly, cost-efficient management is asked, otherwise public money would be wasted (Bambagiotti-Alberti et al., 2016).

2.2. Museum professionals

In the museum world curating practices are often the result of collaborations between different disciplines. A large network of professionals, including directors, curators, designers, educators, technicians and conservators engage in an interdisciplinary practice to fulfill the museum's goals (Bloodworth & Petersen, 2011; Breward, 2011; Cameron, 2008; Donnelly, 2010; Hooper-Greenhill, 2010; Mason, 2015). Hence, depended on the projects, different specialists might be involved and in need to collaborate. In light of an exhibition, the curator and the museum educator are mentioned as key figures (Dean, 2015). The curator usually solves research about the subject matter, provides academic information and most importantly, selects appropriate collection items (Dean, 2015).

Whereas, the museum educator is responsible for interpreting and presenting the product in order to generate educational value (Wong, 2015). In detail, tasks of a museum educator might include conceptualizing school programs, materials for guides or the development of educational tours (Grøn, 2011; Wong, 2015). Often, museum educators play a general role in the exhibition development process (Dean, 2015). In the meantime, a project manager might be involved, who coordinates and oversees all parts of the activities and keeps the project's short-term goals in mind (Dean, 2015). If the project is concerned with the preservation of the painting the conservator takes over key functions. According to the American Institute for Conservation of Historic & Artistic Works: "The conservator possesses the expertise to preserve cultural heritage in a way that retains the integrity of the object, building or site, including its historical significance, context, and aesthetic or visual aspects" (American Institute for Conservation of Historic and Artistic Works, 2003, p. 4). Obviously, a museum does not engage only in these three disciplines but is a rather complex organization with numerous departments, serving the diverse missions of a museum. Editors are engaged in catalogue productions around an exhibition and marketers are needed to communicate the museum's message to the public (Hooper-Greenhill, 2006). Moreover, the front office staff as well as a functioning security management are ensuring the smooth interaction in the respective exhibition halls of the museum. In order to create museum products, such as exhibitions and their accompanying educational media, these professionals engage in collaboration practices. The following section defines interdisciplinary collaboration in more detail.

2.3. Defining interdisciplinary collaboration

In the 21st century a renewed interest in *interdisciplinarity* and *collaboration* has emerged and its impacts and obstacles around the two concepts have been researched persistently over decades (e.g. Billups, 1987; Bronstein, 2003; D'Amour et al., 2005; Ducanis & Golin, 1979; Kagan, 1992; Klein, 1990; Klein & Falk-Krzesinski, 2017; Mason, 2015).

The term interdisciplinarity implies a reciprocal relationship or an activity among different, independent disciplines, since the prefix *inter* translates into *among* or *reciprocally* (Alvargonzález, 2011). Similarly, Choi and Pak (2006) stated: "Interdisciplinarity analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole." (Choi & Pak 2006, p. 351). Similarly, Rhoten and Pfirman (2007) argued: "Interdisciplinary refers to the integration or synthesis of two or more disparate disciplines, bodies of knowledge, or modes of thinking to produce a meaning, explanation, or product that is more extensive and powerful than its constituent parts" (p. 58). Therefore, scholars implied, the outcome of interdisciplinary endeavors is of higher quality than teams of same disciplines would produce.

The second term within the concept, collaboration, was defined by scholars as a state, where involved actors share responsibilities, values, planning activities and decision making (D'Amour, Ferrada-Videla, San Martin Rodriguez, & Beaulieu, 2005; Schwartz, 2006; Zubizarreta, 2006). Indeed, D'Amour et al. (2005) described collaboration as an activity, where professionals agree on joint goals and strategies, share the leadership and resources and implement a sustainable collaborative environment. All definitions emphasize *sharing* as a significant feature of interdisciplinary collaborations, denoting interdependency among stakeholders and a collective authority are most important. Comparably, Schwartz (2006) built upon this definition and emphasized, individuals "learn with and from each other" while engaging in the collaboration (p. 282).

After having defined both terms individually, the concept of *interdisciplinary collaboration* is in need of further clarification. Two decades ago, Berg-Weger and Schneider (1998) explained interdisciplinary collaboration as a process, where professionals of different disciplines work towards a common goal or product (p. 98). Subsequently, the authors Berg-Weger, Rochman, Rosenthal, Sporleder and Birkenmaier (2007) described interdisciplinary team processes as shaped by bottom-up knowledge creation through a collaborative, non-hierarchical nature. This notion coincides with the abovementioned understanding of "collaboration".

However, these definitions lack the description of what distinguishes interdisciplinary collaborations from *intradisciplinary* teams. The main difference is that their members usually have competing perspectives and individuals tend to identify more strongly with their functions and department (Holand, Gaston, & Gomez, 2000). Scholars, advocating interdisciplinary processes, attributed socio-behavioral benefits to interdisciplinary collaboration. Studies reveal improved communication patterns among team members and stronger relationships between co-workers (Bell & Kozlowski, 2002; Bronstein, 2003; Sicotte et al., 2002; Sonnenburg, 2004). Prevalently in all definitions of interdisciplinary collaborations is the team composition with more than one discipline.

To the concept of interdisciplinary collaboration is been drawn considerable attention in the literature. Nevertheless, there is little concrete evaluation of actual practice of interdisciplinarity (Stehr & Weingart, 2000), especially in the context of museums, despite museums are workplaces of different professionals. Even though, interdisciplinarity carries positive connotations scattered around diverse fields, the reality of such team practices might not work as effective. Zwarenstein and Reeves (2006), in their attempt to explain poor interdisciplinary workflows, individuated several key drivers. The lack of precise tasks and role definitions, not enough time for team-building activities, professional socialization and, hence, a resulting "us-and-them" attitude, different vertical organizational structures for each professional and the absence of clear leadership. Therefore, the

authors contradict Berg-Weger et al. (2007), by expressing the need for a leader. According to the authors, this lack of leadership is more complex if considering that professionals are subordinated to different heads of department (Zwarenstein & Reeves, 2006). Further issues within teams of different disciplines reported in the literature are differences in values, language, work practices and approaches to problem solving (Lanham, McDaniel, Crabtree, Miller, Stange, Tallia, & Nutting, 2009; Nicholson, Artz, Armitage, & Fagan, 2000).

To summarize, interdisciplinary collaboration is a process, where different experts synthesize and strive towards a shared overall goal, producing an outcome that is not achievable by intradisciplinary endeavors.

The following section is devoted to stages and sub-stages of an interdisciplinary team within museums. Within these stages important performance drivers found in the literature are highlighted.

2.4. The interdisciplinary process

In order to build a conceptual framework, key foundations as well as two main stages have been defined as well as important foundations determining the process. Firstly, the design-stage is concerned with composing the team, creating product ideas and coordinating tasks and accountabilities. Subsequently, the process-stage is shaped by relational and behavioral dynamics as well as interdisciplinary learning. Lastly, since this research paper investigates on multilayered educational media as outcomes of interdisciplinary processes in museums, these products are further described within this model. Noteworthy, some teams might stay in one stage longer or directly shift to a further stage, especially if members are experienced in interdisciplinary collaboration (Bronstein, 2003). According to the literature, certain teams might also revert to prior stages if certain factors inside or outside the team change (Billups, 1987; Bronstein, 2003).

2.4.1. Key foundations

In order to engage in interdisciplinary collaboration two key dimensions seem necessary to build the foundation of the process. The first one is an interdependent relationship towards the expertise and products of other professionals within the team process. The second factor needed to build a successful collaboration with diverse professionals is a shared overall and clearly defined goal.

The interdependence between team members is a main driver of interdisciplinary collaboration predominant in the literature. The term denotes the dependent relationship of the involved professionals towards each other to achieve the given task (Bronstein, 2003). In order to

operate interdependently a clear comprehension of the respective roles is necessary (Bronstein, 2003). Bronstein (2003) clarified several characteristics of interdependent relationships. Firstly, it is important to spend time together in both informal and formal ways (Bronstein, 2003). Secondly, the communication shall be shaped by respect towards other colleagues' opinions and contributions Bronstein, 2003). Bronstein (2003) stated, team members need to belief, the accomplishment of the overall goals would only be achievable by the contribution of every team member. Prior research of Mattessich and Monsey (1992) stated that professionals perceive the collaborative practices with colleagues as a gain rather than a loss.

The second main basis of interdisciplinary collaboration is the presence and pursuit of shared overall goals. Studies on interdisciplinary collaborations and team processes have shown that a common goal is a condition for effective workflows (Bronstein, 2003; Hall, Stokols, Moser, Taylor, Thornquist, Nebeling, & Jeffery, 2008; Körner et al., 2016; Zwarenstein & Reeves, 2006). Members shall be equally active and determined to attain the goals of the project (Bronstein, 2003). Furthermore, by taking responsibility the respective professional agrees on contributing his or her task and needs to support the relationships between colleagues and involved stakeholders in order to achieve this goal (Bronstein, 2003). Interestingly, studies revealed, multidisciplinary teams adhere better to common objectives as intradisciplinary teams (Cioffi et al., 2010; Körner & Bengel, 2004). Lastly, goals need to be clearly defined, realistic and part of a collective vision (Bronstein, 2003).

2.4.2. Design stage

The first stage is concerned with the member assumption determined by financial and human resources (Sicotte et al., 2002). However, the process of member assumption can continue throughout other stages of the team process, when new problems arise and new fields of expertise become necessary (Norris, O'Rourke, Mayer, & Halvorsen, 2016). The creation of a team within one single discipline is not complex and the only constraint might be given by the upper limit on the given budget (Norris et al., 2016). By contrast, it is much more complex to decide on the number and mix of professionals from different disciplines to form a multidisciplinary team (Norris et al., 2016). Members might hinder the admission of new professionals due to the perceived radical different perspective on the issue compared to their own (Norris et al., 2016). In many cases, the project's budget determines how many professionals of different fields can be in the team (Norris et al., 2016). After the assumption of team members, it is considered important to determine who takes over which role in the team process. Research of Nicholson et al. (2000) and Berg-Weger et al. (2007) stressed, roles need to be supplemented with clear guidelines in order to align diverse expectations. Otherwise, within a team of different professionals with diverse work practices as well as differing knowledge

foundations, conflicting expectations about responsibilities and roles might arise and cause first tensions (Nicholson et al., 2000; Norris et al., 2016). Berg-Weger et al. (2007) claimed, roles as well as responsibilities are in need of clarification within an early stage of an interdisciplinary collaboration. Drawing on Norris et al. (2016), individuals not only need to comprehend their own role but also the perspective, knowledge, expertise and roles of their colleagues. Hence, an increased sensitivity and understanding of what each member contributes to the problem increases trust among the different professionals (Norris et al., 2016). Moreover, it diminishes the risk, that members might feel either inferior or superior towards others (Billups, 1987; Norris et al., 2016). This process forms the ground for further decision-making and negotiation of the action plan (Berg-Weger et al., 2007).

A further significant element of this stage is the idea creation of the product, but outlined in more detail, when conceptualizing multilayered educational media.

The stage is, moreover, characterized by coordinative efforts preparing the project for the actual process of production. Within this sub-stage, overall managerial tasks comprise resource allocation, stipulation of deadlines, financial decisions and the assignment of tasks and responsibilities (Dean, 2015). In fact, the clear definition of tasks and responsibilities has been considered crucial for a successful interdisciplinary collaboration within the literature (Bedwell, Wildman, Diaz-Granados, Salazar, Kramer, & Salas, 2012). Bedwell et al. (2012) confirmed the research by Bell and Kozlowski (2002) and claimed, the nature of given tasks determines the performance of collaborative entities as much as the setting the members operate in. Connected with the definition of tasks is the assignment of roles within the interdisciplinary group. According to Billups (1987), the assignment of the role is influenced by the team members' team spirit, their prior education and their professional training. Moreover, a person's maturity and experience might determine a member's role as well (Billups, 1987). A person needs to be secure in their profession, independent and know what their competences and capabilities are (Bronstein, 2003). Consequently, members should know which capabilities they can expect from their colleagues (Bronstein, 2003). In light of this, tasks are further ideally stipulated in a comprehensive action plan. The presence of bureaucratic procedures of the team's host setting has been perceived to have a positive impact on interdisciplinary collaborations by scholars (Billups, 1987; Hall et al., 2008; Sicotte et al., 2002). The empirical research of Sicotte et al. (2002) outlined a positive correlation of administrative formalization and effective interdisciplinary work practices. The intensity of well-defined frameworks, written rules, specified action plans and a well-grounded assessment of the performance by either the team leader or an outside mediator showed an improved interdisciplinary team performance among participants (Sicotte et al., 2002). The organization WHO (2010) agreed and illustrated the significance of structured protocols, shared and transparent operating resources and

governance models. Nevertheless, interdisciplinary team members might not easily accept rules that constrain their autonomy (Sicotte et al., 2002). Henceforth, formalization frameworks need to be implemented carefully (Sicotte et al., 2002).

Important to mention is further the time a team has available for not only professional but also personal communication. Among scholars the importance of conflict resolutions and communicative efforts within the knowledge sharing processes has been widely accepted (Billups, 1987; Bronstein, 2003; Nicholson et al., 2000). According to Bronstein (2003), members of an interdisciplinary team need to make time available for team maintenance purposes additionally to the mere persecution of the team goals. Bronstein (2003), hence, suggested, the inability to meet multiple and incompatible expectations should be avoided in order to minimize member's frustration.

Lastly, regular team meetings have been found to facilitate decision-making, team support, knowledge exchange and idea creation (Batorowicz & Shepherd, 2011)

2.4.3. Process stage

This stage occurs as soon as the team was composed, the idea approved, and first coordinative efforts solved (Dean, 2015). Within this stage relational factors arise between the different team members and team learning processes take place (Bronstein, 2003). The stage ends with the project removal from the exhibition space and the connected evaluation process. Hence, the museum's space is cleared and ready for the next project.

Within this stage members become familiar with each other and, therefore, *relational-behavioral factors* which influence relationships between different professionals become apparent. Obviously, personality traits are further crucial for every collaborative attempt and influence relational dynamics (Bronstein, 2003; Hall et al., 2008; Sicotte et al., 2002).

One personal characteristic, the degree of disposition to engage in group work, accounts as highly influential to the performance of interdisciplinary collaboration. Disposition is the individual eagerness to engage in the collaborative endeavor. It can be interpreted as the intrinsic motivation to engage in the group work and fulfil the clarified goals.

The intrinsic motivation or the engagement with the broader interdisciplinary topic has been considered crucial, especially in the process of member assumption (Norris et al., 2016). Accordingly, with regard to who gets chosen as a new member, the engagement with the topic of interdisciplinarity counts as an important prerequisite (Norris et al., 2016).

A further aspect of disposition is the team members ability to acknowledge strengths and weaknesses of their own disciplines to their collaborating colleagues and the preparedness of individuating a common ground (Marzano, Carss, & Bell, 2006). Additionally, Marzano et al. (2006) claim, the openness to learn and engage in a clear dialogue and show sensitivity towards other disciplines are crucial for well-functioning interdisciplinary collaboration.

Noteworthy, Olson and Olson (2000) stated, the "collaboration readiness" of interdisciplinary team members determines the work process. The authors stressed the necessity of introducing measures and incentive structures to facilitate the desired behavior, if a culture of collaboration is lacking. (Olson & Olson, 2000). They argued that, despite, the advance of new communication technologies, distance between individuals is still present and influences human interaction, nonetheless (Olson & Olson, 2000).

A further important relational dynamic is flexibility. According to Bornstein (2003), flexibility is a behavior that seeks for productive compromises in situations of disagreements or conflicts. Moreover, a flexible behavior might be needed if roles alter or responsibilities shift in the process (Bronstein, 2003). Bronstein (2003) is in accordance with Mattessich and Monsey (1992), both claiming that interdisciplinary collaborations exposed to changing circumstances are in need of adaptability.

Moreover, trust and respect are further important elements of relational dynamics within interprofessional teams. Often, team members develop trust and respect through shared experiences, where co-workers show their skills, know-how and professional competence (Lewin et al., 2010). Consequently, new members often are in need to demonstrate abilities to be trusted by their colleagues (Lewin et al., 2010). Similarly, the empirical study of Lanham et al. (2009) outlined, respectful interactions were found crucial within interdisciplinary collaborations.

Several factors stimulating interdisciplinary collaborations were clustered as interdisciplinary learning factors. Firstly, the prior interdisciplinary work experience shapes interdisciplinary collaborations. Therefore, in this paper it is clustered as *team learning* and mostly impacting the advanced process stage. Bronstein (2003) builds upon Billups' research (1987) and clarified that prior experience of specialization in one field hinders successful interdisciplinary collaboration. Contrastingly, positive former experiences in interdisciplinary collaboration are to be linked with current successful collaborations (Billups, 1987; Bronstein 2003). In light of this, within a group of professionals from different disciplines, certain impairments might arise. A high professional autonomy might result in professional ethnocentrism (Bronstein, 2003). Consequently, professionals not used to work in interdisciplinary teams and highly secure of their capacities and skills might tend to value their own opinion and profession over others (Bronstein, 2003). False assumptions towards

other disciplines might arise (Bronstein, 2003). As a consequence, team members rather respond to professional stereotypes instead of being curious what others do and how (Bronstein, 2013). These dynamics might develop into tensions and conflicts among the interdisciplinary team (Bronstein, 2003). Billups (1987), therefore, suggested that especially in an early formation stage a *democracy of talents* needs to be established with the help of a sensitive management.

Notably, Van Rijnsoever and Hessels (2011) found that work experience and interdisciplinary research collaboration can be defined by an inverted U-shaped relationship. Given that, after a certain amount of time the professional incorporates the additional knowledge provided by the interdisciplinary team and, thus, the necessity to collaborate might decrease (Van Rijnsoever, & Hessels, 2011).

The second factor within this cluster is the respective discipline of the professionals engaging in collaboration. Indeed, depending on the complexity of the respected task, the number of disciplines within a team will be stipulated. Accordingly, the more disciplines the issue crosses, the higher is the number of different disciplines within the team. Marzano et al. (2006) highlighted in their research a perceived disciplinary asymmetry in communication and knowledge production. The authors found that natural scientists were not as used to discuss methodological approaches on how knowledge was produced compared to social scientists (Marzano et al., 2006). Therefore, efforts are needed to build strong relationships between co-researchers to facilitate discursive collaboration (Marzano et al., 2006). Similarly, Van Rijnsoever and Hessels (2011) have indicated that certain disciplines are more likely to engage in interdisciplinary collaboration than others. The authors distinguish 'basic' and 'strategic' types of disciplines (Van Rijnsoever & Hessels, 2011). Basic disciplines, such as mathematics or physics, are characterized by an autonomous generation of subject matter (Van Rijnsoever & Hessels, 2011). Conversely, strategic disciplines, as medicine or informatic, are in need of other fields of expertise to solve human problems and are shown to engage more in interdisciplinary attempts (Van Rijnsoever & Hessels, 2011). Klein and Parncutt (2010) described art research similarly to Van Rijnsoever & Hessels (2011) *strategic disciplines*. According to the authors, art research includes a wider array of disciplines in itself (Klein & Parncutt, 2010). In fact, art research draws on social science theories but also on concepts form science and technology (Klein & Parncutt, 2010). Theories of aesthetic forms, cognitions of perception and creativity, but also the reception of art works within different cultures find their way into art research (Klein & Parncutt, 2010).

Peters (2002) suggested, differences between collaborators must be individuated and mechanisms developed in order to transform those differences into positive change. This learning process forms the third factor within the sub-process of interdisciplinary learning.

Even though the visual part of the project might be removed from the eye of the museum visitors a last activity prevails. Within this stage participants of the interdisciplinary collaboration assess the project in terms of added value created for the public (Dean, 2015). The museum therefore investigates if the project goals and objectives have been met (Dean, 2015). In addition, outcomes are being analyzed and occurred issues examined (Pinto & Prescott, 1988). This phase at best occurs shortly after the project's termination phase so that members are still involved in the former processes (Dean, 2015). As a result, new ideas, approaches and innovations can be extracted for a new project (Dean, 2015).

On the other hand, evaluation might happen constantly throughout the process in order to facilitate immediate corrective intervention by group members (Bronstein, 2003). Moreover, formalized evaluations contribute to measure if the team action is a functioning interdependent entity (Sicotte et al., 2002). Especially, if professionals are only temporary allocated to work together, it is more likely to become detached from the overall team environment (Bell & Kozlowski, 2002). Therefore, constantly monitoring the environment and informing other team members of any important changes is crucial for the general performance (Bell & Kozlowski, 2002). Berg-Weger et al. (2007) stated, the process of evaluation provides clarity over the team process and the goals, which are crucial elements of successful interdisciplinary collaboration as stated above (Berg-Weger et al., 2007). In addition, by constantly evaluating team progress, transparency over different roles is facilitated (Berg-Weger et al., 2007). Consequently, supervision might contribute to an increased feeling of trust and team cohesion and a more effective communication pattern (Berg-Weger et al., 2007).

2.4.4. The Outcome: multi-layered educational products

The fourth stage of interdisciplinary collaborations represents the multilayered educational media produced by the process. As prior section focused merely on team processes among diverse professionals, the attention is further drawn on how the literature outlines the creation of these multilayered educational products.

2.4.4.1. Idea generation

Firstly, the identification of ideas has been described by Dean (2015) as a process usually involving numerous stakeholders such as staff, management, the wider community, but also deriving from visitor research or current events (Dean, 2015). Due to the myriad possibilities a museum's project might unfold, professionals should be open for suggestions from multiple sources (Dean,

2015). Dean (2015) stresses, the motivation to choose certain ideas shall ideally be determined by the museum's mission to serve and educate the public. Subsequently, decisions are made on which concept or project to pursue (Dean, 2015). Thereby, the museum's goals need to be clear and the museum's audience and their expectations have to be considered (Dean, 2015; Wong, 2015).

2.4.4.2. Production

Overall, the theorist Christopher Breward (2011) pointed out the most effective way of reprocessing museum artefacts or exhibitions is by engaging in an interdisciplinary collaboration. According to Breward (2011), only a wider range of expertise from different fields is able to fully interpret a heritage object. He further stated, that due to the complex visual, material, cultural and social identities of exhibited objects an interdisciplinary approach to encode these objects and display different narratives is more beneficial then staying within traditional disciplinary boundaries (Breward, 2011). Breward (2011) used the example of the exhibition *At Home in Renaissance Italy* at the Victoria and Albert Museum to reinforce his argument. Within the exhibition scholars from fields of sociology, archeology, history of science, art history, conservation, but also Islamic studies or food history worked together to create an accurate image of the complex Renaissance past in Italy (Breward, 2011; Victoria & Albert Museum, 2006). The museum gathered different authentic documents and primary sources from the period, including cooking books, furniture pieces and popular prints to compose a multilayered insight into Renaissance art and culture (Breward, 2011). The interdisciplinary approach facilitated different, often ambiguous interpretations of the same objects and hence, involved the viewer in the meaning-making process (Breward, 2011). The, therefore, created dialogue between the curator and a diverse audience can contribute to a new and innovative social and cultural exchange and overcome dissatisfaction with traditional passive visualization models (Breward, 2011).

However, museum professionals face the challenge on how to encode multilayered meanings inherent in artefacts to speak to a broad and diverse audience (Cameron, 2008). Indeed, due to the integration of multiple scientific, political, social and cultural information layers an object carries, the challenge for museums is to facilitate clear museum codes to their visitors (Cameron, 2008). One form of conveying multilayered information is through educational products oriented around respective artefacts (Wong, 2015). These products can take over the form of guided tours, workshops, or, most prevalently, labels (Wong, 2015). Maroevic (1995) specified this multilayered nature of artefacts further. The information of an object entails information about the artefact as well as the interpretation of it inherent in human knowledge (Maroevic, 1995). In the museum context both scientific and cultural information of the objects are conveyed through the exhibition (Maroevic,

1995). Scientific information is mediated by the main disciplines of the museum, such as art history, archeology, conservation science and ethnology (Maroevic, 1995). Whereas, museology delivers the relevant cultural information determined by social and physical environments (Maroevic, 1995). Chong (2015) argued, in translating this meaning professionals need to focus on the specific audience to be addressed. Illustratively, a tour guide for students might be designed differently than a wall label for an exhibition. Moreover, Chong (2015) emphasized to constantly adapt the product to feedback of target groups.

Interestingly, Wong (2015) stressed, museums need to avoid two extremes while producing educational content. On one hand, minimal information about artefacts would leave visitors too much room for interpretation and, thus, hinder further engagement (Wong, 2015). On the other hand, too extensive explanations, an overly technical or artistic terminology were found to overwhelm the average visitor (Wong, 2015).

2.4.4.3. Objectives

The objectives and goals of educational products according to the literature are oriented around the above-mentioned museum's missions.

Firstly, the products aim at generating multilayered educational value. Falk & Dierking (2000) referred to education as "a category of reasons related to the informational, or cultural content of the museum" (p. 72). Accordingly, Hooper-Greenhill (2010), stated, the concept of learning within a museum is understood as a complex set of processes requiring the use of both cognitive and emotional knowledge and personal experiences.

A second goal of educational media is considered the inclusion of a broad audience. This can be seen as part of the museum's social mission towards the public (Porter, 2006), but also as a way of generating profits (Kotler et al., 2008).

A further objective of educational experiences is to generate entertainment, and to target leisure-related visitations of a museum (Falk & Dierking, 2000).

To summarize, in order to grasp the multilayered nature of artefacts, a collaboration between different disciplines and museum professionals is suggested in order to generate a holistic multilayered educational experience (Breward, 2011; Cameron, 2008). The museum, moreover, is able to follow its purpose to generate pubic value in form of knowledge and education for its audience through an interdisciplinary approach.

2.5. Conceptual Framework

In the theoretical framework, the process of interdisciplinary collaboration in museums has been elaborated. Moreover, the creation of multilayered educational media as a result of these processes has been described. Therefore, they represent the two main themes which will determine this research study. The following conceptual framework is based on an input-process-output model, often applied to conceptualize team-processes (Mohammed, & Hamilton, 2007). Hence, the author of this research study has developed the conceptual framework shown below (Table 1).

Table 1

Conceptual framework

	THE INTERDISCIPLINARY PROCESS		
Key Foundations	**Design stage**	**Process stage**	**Outcome: multi-layered educational media (MEM)**
Interdependence Shared goals	Idea creation (MEM) Team composition Coordination efforts − Clear responsibilities Clear tasks − Clear capabilities − Formalization degree	Relational-behavioral factors − Flexibility − Respect − Compromise − Communication skills Team learning − Prior experience − Field of expertise, discipline − Evaluation	Idea creation Production Objectives − Education − Inclusion − Entertainment

3. Methodology

3.1. Research design

This master thesis applies a qualitative research method due to several characteristics suitable to answer the posed research questions and explained further in detail. The main purpose of qualitative research is to explore human factors of a specific topic and address and answer posed *why or how* questions (Flick, 2009). Qualitative research methods are neither appropriate to test a hypothesis nor to generate representative results for an entire population (Dworkin, 2012). For this very reason the theorist Uwe Flick (2009) stressed the relevance of qualitative research in describing social action. Given that human narratives are becoming more and more pluralistic they are in need of an interpretation within their contextual and their local sphere rather than through universal theories (Flick, 2009). In this regard qualitative research methods are most suitable to capture the diversification of the rapidly changing social contexts (Flick, 2009). Accordingly, the research goal within this study is restricted to a very specific social phenomenon and does not aim at conducting generalizable results for entire populations.

A further aspect of qualitative research is the ability to understand an individual's perspective and point of view in its contextual richness (Dworkin, 2012; Yin, 2016). Indeed, this research paper focuses on perspectives of museum professionals and their perceptions on interdisciplinary collaboration processes. Similarly, qualitative research allows to understand and explain social behavior as in this research paper the strategic decisions of museum professionals (Tucker, 2015; Yin, 2016). Specifically, the qualitative approach enables the researcher to inquire why and how museum professionals engage in collaborative practices with other disciplines and which drivers are perceived as ideal to achieve stipulated goals.

In addition, in qualitative research findings and variables are fluid and can be adopted within the research process and, thereby, multiple sources can be taken into account (Yin, 2016). Accordingly, this variety of sources offers the possibility to '*create converging lines of inquiry'* between the collected data (Yin, 2016, p. 11). In view of this, the method enables the researcher to re-evaluate the theoretical themes after collecting the data and, thus, increase accuracy.

The specific qualitative research approach utilized in this thesis is the method of case studies. In general, case studies are suitable to focus on a constricted number of perceptions and ideas of social processes (Blatter, 2008). These ideas can be traced down in detail through semi-structured, in-depth interviews. According to Robert K. Yin (1981), case study research can include research forms such as interviews, experiments or observations of qualitative or quantitative nature. The prepared topic

guide of the interviews is based on the elaborated theoretical framework in order to establish a valid and transparent data collection and, thus, investigate the phenomena in question thoroughly.

Further, documents linked to the projects are examined to produce a thick description of the issue in question. Essentially, the case study approach has the capability to produce a precise historical account of the researched subject matter and its encompassing contextual elements. The collected data was analyzed meaningfully through the method of thematic analysis.

3.2. Comparative case study with expert interviews

The case study defined by Yin (1981; 2009) focuses on single entities, as institutions or organizations. In a case study research context and phenomenon are distinguished and analyzed (Yin, 2009). The phenomenon describes the element of evaluation while the context denotes its surrounding (Yin, 2009). Therefore, cases have to be understood as "configurational context-dependent entities" (Blatter, 2008, p.68). One stated strength of case studies is, hence, the offered possibility to examine both a contemporary issue and its context (Yin, 1981). In addition, the case study is able to investigate on decision reasoning (Yin, 2009). A further application of the case study method is its ability to illustrate issues within a precise evaluation and in a descriptive mode (Blatter, 2008). In light of this, a case study focuses on descriptive-interpretative elements rather than emphasizing on causal questions (Blatter, 2008). Consequently, a detailed account of the museum work processes and its outcomes can be achieved. Noteworthy, through analyzing the cases, specific processes between the collaborative practices and the desired outcome could been indicated (Blatter, 2008).

The thereby applied comparative case study approach contrasts to the single case study approach, since it investigates on multiple situations within one framework (Agranoff & Radin, 1991). The three cases are based on the same research questions and build upon the same combination of research methods (Agranoff & Radin, 1991). The analysis, however, is founded on a comparison in order to individuate unique or common relationships and patterns (Agranoff & Radin, 1991).

The case study method was adopted for this research paper since the research question aims at analyzing a current social phenomenon in depth (Yin, 2009). Moreover, Yin (2009) states the application of a case study is accurate if a "how or why question is being asked about a contemporary set of events, over which the investigator has little or no control" (p. 10). A widespread concern of case study research and qualitative research in general is the possible biased views of the researcher influencing findings (Yin, 2009). In order to avoid subjective assumptions by the researcher, this methodology section thoroughly describes the researcher's data collection, the literature-based operationalization and the data analysis.

As already mentioned above, the case study consists of conducted expert interviews chosen because of suitable and feasible characteristics for the research. Due to the fact that both cases are ongoing projects in an exploratory phase, questioning the involved professionals was the most efficient way of gathering data in a concentrated manner (Bogner, Littig, & Menz, 2009; 2018). Noteworthy, within this research the interviewees, all involved in the respective projects and employed professionals of the museums, are considered carrier of insider knowledge in their field. Therefore, by involving them in the interview, the researcher gained the opportunity to gather deep insights of the organization and the questioned subject matter (Bogner et al., 2009). Furthermore, the experts acted as surrogates of their disciplines and by holding a key position the researched field was accessed in detail (Bogner et al., 2009). However, it is important to objectively constitute what defines an expert in order to avoid a total belief in expert knowledge (Bogner et al., 2009). As mentioned before, experts can be defined as individuals with knowledge about a specific set of problems (Bogner et al., 2018). Moreover, the expert is characterized by an authority of decision-making (Bogner et al., 2018). As a result, the experts' knowledge and, hence, their interpretations are valid to explain and structure certain kinds of social action meaningfully (Bogner et al., 2018). The expert interviews are semi-structured, which allows the interviewer to ask follow-up questions formulated accordingly to previous statements (Roulston & Choi, 2018). Compared to structured interviews the topic guide is less strictly formatted and topics form only the basis of the questioning (Roulston & Choi, 2018).

Lastly, the stated research questions in this paper require a deep understanding of a museum professional's opinion and of assumptions made in order to engage in the work process (Tucker, 2015). By interviewing professionals involved in the design and creation of the two cases the researcher can make sense of the process of co-creation and collaboration between professionals and how these processes fit in the overall goals of the museum (Tucker, 2015). One aim of the interviews was to create a synergy of perspectives and opinions and discover insights that otherwise might not be stated (Tucker, 2015).

3.2.1. Case selection

The three cases have been carefully selected. Following Patton's (2002) suggestions of purposive sampling, the selected cases count as critical cases. The goal of the researcher was to select cases, where the examined relations are clear and in a representative manner. Furthermore, Patton's (2002) selection criterion of convenience has to be mentioned. Cases had to be chosen regarding the given time limitations and restricted access.

The aim is to predict similar results and achieve a *literal replication* (Yin, 2009). In order to reach a literal replication a few cases, as two, are sufficient to generate valid findings (Yin, 2009). In addition, through the direct replication-design, the presence of a phenomenon is being shown to occur in the examined cases (Yin, 1981). Subsequently, a general explanation throughout the cases will be developed (Yin, 1981).

The cases in question have been chosen according the following selection criteria:

Case has to be placed in a museum.

Case has to entail an interdisciplinary collaboration project with more than two different disciplines involved.

Case 1: The Night Watch project

From July 2019 on the visitors of the Rijksmuseum can view the restoration of *The Night Watch* (1642), Rembrandt's famous group portrait, in the so-called Night Watch Gallery of the Rijksmuseum. In fact, the painting can be visited 365 days a year. In order to secure the preservation of the art work a glass chamber is installed in the mid of the gallery. With the help of computer science, registering different photographic and chemical imaging maps, experts gain a deeper understanding of the material layers of the painting. The generated data is elaborated by an interdisciplinary research team, consisting of art historians, curators, conservators and scientists (Rijksmuseum, 2018).

Case 2: Sargent Digital Label Project

The Art Institute of Chicago (AIC) conducted an evaluation, including 40 intercepts and 7 sessions of focus groups, of the digital label *Making Headlines* placed in the Art Institute's 2018 summer exhibition, *John Singer Sargent and Chicago's Gilded Age* (Molina, 2018).

In collaboration with curatorial, conservation and science, digital experience, and interpretation, 2 conservation-focused digital labels were produced and named *Building a Watercolor* and *Making Headlines*. Building a Watercolor focuses on Sargent's materials and his process for creating watercolors. Making Headlines tells the story of Sargent painting outdoors, and the unexpected newspaper fragments that became stuck to Sargent's *Tarragona Terrace and Garden*

(1908) as a possible consequence of interleaving wet watercolor with newspaper. The subject of this case study has been the above-mentioned interdisciplinary process to create the two digital labels.

Case 3: *Workshop Sporenonderzoek naar Rembrandt!*

This case study evolves around the interdisciplinary project team, which created the workshop *Sporenonderzoek naar Rembrandt!* at the Rijksmuseum in 2018. The workshop invites children between the age of six and twelve to analyze and compare a real painting of the museum's collection to a smaller copied version of the painting. Children, therefore, receive a first insight into chores and tasks of conservators.

In order to examine the cases eleven experts were interviewed using a semi-structured interview guide. Moreover, desk research was solved in order to achieve a triangulation of evidence (Yin, 2009).

The sample include experts from the AIC in Chicago and the Rijksmuseum in Amsterdam, since this research has been solved in cooperation with both of the institutions. Therefore, the museums provided assistance in finding suitable interviewees. The respective professionals have been selected according to several criteria: The interviewees were chosen due to their known expertise and their readiness to communicate their experiences, in this case the co-creation of multilayered educational media. In addition, their involvement in the respective cases was a condition. A further requirement for the selection of the experts was to gather participants of diverse disciplines, since the focus lies on interdisciplinary collaboration processes. Hence, the experts had been chosen so that most derived from different fields, ensuring that at least two interviewees were from other disciplines. Moreover, in order to gain valuable information, the expert needs to carry knowledge about the research topic and be willing to disclose it within the interview (Bogner et al., 2009). Lastly, the selection was depending on the availability of the interviewees and the referrals of the researcher's point of contact within the AIC and the Rijksmuseum. Table 2 presents an overview of the experts questioned, their position within the two museums as well as the cases they were involved.

Table 2

List of experts

Name, organization	Description	Case
Wouter van der Horst (Rijksmuseum) In-person interview	Currently *Coordinator Digital Learning*. Responsible for the digitalization of the Night Watch research project.	Case 1
Katrien Keune (Rijksmuseum) In-person interview	Currently *Head of Science*. Oversees the scientific research concerning the Night Watch research project.	Case 1
Inge Willemsen (Rijksmuseum) In-person interview	Currently *Senior Educator*. Oversees educational texts and labels concerning the Night Watch research project.	Case 1
Valentijn Rambonnet (Rijksmuseum) In-person interview	Currently *Staff member Education Department, Schools*. Concerned with generating educational products within the target group *Secondary schools*.	Case 1
Barbara Tedder (Rijksmuseum) In-person interview	Currently *Account manager Foundations*. She acts as project manager of the Night Watch restoration. Specifically, she coordinated the Glass Chamber construction and the generation of educational projects around the restoration project.	Case 1
Sarah Molina (AIC) Video-call interview	Currently *National Science Foundation fellow*.	Case 2

	In the digital labels project, she was responsible from an interpretation side on editing text and concept for the actual digital label.	
A. Robin Hoffman (AIC) Email interview	Currently *Assistant Editor, Department of Publishing.* Responsible for editing the digital labels as part of his larger responsibility for editing all of the exhibition materials, and as a continuation of production editing the catalogue that accompanied the exhibition.	Case 2
Mary Broadway (AIC) Email interview	Currently *Associate Conservator of Prints and Drawings.* Author of content describing materials, techniques, and conservation within the digital labels project.	Case 2
Thijs Gerbrandy, (Rijksmuseum) In-person interview	Currently *Staff member Education Department, Schools.* Concerned with generating educational products within the target group *primary schools*.	Case 3
Lisanne van den Heuvel (Rijksmuseum) Phone-call interview	Currently *Independent Art Technical Historian and Art Teacher*. As a freelancer at the Rijksmuseum, she collaborated to generate the workshop.	Case 3
Annemiek Spronk (Rijksmuseum)	Currently *Education Department, Head of Schools.*	Case 3

In-person interview	She acted as a team coordinator within the workshop.

4.2.2. Data collection

The interviews had an average length of 45 minutes and were audio-recorded, the interviews were subsequently transcribed. As mentioned above, a special form of semi-structured interviews, expert interviews, were conducted. The conduction took place over a period of four weeks.

Given that the interviews were semi-structured, the questions were predetermined but open-ended avoiding a fixed range of responses to each question statements (Ayres, 2008).

Therefore, the semi-structured nature of the interviews offered the researcher more freedom to engage in unplanned probes and sub-questions dependent on the interviewee's answers (Flick, 2009; Gilbert, 2008; Hermanowicz, 2002). The researcher developed a written topic list in advance and during the interview, the questions were not asked in neat order but according to the participants' statements (Ayres, 2008). In order to facilitate the flow of the conversation more general questions were asked in the beginning and complex questions, crucial for the research in the middle of the interview (Hermanowicz, 2002). The content of the topic list was determined by the theoretical and conceptual framework and is stated in the operationalization-section of this paper.

The interviews with experts of the Rijksmuseum were held face-to-face and tape recorded in order to guarantee spontaneous and genuine answers (Hermanowicz, 2002; Opdenakker, 2006). Since one of the investigated cases is of international nature it was not possible to meet these participants in person. The required interviews were, hence, conducted by video call and email according to the wish of the participants. All interviews have been conducted in English and transcribed verbatim.

Moreover, further evidence around the three case studies has been selected, in order to allow a triangulation of evidence (Yin, 2009). The collected data will be listed in detail in the following operationalization section.

3.3. Operationalization

As mentioned before, the cases and the expert interviews were analyzed based on the elements of the conceptual framework. These elements have been deducted from the theoretical framework. This structure enables to examine the cases and subsequently, compare them. Therefore, this section will address how the main themes are operationalized.

Table 3

Operationalization, Interviews

Themes	Interview questions
Interdisciplinary collaboration	Measured by asking the following questions: "Do you think interdisciplinary collaboration is important in museums? If so, why?" "What are your concerns when engaging in a new interdisciplinary team project?"
Key foundations	Measured by asking the following questions: "How dependent are you from your co-workers?" "Is interdependency fundamental in interdisciplinary collaborations? If so, why?" "Are clear, shared goals fundamental in interdisciplinary collaborations? If so, why?"
Design stage	Measured by asking the following questions: "What is important when composing a new team and why?" • Member's engagement with topic • Size • Inclusion from the start "What is important in terms of coordination efforts and why?"

	• Clear tasks
	• Clear responsibilities
	• Clear capabilities of colleagues
	• Time with colleagues outside work
	• Written guidelines and action plan

Process stage	Measured by asking the following questions:
	"What are important behavioral-relational dynamics in interdisciplinary collaborations?"
	• Compromise
	• Communication skills (listening)
	• Respect (democracy of talents)
	• Flexibility
	• Trust
	"How do you evaluate the project?"
	• Time: During process or/and afterwards
	• Immediate corrective interventions
	"Does your prior education influence interdisciplinary collaborations today? If so, why?"
	"Do your prior experiences with interdisciplinary collaborations facilitate interdisciplinary collaborations today? If so, why?

Multilayered educational media

	"How was the idea for this project generated?"
	• In collaboration with whole team
	• Other sources outside team

- Brainstorming
- With educational purpose in mind

"What is important considering the production of multilayered educational products?"

"What is important considering the content of multilayered educational products?"

- Complexity of information
- Amount of information
- Relevant layers

"What is important considering the mean of multilayered educational products?"

"What are/were goals and wished outcomes for the project?"

- Inclusion of wide audience
- Entertainment
- Education
- Profit/Sponsorship

Table 4

Operationalization, desk research

Themes	Desk research	Case
Interdisciplinary collaboration	Press release of the Rijksmuseum and newspaper articles stating main involved stakeholders	Case 1
	Evaluation report stating main involved stakeholders	Case 2
	Folders and website of workshop stating main involved stakeholders	Case 3

Key foundations	Press release of the Rijksmuseum and newspaper articles stating main involved stakeholders and common goals	Case 1
	Evaluation report stating main involved stakeholders and common goals	Case 2
	Folders and website of workshop stating main involved stakeholders. Core goals are stated in the folder.	Case 3
Design stage	No previous research	Case 1
	Evaluation report; evaluation plan	Case 2
	No previous research	Case 3
Process stage	No previous research	Case 1
	Evaluation report; evaluation plan	Case 2
	No previous research	Case 3
Outcome: multilayered educational media	Project's website, press releases, newspaper articles	Case 1
	Evaluation report; evaluation plan	Case 2
	Print marketing material and workshop's website	Case 3

3.4. Data analysis

The method applied for analyzing the gathered data is that of thematic analysis. The main aspect of thematic analysis is the identification and description of "both implicit and explicit ideas within the data, that is, themes" (Guest, MacQueen & Namey, 2012, p. 9). Accordingly, it is a method to record and analyze patterns (Braun & Clarke, 2006). Subsequently, codes are developed and assigned to raw data according to the previously defined themes (Guest et al., 2012). Themes aim at capturing data directly related to the research question (Braun & Clarke, 2006). Braun and Clark (2006) further denote, the frequency a theme appears in the analyzed data set does not constitute it as a theme. In the light of qualitative research, it is the researcher's judgement determining themes (Braun & Clarke, 2006). Therefore, the fundamental prerequisite of a theme is not of quantifiable character but that "it captures something important in relation to the overall research question" (Braun & Clarke, 2006, p. 82).

An important distinction is to be made between inductive and theoretical thematic analysis. Former is similar to grounded theory, where the codes are data driven and not based on a pre-existing coding frame (Braun & Clarke, 2006). On the contrast, theoretical thematic analysis is driven by the researcher's theoretical focus and provides an analysis of some data aspects (Braun & Clarke, 2006). As already stated, within this Master thesis themes are based on the elaborated theoretical and conceptual framework and therefore, a theoretical thematic analysis is applied. Tuckett (2005) holds the opinion, an early involvement with literature makes a researcher more aware of details within the data set.

The research method offers several benefits to the researcher. Firstly, it is flexible and not tied to any pre-existing theoretical framework but can be used within different theoretical discourses (Braun & Clarke, 2006). Braun and Clarke (2006) highlight, thematic analysis can be of an essentialist nature and ask for meanings and experiences but also act as a contextual method including aspects of the broader social context (p. 81).

Secondly, the amount of data can be rendered comprehensible and meaningful as well as reduced significantly (Boeije, 2010).

The interpretation of data through thematic analysis is a laborious process in need of further clarification. The first step was to seek for and individuate patterns of meanings in the data (Braun & Clarke, 2006). This process started already within the data collection of this paper. The analysis was of iterative nature and the entire data set as well as the subsequently coded extracts were repeatedly read (Braun & Clarke, 2006). As a subsequent step, the data was fragmented and organized into first meaningful codes (Tuckett, 2005). This phase, also denoted as *labeling phase* by Boeije (2010), gives a first overview of the themes presented within the data. These codes, however, do not constitute the final themes, which are broader in meaning (Braun & Clarke, 2006). The process of coding was determined by the theory-driven approach within this paper and, therefore, aiming at identifying certain concepts within the data set (Braun & Clarke, 2006). Indeed, the data segments are labelled according to pre-elaborated theoretical concepts explained in detail in the theory section of the thesis paper. After all data was initially coded the search for themes took place (Braun & Clarke, 2006). All relevant data fragments were sorted into pre-defined theoretical categories or themes. Moreover, the data segments were compared with each other and overlapping codes eliminated, which resulted in a further reduction of data (Boeije, 2010). Subsequently, subcategories were formed, and it was possible to further compare the fragmented data and the different codes (Braun & Clarke, 2006). As a final step the main themes and subthemes derived from literature were individuated out of the collected data (Boeije, 2010). Moreover, themes were revised in order to determine the presence of a coherent patterns (Braun & Clarke, 2006). Latter to that, the data set was re-read to investigate the

themes relation to the entire data set (Braun & Clarke, 2006). As a last step, themes were defined and concisely named (Braun & Clarke, 2006).

Every theme is presented and analyzed precisely within the result section of this paper.

3.5. Reliability, Validity

Reliability and *validity* are concepts used within quantitative research. Reliability refers to the stability of the measurement (Silverman, 2011). It indicates the degree of stable results resulting from a research method (Long & Johnson, 2000). Validity, on the other hand, discusses the extent at how well a research instrument measures the expected outcome (Long & Johnson, 2000). Both terms aim at facilitating the objective assessment of research studies (Long & Johnson, 2000). In qualitative research, however, the use of these concepts has been questioned, since the nature of qualitative research is oriented around individual perspectives dependent on the respective context (Flick, 2009). However, Silverman (2011) outlined the need of evaluation measures and the adaption of reliability and validity to qualitative approaches. Silverman (2011), therefore, suggested methods to make qualitative research less dependent on the researcher's ideas and suggestive interpretations but transparent to an external inspection.

The reliability of this research was ensured through clear and generally understandable interview questions (Silverman, 2011). Moreover, the recording and subsequent precise transcription of the interview enhanced this research's reliability (Silverman, 2011). Lastly, the extended presentation of data within the result section of this study and the list of questions used for the interview are criteria, attributed by Silverman (2011), to ensure reliability.

Moisander and Valtonen (2006) outlined criteria to evaluate qualitative research and, hence, a guideline for a researcher to claim credibility and valid results. Firstly, by stating the relevance of the researched topic both in the academic and social discourse, credibility of the research study was ensured (Moisander and Valtonen, 2006). Moreover, Lamont and White (2005) argued, the research increases credibility with findings and interpretations build upon literature. Following this note, David Silverman (2011) stressed the importance of theory-driven research in order to decrease researchers' interpretations based on own subjective experiences. As mentioned previously the analysis of this paper expands on its theoretical and conceptual framework. Moreover, validity is given by the accurate process of coding and the iterative process of comparing concepts and themes before receiving the final results (Silverman, 2011).

Lastly, the research methods of case studies, expert interviews and thematic analysis are well established within communication and museum studies (Bogner et al., 2018; Roulston & Choi, 2018; Tucker, 2015; Yin, 2016).

4. Results

4.1. Case: The Night Watch Research Project at the Rijksmuseum

Interdisciplinary processes

The project includes the participation of myriad professionals within the Rijksmuseum. Petria Noble stated in an interview with The Art Newspaper, around "20 conservators, scientists and curators" are involved in the research project (Kenney, 2019). Similarly, according to the museum's press release (Rijksmuseum, 2018) the research team working on The Night Watch consists of "researchers, conservators and restorers from the Rijksmuseum, which will conduct this research in close collaboration with museums and universities in the Netherlands and abroad".

4.1.1. Key foundations

In respect of the Night Watch research project, all five experts felt an interdependent relationship towards their co-workers. Wouter van der Horst, current staff member of the education department at the Rijksmuseum and involved in the Night Watch Research project, indicated: "This is such a technical project, that, I'm very much dependent on the expertise of others". Interestingly, Katrien Keune, head of science at the Rijksmuseum, expressed the same need for educators: "So, if I do science and I'm on to translate some to the public, then yes, I need my colleagues from the education department, because they are the experts on how to communicate and translate those information" .

Furthermore, the majority of the interviewees felt an interdependent relationship towards their shared resources provided by colleagues in order to solve everyday tasks. In view of this Barbara Tedder, a project coordinator, highlighted:

> You cannot make a marketing education or marketing and communication plan without input from fundraising department because that's also connected. So, I think in the end, all the different departments, they need each other in order to make good end products.

Moreover, the majority of respondents emphasized the importance of one shared goal among team members. Accordingly, Wouter van der Horst pointed out:

Yeah, it gets everyone aligned, aligned on the same goals. I think that is very important. Because if you're not aligned on the same goals and you continue on collaborating, then you will get different expectations, different ideas of what you should do, and then you will probably also get irritations.

Similarly, Barbara Tedder stated, an important task of a project manager includes: "You have to make sure that everybody is aligned".

Interestingly, two interviewees noted, the project goal needs to be formulated in an explicit and precise way. Accordingly, Inge Willemsen, senior educator at the Rijksmuseum, drew on a memory of a collaborative workshop and explained: "But, the topic 'what is a good story', that is too abstract". She further explained that the consequence of a wage overall goal led to time waste within the work sessions and, thus, caused frustration.

4.1.2. Design stage

In respect of *team composition* aspects, according to three of five experts, the project member assumption at the Rijksmuseum is solved by heads of involved departments in cooperation with the exhibition department of the Rijksmuseum, which assists with coordinative processes. The majority of experts felt, it is important, that team members have an affiliation to the project's topic. Barbara Tedder outlined "I think they always try to make a connection. If people have a certain affinity for a specific topic, they try to put them into the project". Therefore, the individual's *high engagement* with the project's subject matter is considered a decision-driver when planning a team composition.

Interestingly, two of the five experts attributed importance to an early inclusion of involved key stakeholders within the team work. Accordingly, Van der Horst expressed his opinion on assumption processes as follows:

Because if that comes too late and you already have a concept or plan, then it can really hinder it. But, no, as long as you make sure that everybody is involved in an early stage, then it's, it's definitely an enrichment.

The expert, thus, implied, members should specifically be included in elaborating first concepts and action plans in order to not hinder the work flow. Similarly, Rambonnet attributed importance to involve members in an early stage of the team process: "I already discussed [education

product] with the experts and also let them have influence on the program, so they feel also connected to the program and have a certain ownership as well". Even though, he does not specifically mention the importance of involvement from an early stage of the team process, it is assumed that "have influence on the program" happens in an early planning stage of the project.

With regard to the composition, the majority of experts stressed the importance of professionals form diverse fields to be in the team. Accordingly, Willemsen outlined the need of involving "the front desk or security or who works in the building itself" in order to increase information exchange. According to the expert, knowledge exchange is a desired outcome of interdisciplinary collaborations and ideally provided through actors from myriad departments of the organization.

Interestingly, Katrien Keune felt, an interdisciplinary team is also composed by a variety of diverse skills. She described her ideal composition of a team as: "You need somebody who is a perfectionist, somebody who is fast, somebody who is critical".

In response to important team roles, remarkably, the majority of the experts value the presence of a team leader or coordinator. Four members agreed on the necessity of an individual with coordinative tasks that takes over a role of guidance. Wouter van der Horst beliefed that the mere idea generation is not an issue within an interdisciplinary team but argued that a "project owner" needs to structure these creative flows in order to "transforms it into something concrete". Similarly, Barbara Tedder stressed the need for guidance in order to keep team members on track of overall deadlines and tasks.

Significantly, three of five experts felt, the need for guidance would increase with the complexity of the project and the number of involved stakeholders within the project. In light of this, Wouter van der Horst explained the presence of a third party taking over the role as moderator: "And there was actually a moderator present because we felt we need an external party to, to guide us because there weren't just so many ideas and it was such a big project.".

Lastly, two of five experts highlighted, a team consisting of too many members often leads to time loss. Inge Willemsen argued:

Well, these meetings with large groups, I think, it's a lot of time and a lot of talk and the outcomes…I always want to be efficient and quick and I want to write and if I have questions, I go to the person and ask.

Barbara Tedder in this context claimed: "when the project is very large, you also have sub-teams". Therefore, in order to manage "large projects" with a high number of involved members, sub-teams can be seen as a solution.

With regard to *coordination activities*, the experts explained that the Rijksmuseum provides an organizational structure to facilitate these coordination efforts. Firstly, that takes place through team coordinators, as already mentioned in the prior paragraph. Secondly, two experts mentioned the exhibition department as a coordination organ within the Rijksmuseum, responsible for scheduling and coordinating team meetings. Willemsen describes the department as follows: "The exhibition department, they plan all the meetings. They decide, they should meet each other, and they have to sit together."

An effective instrument of communication and information exchange, stated by almost all experts, are *face to face meetings*. According to the respondents, regular meetings contribute to clarification of tasks, expectations and eventual changes in the planning. Interestingly, Tedder stressed, conflicts might arise if communication is not facilitated thoroughly: "They hear something, and they get angry. Because they think, oh, I'm not well informed and I don't want this". Significantly, three of the experts claim that meetings help overcome *space barriers,* since the project team members do not share an office. In view of this Valentijn explained: There they [conservation department] literally have this secured wall where you cannot pass, I mean, that's already, here is also, the curators are in a villa here next to us". Tedder followed this thought and argued: "It's the Rijksmuseum. A lot of people work here, so it's very easy to, to, to just stay in your own department and not interact because you don't see each other". This is in accordance with Inge Willemsen's point of view: "Well, it [meeting] was good because we're a big organization and sometimes the departments are like islands".

The majority of the questioned professionals perceived it as ideal to know about their colleagues' capabilities, although, not always feasible. Katrien Keune outlined: "I think that's very important to create a team where you know where people's strong points are and people's weak points".

When questioned about the nature of tasks all five experts agreed on the necessity of *clearly defined tasks* from an early stage of the project. Keune stressed: "So you have to make a project and things and tasks have to be clear because otherwise things are getting fuzzy and not done". Barbara Tedder, nevertheless, argued, tasks might change while engaging in the work processes and urged to remain flexible: "Well in general, yes it is clear, but sometimes of course, things also change, new things become important. And then you of course need to, to look again and see, okay, there's, there's something new. Who is going to be responsible for this?".

Lastly, the majority of respondents expressed the need for clear accountabilities of involved team members.

4.1.3. Process stage

In the matter of *relational-behavioral factors* all of the respondents agreed that being flexible and open towards co-workers within a collaborative process is crucial.

As a form of flexibility, openness towards change was considered significant within interprofessional processes by Katrien Keune: "And not something like we do something because we always do it". Interestingly, Keune felt, mirroring the respective professional language and adapting to co-workers from different fields would facilitate collaborations:

So, if I speak to my science or chemistry colleagues, I approach them differently than when I speak here to an art historian or to a conservator. Because we have another relationship in that sense. I think you have to be very flexible to adapt and understand what is the field we are playing in.

Wouter van der Horst expressed a different nuance of flexibility. For him, adapting to colleagues should not be seen as giving up control but still maintaining assertiveness: "I can more steer it into the direction that I often wanted to go these collaborations". Thereby, by communicating assertively he wished to achieve wished outcomes.

Moreover, the majority of respondents individuated sensitivity towards other disciplines as especially important in interdisciplinary collaborations.

Significantly, the majority of the experts expressed that showing respect towards other team members is a driver for successful collaborations. In light of this Van der Horst stressed: "The different fields of expertise, I think, is a very important one, especially in big organizations to, to really respect that from each other. I think that's, that's most important.". Similarly, Valentijn Rambonnet argues: "Of course, I respect their scientific knowledge, but also that they would trust me, that I know how to design a program like that". Interestingly, Wouter van der Horst expresses, within interdisciplinary collaboration, blurring professional boundaries can be challenging:

In a department like the education department, people often don't really, and this is a little bit blunt maybe, but don't really get what the department is really doing, as we are not restoring paintings as we don't do…It doesn't really feel concrete. So, it's always very inviting for people to think about cool educational projects themselves as well.

All experts attributed importance to compromise on different department goals in order to achieve the overall project goal. Wouter van der Horst argues that targeting a broad audience results in: "I have to dumb down the research bars a little bit […] which means that certain stakeholder, they could be unhappy with how things are working out". An unexpected finding was expressed by Inge Willemsen, who considered tension between different department goals as fruitful:

Because they [curators] want to tell too much and too many details. Because they are many steps ahead. And maybe in the beginning I want to tell too little and then we meet in the middle and then it's, it's the best.

A further surprising finding was brought to light by Barbara Tedder. She felt, the main obstacle of finding a compromise at the Rijksmuseum is the difficulty of giving up the own idea:

It's, it's sometimes hard to let go and to, to believe in the qualities of different departments because people within museums tend to be very professional but also very, very ambitious and also very detail oriented. So, it's hard to, to hand things over and to say, okay, that's, that is your responsibility.

Therefore, she illustrates that interdisciplinary collaborations in museums, where projects evolve around creativity and idea generation, individuals face the challenge to *burry own ideas for the sake of the overall goal*. She further explained, if a consensus cannot be reached between parties: "The board of directors decides". According to Tedder, the important task of a team coordinator is to ensure that no involved party is frustrated with the decisions made by the board. Therefore, she again, stressed the importance of face to face meetings: "So I try to facilitate that, that people actually sit together and, and talk it through. And then in the end you also notice that once people sit together and talk, good things happen".

In respect to *interdisciplinary learning* factors, the majority of the respondents believed evaluation facilitated the interprofessional workflows. According to Tedder, after every project the respective department evaluates the outcomes. Tedder, further, outlined, the evaluated issues are key figures, such as visitor numbers or financial profits and she stated, interpersonal conflicts or socio-emotional factors are not subject of evaluation: "It's not so much about personal conflicts because in general we don't have that". On the other hand, Keune saw evaluation as enabling professional development: "But it is important to be evaluated, because otherwise we cannot grow". Similarly, Wouter van der Horst perceived the outcome of evaluation as a learning and innovation process:

And an exhibition can be over, but the exhibition is never really finished because you get so much out of it and you've learned so much. And sometimes you've created products for a certain exhibition or for the Night Watch Research project which you can then incorporate in other products as well.

By contrast, Inge Willemsen noted, only complex projects are in need of an evaluation. She, furthermore, questioned the influence of evaluation to change incumbent processes: "To change ongoing processes that takes, takes a while. We are a very big, big ship".

Moreover, the majority of the participants found, *prior experiences* would influence interdisciplinary collaborations in a positive matter. Noteworthy, Keune remembered, 20 years ago: "you could see, that it was very tough to communicate. Because there were these professors from their own expertise, and they were the kings of their own expertise. There it was extremely hard to collaborate". The expert, therefore, indicated the necessity of frequent interdisciplinary experiences within an organization. To make a comparison to today, she explained: "We are used to speak with my colleague, who is an art historian". Therefore, she implied, professionals from different fields need to be spoken to in "a specific language".

A further finding was that educators as well as scientists perceived their discipline as multidisciplinary by nature and saw a positive effect on interdisciplinary collaboration resulting from that. Van der Horst explained: "But within the education department, we have all of these different fields of expertise. We have all of these different targets that we're trying to reach with all of these different disciplines that we do".

Similarly, Katrien Keune stated: "So, I collaborate for instance with people from the medical field. We collaborate with people from the industry, with academia as well".

Unexpectedly, Keune further explained, her scientific background would shape her interactions positively by fostering an analytical, problem-solution-oriented approach towards collaborations: "Because we very try to think analytical in our thinking processes. So, I think in that way it helps to collaborate because it makes relationships more clear. That's spoken personally for myself".

4.1.4. Results: multilayered educational media

Interdisciplinary collaboration was seen by the experts as necessary and important within museums. As outcomes of these co-creational processes two respondents named inspirational effects. Illustrative is Keune's quote: "Well, I think you want to be inspired by your colleagues and especially with other disciplines. That's, that is nice that you think, oh, I didn't think about this.".

Most importantly, the respondents found that in order to produce a multilayered educational product, more than one discipline is necessary. Wouter van der Horst stated: "It's the sum of all of these different stories, expertise that make up a good educational project".

4.1.4.1. Idea creation

Noteworthy, the Night Watch research project is divided into the research project per se, which has the goal to preserve the painting for future generations and the presentation project (Rijksmuseum, n.d.-a). Latter is mainly concerned with the clear translation of the preservation process to a wide museum's audience (Rijksmuseum, n.d.-a). Together, the two project groups form the Night Watch research project (Rijksmuseum, n.d.-a).

According to three experts the idea to present the restoration process was a suggestion from the board of directors. The idea subsequently was developed within a brainstorm among different heads of departments. Wouter van der Horst explained the further process in detail: "So, we had the head of the education department, head of communication, the head of conservation and science, the head of paintings, everybody in the same room and just started brainstorming what to do".

Interestingly, all involved experts revealed that the main inspiration source to develop the project and an educational product in general was the *recourse on existing resources*. Katrien Keune described this process as follows:

I think that's the reason why the Night Watch project started because we have a lot of expertise from previous projects on the technique of Rembrandt, on alterations in paint. So, I think we

have already a lot of expertise form a science point of view, from a conservation point of view and an art historian point of view.

Therefore, an important inspiration-component for the project was the possibility to use previous research solved on the Night Watch and the possession of technical devices needed for the restoration.

Moreover, Wouter van der Horst added: "But when it comes to the Night Watch research project, I think there were a lot of ideas that were floating around in different parts of the organization". He implied, there is not only a recourse of research and devices but also on ideas. In general, when reflecting on the generation of educational products, Rambonnet stated: "I just look what is, what is something that's happening at this moment in the museum or what kind of projects are coming up that are interesting". Hence, it seemed the production of educational media is closely linked to the museum's exhibition, collection or resources.

4.1.4.1. Production

All experts mentioned that within the production process more than one discipline is involved in generating educational products. Inge Willemsen explained, within the process of interdisciplinary collaboration more perspectives can be unveiled to visitors. She argued: "That it's not only about art and art history or history what most of the visitors think before they visit our museum. So that's why I think it's, it [interdisciplinary collaboration] adds a lot.".

The majority of experts stated, the content of a multilayered educational product needs to be oriented on the specific target group. In the case of the Night Watch research project, Katrien Keune stated: "We will give output public, but also output to the scientific field. So that's important that your output will be in different categories". Wouter van der Horst followed this notion and argued, besides the target audience, the mean or the platform used to convey the content would determine the style of the content: "So, I think when it comes to products, for example, for YouTube, you should combine those two and make sure it's content created for that specific platform". Similarly, Willemsen stressed the need to produce content in an empathic manner with regard to the audience: "It always goes back to the understanding that we have to be the visitor and, now, don't know anything about the subject".

When asking participants, how a multilayered message can be best transferred to the audience, the majority of the respondents stated that the content shall be comprehensible. Barbara Tedder simply stated: "I think the most important one is that everyone understands what's going on there". Every respondent had a unique view on what comprehensible means.

Inge Willemsen stated that it is important to convey short and only essential information to the visitor: "With the labels we try to give them just the information they need". Katrien Keune agreed and stressed the importance of selecting information: "I think to answer your question, it's about the dose. You don't have to give all information at once, so you have to select what is the information I'm giving to the audience at this moment". She expanded on this thought and outlined the need of explaining functional principles to the visitors: "So, if they're seeing for instance a microscope, there we have to mention why we are doing, why we are using the microscope and what we want to know".

Hence, the expert stressed, not to avoid complex phenomena, but use concise and comprehensible language to explain it: "You always have to go in depth. You always have to try to explain complex things in an easy, way. Translate complex issues in easy, accessible language".

4.1.4.3. Objectives

The analyzed data, including expert interviews and newspaper articles reporting on the Night Watch research project, reveals four main outcomes pursued by the project.

Firstly, the preservation of the painting for future generations was seen as a vital goal for engaging in the project. Tacco Dibbits, the director of the Rijksmuseum, revealed in an interview to the British newspaper *The Guardian*: "The Night Watch by Rembrandt is one of the most famous paintings in the world and we feel we have to preserve it for future generations" (Connolly, 2018). Similarly, expert Barbara Tedder stated: "Well I think the main goal for the Rijksmuseum is to make sure that this masterpiece stays in good shape for future generations". However, this is somehow given, since it is a conservation project and the duty of a museum is to maintain and cure artefacts. Hence, the mere need to preserve the painting does not imply opening it to the audience.

A further, less significant finding outlines transparency as an overall goal, achieved by showing the restoration process to the world. As Conolly stated: "Dibbits said conservators and restorers were clamouring to work on the project and insisted that they would not shy away from public scrutiny if criticisms or comments over the progress of the restoration work were forthcoming" (Connolly, 2018). In other words, Dibbits aimed at disclosing alterations to the painting to the general public. Consequently, the external viewer is able to judge if the restoration process is accurate and necessary.

Noteworthy, all participants mentioned a third motivation for the project to be the inclusion of a wide and diverse audience. This reach for inclusion is described by Wouter van der Horst as follows: "So, for example, you could have different needs from the museum then, then me and, and the museum has to make sure that we both get what we want". Interestingly, Willemsen took a critical

position and questioned the ability of the museum to include every visitor: "I think for some visitors it will be interesting. And for some it will be a less spectacular experience because the, the frame of the Night Watch, they're going to take it off". Willemsen further explained that visitors might see less because of the glass chamber around the restoration process.

A further frequent reasoning to keep the restoration in the public eye by both experts and press articles was the goal of accessibility. The fact, that the restoration takes place in the museum gallery and not in the restoration department ensures that interested visitors can still see the painting. Dibbits argued: "Conservation is usually done behind closed doors, but this is such an important painting, we feel that the public who owns it has the right to see it and we want to share this very important moment" (Connolly, 2018). Accordingly, in the press release of the Rijksmuseum a main aim of the project seems to be accessibility: "A digital platform will allow viewers from all over the world to follow the entire process online continuing the Rijksmuseum innovation in the digital field" (Rijksmuseum, 2018).

A slightly less frequent emerging reason for the project is the aim of *engaging* the audience. The Rijksmuseum announced to live stream the restoration process; this endeavor was abolished according to Barbara Tedder. According to her, this decision was justified as follows: "Yeah, we are worried that it's not fascinating enough.". In light of this, for an art museum it is important to create a level of engagement for their visitors. Visitors should be "fascinated". Inge Willemsen agreed and described her duty of writing descriptive texts for the restoration process: "But then it's my job to make it spectacular."

Overall, the educational purpose of the restoration presentation was acknowledged by both press articles and all the five experts. In this context, Wouter van der Horst explained:

And when you start asking those kinds of questions, you immediately get into your, kind of, your educational mission to educate society, to spread the culture. So, as soon as an audience is involved in what kind of way, education is, is also always involved.

Conolly found that: "Conservators will be on hand to answer visitors' questions, and regular updates on the work, such as discoveries over pigments used or changes made by Rembrandt, will be made public" (Connolly, 2018). Here not only the mission to keep the process transparent becomes apparent but also an overall educational mission, since conservators will engage in a discussion with the public and, hence, convey knowledge. According to Keune, the interdisciplinary collaboration within the Night Watch project can generate a holistic understanding of the artefact:

You can think about the art, the thinking of the artist and that's, that's what you want to deliver. And to understand what the artistic process of Rembrandt is, we need to have techniques. That's what you have to explain, to get that insight.

4.2. Case: The Sargent digital label project

Interdisciplinary process

The project group working on the creation of the digital labels was considered interdisciplinary according to the three experts and the unpublished project report provided by the AIC. According to the final project's report, the digital label's project was solved: "In collaboration with curatorial, conservation and science, digital experience, and interpretation". (Molina, 2018, p. 2).

4.2.1. Key foundations

The majority of the participants expressed an interdependent relationship towards their team colleagues. Mary Broadway, currently an associate conservator at the AIC, expressed this connection as: "A successful collaboration is one in which each team member's expertise informs or enhances the others. Ultimately, an information product is created that could not have been achieved by an individual". According to Broadway, diverse professionals and their expertise are able to generate an end product, an individual is not able to make on its own. Sarah Molina, at the moment a national science foundation fellow at the AIC, felt an interdependent relationship based on limited capacities of one individual: "So really, people can't, you can't do your colleagues' jobs and that's why you need them". She, moreover, stated the tight relationship within a museum products and preceding scientific research: "You can't have the content without the research". Hence, she describes the interdependent relationship a "content creator", such as a curator or editor within a museum, has towards the researcher and vice versa.

The digital labels project was part of an audience-research examining the visitors' interaction with the labels (Molina, 2018). Interestingly, within the evaluation report of this study, collaboration with other departments was individuated as necessary to ensure a well-working end product: "This finding indicates the need for interpretation [department] and experience design [department] to collaborate in the future about prototyping digital interactives to avoid issues with the interface that prevent users from engaging with content" (Molina, 2018, p. 4).

Moreover, all three respondents attributed importance to shared goals within interdisciplinary collaboration processes. Sarah Molina referred to shared goals within the digital labels project as follows:

I think that we have shared goals overall. I think everybody is interested in engaging and compelling texts and creating something for digital labels that's pretty concise and objects-focused. So those are really united ones, but everybody's going to have its own perspective for how to get there.

Noteworthy, she implied the presence of shared goals, while every department or individual has different opinions on how to reach the goal. She further specified the need of clearly communicating main project goals: "I think, it's really important to have the aims and goals of the project laid out so that everybody knows what you're working towards". Accordingly, Robin Hoffman argued: "It is important to establish goals in order to respect everyone's time and energy, and to avoid working at cross-purposes. Priorities must be clear from the outset.". She pointed out the wasted time if goals are not specified and communicated clearly from the start of the collaborative endeavors. Broadway added, shared overall goals might lead to synergy effects and therefore enhance effective collaborative processes responsible for multilayered educational products.

4.2.2. Design stage

When it comes to *team composition*, according to the three experts, the assumption of team members was determined by their prior collaboration on the catalogue for the exhibition the labels have been placed in. Broadway outlined: "It was based on the team that wrote for the catalog, which included the exhibition curator, the conservator assigned to the exhibition and catalog author, and the collaborating scientists, plus design and production". This implied, professionals with an expertise for the topic where assigned to the project. Similarly, Hoffman pointed out that an expertise of the topic was an assumption criterion: "I was the only editor available for the work, and I had some familiarity with the topic, especially after work on the catalogue and other exhibition texts".

Regarding the importance of intrinsic motivation as a factor for potential team members to get assumed, the experts had differing opinions. Sarah Molina stated: "But, that everybody has a commitment and passion for art objects. That is pretty key". Therefore, Molina implies, museum professionals have a natural degree of intrinsic motivation for the museum's collection and subject matter. By contrast, according to Broadway, a high engagement with the topic of collaboration is helpful but not necessary.

All three experts expressed the importance of a team coordinator within interdisciplinary collaborative practices. Sarah Molina pointed out the importance of a person coordinating the team but not the necessity of an authoritarian leader: "I think, it is of course, if somebody is, the one person leading or spearheading the project, but you don't want it to become where every other discipline is kind of a service to one". Moreover, Hoffman assessed it as necessary to have a clearly communicated "hierarchy of decision-making" in order to achieve effective results. Broadway mentioned the importance of guidance through deadlines in order to ensure performance from involved team members.

Regarding the ideal team size, Hoffman mentioned, there should be "a manageable number of stakeholders" in order to create efficient interdisciplinary collaborative processes.

In terms of *coordination efforts*, as mentioned by Molina, within the AIC important tasks were taken over by an appointed project management team, which stipulates schedules and sets meetings. Moreover, all participants agreed on the necessity of written and clear guidelines. Hoffman stressed, "written guidelines and schedules" ensure "that contributors can be held accountable to their responsibilities and deadlines". Broadway, similarly, stated: "Interpretation will drift, if core goals are not written down. Deadlines keep people with busy schedules on task".

Furthermore, all participants agreed that the definition of clear tasks is crucial within all collaborative endeavors. However, according to the experts, these tasks do not need to be shared among team members. Accordingly, Broadway stated: "Some shared tasks are probably good in terms of keeping to a timeline, but it's not necessary". Furthermore, Hoffman named "rational workflow processes to guide their efforts" as an element of successful collaborative processes.

All of the interviewees expressed no absolute need in knowing about colleagues' capabilities, when asked directly. Nevertheless, Hoffman mentioned an added value: "Really, it's ideal to know people's capabilities, but at the end of the day you have to work with whoever's on the team [and] has the necessary expertise". Broadway, moreover, argued that within collaborative processes, it is necessary to state clear goals and have the ability to estimate "if the group is capable of answering them". By that, Broadway implied, capabilities of members need to be assessed in order to allow a successful collaboration. Molina, moreover, argued, it is important to have: "The level of trust that people are really dedicated and capable of doing their work". Molina, therefore, insinuated, specific knowledge over colleagues and their capabilities is not absolutely necessary, if trust is given.

Regarding the need for extra time in order to get to know team members, all respondents argued that it is not crucially necessary. Broadway stated: "It can be, but I don't think it's a crucial element". Noteworthy, Hoffman expressed her opinion that personal conversation might not be a part of collaboration and further explained: "I think you don't really need to have interpersonal chemistry

to work well together. Sometimes, socializing can be more distracting than useful". Following Sarah Molina, it is dependent upon the context. She claimed, for the digital label project: "Not all of us knew each other that personally, but it worked fine, just on a professional level". Molina further specified, personal time is wanted, if collaborations "are not going as smoothly", if the project's topic is highly sensitive and individuals, thus, have opposed views.

4.2.3. Process stage

In respect of *relational and behavioral dynamics*, all experts agreed on the importance of being flexible within collaborative workflows. Molina argued: "You can't be so tied to work, so you don't want to change it at all. You have to be flexible". By comparison, Broadway emphasized the need for a balance between flexibility and "to be able to assert your ideas" and at the same time "to be flexible you have to be open to other ideas". In view of this, Molina stated the importance of assertive argumentation in presenting and negotiating own ideas: "It's really [about] explaining why you are trying to fight for something to be in that final text. If it makes sense and it makes sense and if it doesn't…".

Both Broadway and Hoffman named listening as important social skill within team communication. Hoffman, furthermore, individuated adapting and mirroring the language of colleagues as helpful for interdisciplinary collaborations. Broadway, moreover, stressed the importance of being sensitive towards other disciplines.

Lastly, the majority of the respondents emphasized the importance of compromising within collaboration practices. The need for compromise became apparent especially when departments consisting of different department goals are involved, as Molina argued:

You're going to disagree quite a bit with your colleagues most likely on a number of different things. And that's fine because you know, ultimately people are interested in defending one perspective. You have to compromise, but generally, I feel like it turns out for the better.

Interestingly, Molina contributes opposing views and, hence, created discussions and interactions with other professionals a positive outcome.

In respect to *interdisciplinary learning factors*, all experts agreed, that their own discipline influences their interdisciplinary workflow.

Hoffman in this respect mentioned: I don't see how my training could not inform my collaborative work processes. I draw on all that I know that might be useful or relevant". From the position of an art historian, Molina acknowledged that her discipline of art history is in itself interdisciplinary and facilitates collaborative practices with other museum professionals. Noteworthy, Broadway stated, the discipline of conservation incorporates an "enhanced understanding of art through science, so yes, collaboration is baked into conservators' methodologies to some degree".

As for the influence prior experiences have on interdisciplinary collaborations, all respondents agreed on an improved development due to prior interdisciplinary experiences. In view of this, Broadway stated: "Working in groups is a learned skill, so if you practiced that skill during your education and feel comfortable with it, then you are much more likely to engage in group projects, I think".

With regard to the value of evaluation procedures, two of three participants found an added value for a further project only if re-engaging with same colleagues. Molina stated: "It's a little bit harder here at the museum because a lot of these projects you'll work on them with different people". Nevertheless, Molina mentioned the possibility of self-reflection: "But you can take off what you can change yourself".

Broadway, on the other hand marked the importance of evaluations in any case: "Yes, it gives people a chance to talk about what went wrong or what they would change, which not only benefits the next project, but is also cathartic".

4.2.4. Results: multilayered educational media

Two respondents stated interdisciplinary collaboration as crucial in order to create informational products in museums. According to Molina, an important way in order to inform diverse visitors and therefore meet the museum's goal of inclusion is to work interdisciplinary. She stated:

Whenever you're trying to tell fuller narratives that appeal to a number of visitors. So, it's usually important to have a number of perspectives. And one of the best ways to do that of course, is to have people on your team who are coming from a lot of different points of view.

Similarly, Broadway argued: "Depends on what the meanings are, but it is helpful 90% of the time to have a concept explained through the lenses of different disciplines. You never know what

someone will relate to". Thereby, Broadway implied, diverse needs of a broad audience can be better met with the expertise of different disciplines.

Hoffman, on the other hand, questioned the need for interdisciplinary collaboration in order to create a more complete information product about an artefact. In her opinion, the "best" way to translate the respective meaning of an object depends on the object itself and therefore, the context. She states:

I don't think that interdisciplinary collaboration is inevitably necessary to 'do justice' to an object's meaning. There is no empirical way to be complete about identifying or imparting all of potential meaning in an object, so there's no way to judge, in an objective way, what is most important about a work. It's all contextual.

By contrast, Molina had a more general view on creating educational products: "the opposite of interdisciplinary thinking is just you thinking from one perspective. So, it's hard to just have one perspective and activate an object in kind of a number of different ways."

4.2.4.1. Idea creation

The overall goal of the digital label's project, stated by Molina, was "to get people to engage longer and deeper with the objects that are on". Broadway, on the other hand, argued: "The content of the digital label was designed to highlight discoveries made during research and treatment undertaken for the publication". Therefore, the scientific purpose of the museum was outlined by Broadway.

All three respondents disclosed, the idea for the project was generated by the curator of the respective exhibition the labels were placed in. Molina further explained: Well so for this, it was for an exhibition and so it was determined partially by the curator". Similarly, Hoffman disclosed: "She [curator] wanted it to be known to the world that she had figured certain things out and/or assembled a particular narrative that she thought deserved more attention". The main inspiration, hence, was a discovery, conservators and scientists made with regards to Sargent's paintings. Due to the fact, that an exhibition of the respective artist was in planning at that time, the content-idea for the digital labels was generated. Indeed, according to the three experts the educational product was designed as addition to traditional wall-labels within an exhibition.

4.2.4.2. Production

In respect of the content of a multilayered educational product, all respondents stated, museum professionals need to be careful to not overwhelm visitors with too much information. Hoffman highlighted, the amount and complexity of information is dependent on the context. The expert, further, explained, too little information would hinder visitors to appreciate artefacts and too much information could easily overwhelm the audience and block their engagement with the artefacts. According to Molina, the final educational product "has to be a distillation of a number of different things". This implies, museum professionals have to make a choice and decide, what is important to convey to their audience. Similarly, Broadway noted, it is important to give enough information in order to enable a visitor's appreciation of artefacts. Moreover, she distinguished museums by collection and stressed, visitors of an art museum are foremost interested in visual media. Therefore, visitors strive for visual learning opportunities, not so much texts, as Broadway claimed.

Interestingly, Broadway stated, the museum shall not strive to explain every layer of meaning to the visitor. She argued: "Some works are just beautiful to look at and it doesn't make them more beautiful to know why".

Hoffman further argued: "Ideally, interpretive frameworks are layered in order to have multiple opportunities of reaching any given person with at least some information". She emphasized the museum's goal of inclusion: "A combination of educational products shall be designed in order to educate a wide audience".

In respect of complexity of content, all participants agreed that complexity shall not be avoided. Broadway emphasized that due to the multilayered nature of artefacts it will take museum professionals "a lot of effort to explain". Molina, similarly, stated: "the idea should be complex, but within the presentation there should be an effort to make it more accessible". However, Broadway highlighted, that "scientific concepts" might be too complex for and not wanted from visitors of an art museum. Molina argued slightly different and stressed, scientific concepts are in need of an accessible explanation.

4.2.4.3. Objectives

Three overall outcomes of the project were individuated by both experts and the evaluation report connected with the investigation of visitor's engagement with the digital labels.

The main outcome, confirmed by experts and the evaluation report, was found to be the visitors' engagement with the respective paintings. Molina stated: "Our goal for digital labels is to get people to engage longer and deeper with the objects that are on". The prolonged engagement of

visitors in respect of: "the length of time visitors spends looking at objects and reading labels" has been, furthermore, stated in the evaluation report as a significant finding (Molina, 2018, p. 3). Moreover, one proposition of the evaluation plan stated the importance attributed to visitors' generation of curiosity: "Visitors will feel a sense of discovery when engaging with stories of art and science; in turn, this may provoke questions on the part of the visitor" (Art Institute of Chicago, 2018, p. 5).

The second main outcome, that all experts implied, was the inclusion of a broad audience with diverse needs. In light of this, Hoffman argued, her main goal was to design digital labels, that are: "understandable by a large swath of our visitors".

The overall educational goal of the product has been mentioned by both experts and evaluation documents. The aim to convey additional scientific information to the visitors can be seen in the tested propositions within the evaluation plan (Art Institute of Chicago, 2018). Information on "Materials, Techniques, Processes; the Physical Properties; the Making of an Object; and the Science behind an Object" shall increase "Awareness, Knowledge, Understanding" as well as an "Additional Lens for Engaging with Objects" (Art Institute of Chicago, 2018, p. 4). Similarly, Molina individuated an educational value and a broader holistic understanding as outcome from the interdisciplinary project. Molina argued, for non-scientists and non-artists the materiality of an object might be abstract. Therefore, she outlined: "conservation science narratives can allow that deeper understanding of the physicality of objects".

4.3. Case: Workshop "Sporenonderzoek naar Rembrandt!"

As annotated in the methodology section the following case describes the creation and interprofessional team process that created and tested the workshop *Sporenonderzoek naar Rembrandt!* at the Rijksmuseum. The workshop targets primary school children between the age of six and twelve years (Rijksmuseum, 2019).

Interdisciplinary process

According to the experts, educators, conservation scientists, technical art historians entered the collaboration in order to generate the workshop.

4.3.1. Key foundations

All three experts expressed an interdependent relationship when engaging in the project work group. Thijs Gerbrandy highlighted the need for diverse professionals, since one expertise is not capable of solving all given tasks. He described the generation of an educational product as an integration of different expertises: "It's not that I make something and tell her, make sure they see it. It's much more complicated, much more integrated in each other". Lisanne van den Heuvel emphasized, that through the integration of different experts, ideas can be generated, and problems solved, since every discipline draws on own experiences and, thus, enriches the outcome. Gerbrandy stressed, the education department might be especially interdependent towards curators and the marketing department, as well as towards the front office and security service of the museum: "So if I develop a tour on, let's say 17th centuries still lifes then the first thing I'm going to do is ask a curator to educate me on the subject".

With respect to shared goals, all three experts mentioned the importance to align team members on the same goals in an early stage of the project. However, Annemiek Sponk stressed, in a team with diverse specialists it can become challenging to align everyone on the same goal. Sponk attributed that to the different perspectives the experts have and therefore the tendency to believe in different overall goals. She argued:

> And so, we all have these different opinions. And that's not always clear then, what's the main focus? Is it, is it that it is for schools or is it that it is a Rijksmuseum product in the atelier? So, it is of course, everything of this.

Therefore, the expert implied, the overall goal is a composition of different perspectives and opinions of different experts. Van den Heuvel, when asked what is essential for interdisciplinary collaborations, stated the importance of clear information on the common goal, so that every member can reach it.

Noteworthy, Gerbrandy generalized the idea of the overall goal in order to explain why interdisciplinary collaborations in museums are successful. The expert claimed:

> Because the goal of the museum is basically the same. So, if you have a good focus in the museum then every different department has the same goal. In this case, to show the museum to as many people as possible.

Hence, he slightly contradicts Sponk's argumentation by implying that the overall goal is already given by the organization and different departments just contribute to reach the goal. Similarly, Van den Heuvel argued: "I think everybody has own goals but in the end, it is not hard to align to the overall goal if everything is clear".

4.3.2. Design stage

In respect of *team composition*, based on the expert interviews, the team to create the workshop was composed by five experts, according to their individual capabilities needed for generating the workshop. Sponk described the team composition for new workshop generations in general:

Normally we have, the one that's responsible for the target group, so Thijs in this case, for primary schools. So that's the beginning. We have Irma, because she's responsible for that art programming in the atelier. And then depending of the ideas we need other people.

As reported by Van den Heuvel, since the workshop involved conservation science assignments, specialists from this department were assumed. Moreover, she explained, for the specific project, she has been called since her expertise was needed as a technical art historian in order to create accurate assignments for children.

With regard to a team coordinator, all three experts expressed the vital role, team coordination played within the project. In light of this, Van Heuvel argued: "So, it is always good to have one person that has an overview of the project and it responsible for answering questions".

However, Annemiek Sponk argued, that decision-making was shared between members and "there's not really a leader".

Interestingly, Sponk stated the challenge of members not involved from the start of the project:

Maybe in the beginning what went wrong is that, there were people that had more time than the others. So, they were brainstorming already and going to experts and writing things down

and reading books and explore things on their own. And then another one is not yet really involved in it.

Therefore, Sponk stressed the importance of the inclusion of key individuals from the beginning. The expert further claimed, the same is valid for a new member entering the project on a later stage: "But still it happens that you also think: Okay, we already did so much, now we get a new person and please do not say this, because we thought about it already". The approach in order to solve this challenge suggested by Sponk is to keep openminded towards new ideas and perspectives and learn more about the new member's skills. By contrast, Van den Heuvel felt no need for an inclusion from the start of the team process. The expert stressed, a new member can be included also in a later stage and the expertise can be an enrichment, nevertheless.

With regard to *coordination efforts*, diverse findings emerged. The majority of experts did not see the space barriers between different departments at the Rijksmuseum as challenging. Only, Gerbrandy outlined his concerns in that matter: "So, I think the only concern is really that all those departments are very separate in a certain way".

However, later in the interview, the expert stated: "But on the other hand, it's really nice that we're together. It makes us as a department stronger". He further explained, the need to be in same office spaces is highest when collaborating on a daily basis. Otherwise, Gerbrandy suggested regular meetings and structured information exchange in order to compensate for the spatial distance. On the other hand, Lisanne van den Heuvel expressed not an absolute necessity to have an office or be located close to the project team members. The expert, furthermore, agreed with Gerbrandy, that face to face meetings are essential for information exchange on complex issues. However, she empathized, a meeting would be obsolete if there are minor details to discuss: "And when it is only about small details and small questions than email is fine. Because, you can't meet for everything, people are too busy for that"

The need for clear information-exchange within interdisciplinary processes was outlined by all three experts. Gerbrandy noted within interdisciplinary collaborations information exchange is essential. However, he argued, too much information could increase confusion, if numerous departments and stakeholders were involved.

Moreover, the experts mentioned the importance of deadlines and written action plans in order to define clear tasks and accountabilities. In this regard, Gerbrandy stressed the importance of a written report from the front desk of the museum:

And I think that's a valuable tool for us and for them to ventilate their frustration and it really helps us to understand what's going on there. And helps to connect the different departments with each other to improve the workflow.

When asked about the need for structured guidelines provided by the organization, Sponk argued it would vary individually: "It depends. I guess I'm not really a person that needs this structure".

In respect of capabilities of other co-workers, all experts expressed the importance of being well informed about the matter. Gerbrandy argued, that would be naturally given by the organization: "So I'm, I'm always presented as the specialist 'primary education' and the specialist 'Japanese Varnish-work' is always presented as such". Van den Heuvel argued, in interdisciplinary collaborations: "I think everybody wants to work with people they already know and where they know it works well". Sponk stressed the importance of clear capabilities, in order to receive assistance and know the suitable contact person, as well as divide the tasks among team members.

The opinions differed among the experts, when questioned about the need to know colleagues on a personal level and the value on spending leisure time with co-workers. Sponk attributed importance to spending time outside the professional framework, since it leads to a better "team energy" and offers the chance to learn more about new colleagues' skills and capabilities: "And then it's also about respect and drinking coffee and really, yeah, find out what his skills are and what he can bring into the project instead of protecting it". According to Sponk, a certain degree of familiarity with co-workers enhances respect and openness towards other ideas. By contrast, Van den Heuvel did not feel the need for getting to know colleagues on a personal level. According to the expert, a professional level is normally sufficient.

Two experts mentioned the importance of the budget as a coordination element. Noteworthy, Sponk explained, due to the fact that the Rijksmuseum is a well-visited and prominent museum, there can be always found interested customers for educational products. Therefore, arising expenses get often approved. Furthermore, she mentioned private donors and foundations with a high interest in sustaining the cultural programs within the Rijksmuseum.

All respondents felt, tasks need to be clear from an early stage of the project. Nevertheless, Van den Heuvel stressed the importance of remaining flexible if responsibilities might shift: "And so, you have to adapt to it".

4.3.3. Process stage

Within the process-stage several findings emerged that can be attributed to *relational-behavioral dynamics*.

All experts mentioned the importance of flexibility in contact with diverse experts. In view of this, openness towards other ideas emerged as significant among the experts. Sponk stressed the need to not categorically reject different opinions: "So that, when somebody has the idea that you say 'Yes' and then we do this and this. Instead of 'No, I don't think this will work'".

The expert connected that with a positive and "good energy" among team members and as "the same spirit or the same enthusiasm or drive to teach something". Hence, Sponk individuated a shared motivation for the project's topic as a facilitator for effective collaborations.

All experts shared the opinion, that compromising is especially essential with interprofessional collaborations. Sponk talked about the challenge of different experts compromising on own goals for a shared overall goal: "And the hardest thing I guess for the department of Katrien was, that we made it so simple. So that they really needed to believe that it was necessary to, to simplify it". Significantly, Van den Heuvel agreed and explained it was impossible to implement certain scientific procedures accurately within the children workshop, since certain chemicals were toxic and certain experiments would last too long. Therefore, the expert stressed the importance of an interdisciplinary collaboration, so that these needed alterations were addressed and discussed from another perspective.

All experts agreed to value communication skills as important within interdisciplinary collaborations. Noteworthy, Sponk, besides advocating to be "transparent and open in communication", suggested to still "dive into something and just go for it and not see the limits". Similarly, all experts valued listening as part of good communication skills. Sponk in respect of this, emphasized listening: "I really, really don't know anything about the work they do. So that was new for me too". Moreover, all thre experts mentioned, that it is helpful within interdisciplinary collaborations to either find or already speak the same language as co-workers. Van den Heuvel pointed out, that co-workers should ideally be direct, but not offensive and communicate in a rational manner.

All three participants expressed the need to show respect towards other collaboration partners. With regard to professional boundaries becoming blurry within interdisciplinary workflows, opinions differed among the experts.

For Gerbrandy it was not the case within the Rijksmuseum: "No, I think those borders are very distinct and very clear". Accordingly, Van den Heuvel argued, other disciplines would not intrude professional borders but rather inspire and enrich different professionals. Similarly, Sponk argued, with the needed respect, blurry professional lines are where "the magic begins".

Interestingly, one expert mentioned it is important within a collaboration to "have the same standard of quality" in order to achieve the best possible outcome.

In respect to *interdisciplinary learning*, all experts emphasized the importance of evaluating workflows. Gerbrandy, foremost, attributed importance to evaluate the educational product, in order to improve it: "We're constantly looking at it [product], criticizing it, developing it again, making it better. And maybe, at some point, we think we need something new. We don't like to stand still". He, hence, stressed the urge to scrutinize and innovate as significant in order to create valuable educational products. In light of evaluation practices, Sponk noted, the biggest challenge within the evaluation phase is to decide who can make the decision to change something: "Because it's still, it's now in the phase that we need to monitor what's going on and we need to adjust things that not work very well. And then it's always a balance, who can make the decision".

With regard to the influence prior experience has on current interdisciplinary practices, all experts agreed on a positive influence. Noteworthy, Gerbrandy felt, especially in a large museum, employees are more likely to work together on an interprofessional level. Therefore, he noted: But I know from other museums that education department is much more like an island. So, they are less used to, in those smaller, smaller museums they are less used to collaboration". He suggested, effective interdisciplinary collaboration is a learned skill. Sponk noted, interprofessional experiences are among others valuable for the individual's personal development: "So you learn from it, of course, because it develops you as a person and, and in a lot of different ways.".

The former education of the experts has been a significant influence on their interdisciplinary collaborations. Gerbrandy presupposed, his art history study enables him to find a shared language with curators. Sponk asserted, her study focused on inter-religious and intercultural dialogue and improved her dealing with conflicting ideas and perspectives. Van den Heuvel felt, her technical art history master program has improved her collaboration skills since the program itself is highly interdisciplinary. She implied, she could, thus, find common ground with different professionals easier.

4.3.4. Result: multilayered educational media

4.3.4.1. Idea creation

As reported by Gerbrandy, the idea creation for workshops in general is solved by an individual within the education department and further developed by feedback from colleagues within the department and from the main target group, in this case teachers and children. Sponk agreed and stated, conversation with teachers offers a significant inspiration source for educational products. Both, Sponk and Van den Heuvel explained, the idea for this workshop was generated within a brainstorm with the key team members. According to Gerbrandy the main drivers to create the workshop were twofold. Firstly, the workshop should be centered around the prominent event of The Night Watch restoration within the 350th anniversary of Rembrandt's death. Secondly, the workshop should meet the children's demand for practical approaches: "Because, if I do something or I organize something for, for, for an 11-year old, at first I want to check with the 11-year old if they're even interested". Overall, Gerbrandy emphasized the importance of developing, testing and redeveloping educational products with the incorporation of the target group. Similarly, Sponk named teachers' demands for a more "hands-on" approach and the, hence, suitable setting of the museum's atelier rather than a school's classroom as pivotal to design the workshop. Moreover, she stressed: "The restoration department has this wish to also be more open for the public". Thus, according to her, it was more about the restoration department's urge for a transparent presentation of the department's tasks.

4.3.4.2. Production

In respect to the content of multilayered educational products, all experts agreed that the content shall aim to explain complex issues in an accessible way. In light of this, Van den Heuvel argued: "I think you should not underestimate the public. Visitors understand more than we think". Similarly, Sponk stressed a museum in general strives for simple and inclusive explanations. Noteworthy, the expert highlighted the importance of not overwhelming the audience with too much information: "We want to teach a lot but we, you cannot bother the people with all those different insights". Therefore, Sponk implies to filter information in order to appeal to a broad audience. Gerbrandy, on the other side, accentuated, the content of an educational product is ideally tailored to the niche audience and aims at critically questioning the subject matter.

Interestingly, all experts highlighted the important mission of a museum to include scientific aspects of art production and preservation within their educational products.

With regard to the means of educational products, two experts agreed, the choice would be determined by the context. In this regard, Sponk stressed: "Depends of what you want to tell and which public you want to reach".

4.3.4.3. Objectives

Three overall outcomes of the project were individuated by both experts and the workshop's marketing materials.

One pursuit outcome was the inclusion of numerous visitors. In view of this, Gerbrandy emphasized the importance of questioning topics critically: "If, if a museum is only about rich white men, then we can't be an inclusive museum for all Dutch people". Sponk argued, by including scientific aspects in educational products, individuals with a less affinity towards art can be spoken to: "I think when you have people that are not really interested in the 'art, art, art', but you can make them curious by using more scientific or more chemical insights".

One surprising finding denoted, the museum aims at informing visitors about processes and departments that are normally hidden to the public and was stated by Sponk. The expert, in that matter stressed, museums want to offer their audience an idea of "what's this place, what is this museum". The expert, moreover, argued, little is known about the complexity of the museum as a functioning organization:

> Most of the times people think that there are not many people working in the museums. Only the people that hang the works and the guardians that say hello and give you the ticket. They have no idea what's happening all around them or how the museum works.

Van den Heuvel stressed the museum's urge of transparency in respect to the restoration department: "I think, now especially for the restoration department, it is a goal to show the world what research they solve. Normally, that all happens behind closed doors".

The educational outcome becomes apparent through the experts' statement and the official website of the workshop. Already in the first descriptive paragraph, it is outlined, that students receive the possibility to become researchers themselves and learn about conservation research, but the artist Rembrandt as well (Rijksmuseum, n.d.-b). Accordingly, Sponk accentuated, the museum is an ideal setting to gather tacit knowledge compared to schools and their one-sided knowledge transfer: "And so, the whole context is not really stimulating children to find out things themselves. And in the

museum of course, it's more like this setting where you can become curious and wanting to know new things". Van den Heuvel stressed the importance of educating visitors about scientific aspects in order to meet their natural curiosity. Gerbrandy outlined, the workshop conveys multilayered educational information: "And they, they, learn something about chemistry. They learn something about paint. They learn something about restoration of paintings, about all different techniques". One aspect of the educational outcome was seen by experts in the integration of scientific information within the workshop. All three experts valued the multilayered experience caused by this new approach. Gerbrandy stated:

> It adds to the value of the work of art. And I think by teaching children these kinds of skills, not to become a, restorer but more that they see different aspects of art. Not as something flat on the wall. You can look at it and appreciate and you can learn something from it, but also what is the object itself?

Van den Heuvel explains the trend of science: "I think everybody has this curiosity inside and wants to know what something is made off and how it was made". Lastly, Sponk argued:

> That it's also a new thing for children to find out that the painting probably is not what you see but that there is a lot of scientific research underneath, where you can learn more about the painter, the state that it's in.

4.4. Comparison of the cases

The following section is a comparison of the main findings among the three analyzed cases and an attempt to answer the two sub research questions. In order to facilitate the reading process, the respective projects are addressed as case 1 (Night Watch research project), case 2 (Sargent digital labels' project) and case 3 (workshop *Sporenonderzoek naar Rembrandt!*).

In order to answer the first sub research question on how interdisciplinary processes are executed in museums, the following findings emerged.

Interdisciplinary process

4.4.1. Key foundations

Not surprisingly, perceived interdependence towards colleagues and their expertise was a recurring theme among experts in all three cases. Experts outlined this relationship as crucial, or even self-evident and stressed the importance of their co-workers to meet the project's goal. The presence of interdependent relationships with colleagues or the act of "sharing" resources and responsibilities during interdisciplinary collaborations has been widely reported in the literature (Bronstein, 2003; D'Amour et al., 2005; Schwartz, 2006). Moreover, a shared goal was seen as necessary to engage in collaborative endeavors in all of the three cases. This notion is in accordance with Bronstein (2003), claiming, the presence of collective goals is a core element of interdisciplinary collaborations.

4.4.2. Design stage

In the early stage of the project, the findings identify certain aspects within team composition as important. The professionals' involvement in concept- and decision-making from an early stage was expressed by experts of case 1 and 3.

Similarly, the assumption of members with an affiliation to the project's topic was considered as important in case 1 as it was in case 3. However, experts of case 2 stressed, the importance of the necessary expertise to solve project's goals but a specific affiliation with the topic was deemed as less relevant. A team coordinator with a guidance-role in order to decrease complexity and enhance goal adherence was considered essential within all three cases. However, within case 2 and 3 experts expressed no need for an authoritarian leader within interdisciplinary collaborations. This latter finding is in contrast to the elaborated theory on collaboration. Schwartz (2006) defined collaboration as a team process, where goals and leadership are shared. The author, therefore, implied equal authority over the decision-making of all members and no need of a project leader (Schwartz, 2006). Lastly, experts of all three cases mentioned, the number of team members should not be too high in order to increase efficiency.

In terms of coordination efforts, among all three cases, experts mentioned the necessity of clarity in tasks, duties, responsibilities and expectations. Only experts within case 1 suggested team meetings being important to convey information and avoid conflicts.

In general, the majority of the experts considered knowing about capabilities of co-workers as an ideal scenario, in order to receive help and improve outcomes. However, some experts outlined,

it is rarely feasible within larger organizations. Only experts of case 2 and one expert of case 3 outlined no need to spend extra time with co-workers in order to get to know them privately.

4.4.3. Process stage

In addition, the following key drivers of relational and behavioral dynamics were individuated as essential. In communicating and negotiating with professionals from other fields, experts within all three cases named flexibility within interacting with co-workers as important.

Experts of case 1 and 2 added, that besides adaptiveness, assertiveness in pursuing own ideas is relevant.

Respect towards other disciplines was seen as crucial among experts within every case. Experts of case 1 and 3 mentioned the importance of not intruding too much into professional competencies. On the other hand, experts of case 3 saw in the intrusion often the added value by achieving a result that would otherwise not have been generated. Compromising on individual and department goals was moreover seen as necessary within interdisciplinary collaborations, especially in case 1 and 3.

Moreover, the most relevant findings in terms of interdisciplinary learning dynamics are the value of evaluation processes for personal and professional development, mostly found among experts within case 1 and 3. Experts from case 2 saw the evaluation of a project only as valuable, if they would continue working with same co-workers in the future. Moreover, interdisciplinary experience, either within the own department or from prior collaborations, was seen as a facilitator for future interprofessional processes within all three cases. Interestingly, experts of case 1 and case 3 mentioned, the need to find a common language with experts of different fields, often achieved through prior similar education with the other expert.

4.4.4. Result: multilayered educational media

In order to answer the second research question on how multilayered educational media are created in museums, the following findings emerged.

4.4.4.1. Idea creation

The multilayered educational product analyzed within case 1 was inspired by current events affecting the museum, the idea was further developed within a brainstorm among key stakeholders of

different departments. However, the board of directors gave the initial input to present the restoration to the museum's audience. By comparison, the idea for case 2 solely emerged from a curator aiming at presenting current conservational research for a specific art work. On the other hand, the idea of case 3 was developed by the education department in discussion with representatives of the target group.

4.4.4.2. Production

According to the findings of case 1, moreover, an educational product should be tailored to the specific target group and oriented towards the mean conveying the information. In respect to the content, emphasis was put on selected, comprehensible but nevertheless complex information. Similar as in case 1, experts of case 2 expressed the need of a comprehensive content translation. However, one expert expressed no need in explaining too complex scientific issues within an art museum. Within case 3, experts again agreed on an understandable translation of the content towards the audience. Nevertheless, opinions differed slightly among the respondents. Similar to case 2, one expert argued content should not include to many scientific details. All in all, educators within all three cases preferred concise and simple content, while conservators and scientists emphasized the need for explaining scientific principles thoroughly.

4.4.4.1. Objectives

Lastly, the projects seem to pursue several objectives. Within all three cases, the inclusion of a large and diverse audience through the abovementioned comprehensible translation of the scientific project was aimed. Only for case 1, the showcasing of the painting throughout the conservation process, instead of removing it from the gallery, was found as an essential goal and mission towards the public community. For case 2, a prolonged engagement with the product was a main goal. For case 1 and 3, the disclosure of conservation science was found to be a further main goal. Overall, the educational goal to teach visitors more layers of information, besides the art history data, was a significant finding among all three cases.

5. Conclusion and Discussion

The main purpose of this research was to investigate how museums can generate multilayered educational media through the process of interdisciplinary collaborations. Concretely, by adopting the qualitative research method of comparative case studies, this Master's thesis has aimed at answering the posed research question: *How can museums generate multilayered educational media with interdisciplinary processes?*

As mentioned within previous chapters, the museum as a social institution strives to generate educational value in order to serve the wider community, mainly through the translation of exhibited artefacts and their meaning to its audience (Breward, 2011; Falk & Dierking, 2000; Hooper-Greenhill, 2010; Kotler et al., 2008; Porter, 2006; Wong, 2015). This translation of meaning traditionally takes over the role of educational products (Wong, 2015). As artefacts or cultural heritage in general contain multiple layers of meaning, the translation of meaning often occurs in collaboration with diverse museum professionals in order to convey a multifaceted, holistic taxation of knowledge (Breward, 2011). Therefore, the museum aims at appealing to different visitor groups, that are divided by different interests as well as experiences and knowledge bases (Falk and Dierking, 2000; Hooper-Greenhill, 2000). The before mentioned group process, involving different professionals, is considered as highly complex. Professionals engage in a collaboration with co-workers from different disciplines, educational backgrounds, often contrasting department goals and perspectives (Bronstein, 2003; Körner et al., 2016; Zwarenstein & Reeves, 2006). Moreover, organizational and environmental restrictions can, additionally, hinder effective workflows (Hall et al., 2008; Sicotte et al., 2002). Since limited previous research has been solved on interdisciplinary collaborations within museums (Breward, 2011), this research paper aimed at conceptualizing which drivers facilitated these processes.

Overall, the thorough analysis of the three cases, including data from expert interviews and secondary research, enabled the extraction of several significant findings that give answers to the main research question. These findings represent the most significant and reoccurring evidence within the cases.

5.1. Significant findings

In respect of the process of interdisciplinary collaboration several findings emerged. Overall, a *strong interdependence* towards team members and their expertise was recognizable within the three projects. The experts most commonly referred to the impossibility to solve the work without

professionals from other fields. Therefore, it was interpreted as a necessary condition of the process. This notion is widely accepted in the literature about collaborations in general (Kagan, 1992; D'Amour et al., 2005; Schwartz, 2006) but also within studies of interdisciplinary teams (Bronstein, 2003; Hall et al., 2008; Körner et al., 2016; Sicotte et al., 2002). Similarly, an *overall shared goal* as main condition in order to engage in team practices has been investigated by numerous studies (Batorowicz & Shepherd, 2011; Billups, 1979; Bronstein, 2003; Körner et al., 2016).

Interestingly, the necessity of a team coordinator in order to align individuals towards the overall goal and concretize raw ideas was a common finding with regard to team roles. This can be seen as a compromise between an authoritarian team leader, as suggested by Zwarenstein and Reeves (2006) and a shared authority among all team members. However, latter was individuated within the literature as element of collaborations (Kagan, 1992; Schwartz, 2006), experts feared a loss of focus, missing deadlines and the pursuit of individual goals rather than overall objectives as consequences of a lack of coordination. Significantly, the analyzed projects were all guided by a team coordinator. Hence, the organizations valued the presence of one guiding individual. Nevertheless, the clear definition of team member roles was seen as important among the literature (Berg-Weger et al., 2007; Nicholson et al., 2000; Norris et al., 2016).

As to important relational and behavioral dynamics within interdisciplinary collaborations, *flexibility* and an *openness towards the collaboration* in general, as well *towards other professionals* were recurring findings. Accordingly, a similar pattern of results was obtained in several research studies (Bronstein 2003; Lanham et al., 2009; Marzano et al., 2006). Moreover, the challenge to *compromise* between department goals and overall museum goals seemed challenging among interdisciplinary teams. The most occurring conflict of goals was found to be between museum educators striving for the inclusion and engagement of a broad audience and conservation scientists aiming for a precise and detailed explanation of technical principles. A solution was found in communication efforts such as listening, asking questions and face to face meetings. These findings represent no surprise, since research stressed the importance of a well-functioning communication among team members (e.g. Berg-Weger et al, 2007; Hall et al., 2008; Marzano et al., 2006).

A further main finding connected with relational dynamic is the *respect* towards other disciplines' boundaries and expertise and has been stressed by the research of Marzano et al. (2006) and Lanham et al. (2009) as key driver of interdisciplinary collaborations.

In light of learning activities among multidisciplinary teams, experiences with prior interdisciplinary environments or processes, were seen as improving subsequent ones. This finding slightly disagrees with Van Rijnsoever and Hessels' study (2011), arguing that, after a certain amount of time the willingness to collaborate among professionals decreases, because the professional already

incorporates the additional knowledge provided by the interdisciplinary team. Contrary to the findings of Marzano et al. (2006), it was not demonstrated, that natural scientists would be less able to collaborate with other disciplines. Conversely, a scientist's ability to collaborate well was attributed to a typical ability of analytical thinking, less emotive communication, and problem-solving abilities. However, I speculate that this might be influenced by professional stereotypes. Interestingly, often experts found, their own discipline would be interdisciplinary by nature and therefore facilitate the process.

In respect to the creation of multilayered educational products in general, it is interesting to note that, the inspiration source of multilayered educational media was often connected with current exhibitions or events important for the museum. Furthermore, brainstorming was often considered a useful tool to create the product's idea, confirming the argumentation of Dean (2015).

With regard to the production of educational media, a promising finding was that multilayered educational products need to be phrased in a comprehensible language in order to be understood by a broad audience. Similarly, Wong (2015) and Cameron (2008) outlined the necessity of a museum to encode meanings in an understandable way to their visitors. Accordingly, the results demonstrated, complex issues should not be avoided but the effort invested in order to create a concise and clear explanation. The analysis, moreover, found evidence for the need to orient the educational product around a niche target audience. This notion is in accordance with findings reported by Chong (2015).

Individuated objectives and results of multilayered educational goals are oriented on the museum's mission. The most prominent finding in this matter was to create an *educational outcome*, especially by adding scientific information. Numerous scholars outlined, education as an important mission of the museum (e.g. Anderson et al., 2015; Falk & Dierking, 2000; Hooper-Greenhill, 2006). Therefore, it comes as no surprise that main operations of the museum are oriented around an educational goal. A sub-goal of education was found as engagement of the visitors. This is in agreement with literature around audience-research (Black, 2016; Falk & Dierking, 2000; Grøn, 2012; Lang et al., 2006; Wong, 2015).

A further reoccurring finding was the inclusion of a broad and diverse audience. This seemed to influence behaviors and processes throughout the generation of the multilayered educational product. In fact, Falk & Dierking (2000) expressed it as challenging for a museum to appeal to myriad individuals, diverse in experiences, interests or education.

An unexpected finding in this regard was the importance to offer museum visitor access to otherwise hidden tasks and operations. This can be seen as an urge to strive for transparency and disclosure towards the public community.

The analysis did not individuate significant evidence for an overall economic objective of multilayered educational media, as by contrast suggested by Black (2016) and Kotler et al. (2008).

To summarize, the findings confirm, a museum's need to engage into interdisciplinary collaboration in order to grasp and, subsequently, translate the multifaceted and complex nature of exhibited objects. The main motivation to produce the multilayered educational media was found to be oriented around audience needs. Moreover, it became apparent, the challenging and complex team functions among different professionals are in need of guidance and coordination in order to structure divergent creative flows. Moreover, so called *people skills*, as a personal willingness to engage in collaboration and compromising on own goals for a shared overall goal have been found crucial in order to successfully engage in interdisciplinary collaborations. Lastly, the more professionals are used to work interdisciplinary, the more facilely will the collaboration proceed.

5.2. Limitations and further research

This paper aimed at investigating how interdisciplinary processes were solved in museums in order to produce multilayered educational products. Analyzing the contemporary idea of interdisciplinary collaborations within museums in relation to their main purpose of generating educational value, the following few limitations arose. These limitations could further act as stimulations for future research.

Firstly, the selected cases were oriented around interdisciplinary projects within museums from the Netherlands and the United States. However, two projects were placed within the Rijksmuseum. Therefore, as resulting in the comparison of the cases, findings were similar with regard to organizational structure and culture among two cases. Therefore, in order to achieve a deeper variety of findings and a more accurate comparison, a multiple case study research, including projects from different museums could be conducted as further research.

Secondly, since one of the goals of this research was to understand, how multidisciplinary teams within museums operate, further expert interviews might have been conducted including professionals from other fields of the organization.

Thirdly, since a case study allows a myriad collection of different evidence in order to answer the research question, the conduction of an audience-perception study in form of a survey could further

examine how multilayered educational media are perceived and valued among visitors. As mentioned previously, one of the main goals of these products is to educate and appeal to a wide audience. Especially, the appeal of scientific and conservational knowledge to the average visitor investigated through visitor-surveys could be a valuable addition to this research.

Lastly, the theoretical and conceptual framework of this study covers the interdisciplinary process in a broad manner, including different aspects such as relational and behavioral dynamics contrasting with coordination and team composition aspects. This was found necessary due to the lack of previous research about interdisciplinary collaborations in museums. However, a more narrowed analysis of either socio-emotional relations among team members or a mere focus on organizational and environmental factors and constraints, would be further significant to research.

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Appendix A : Interview Guide

Introductory text

My name is Anna Luksic', I am enrolled at the master's program *Media and Creative Industries* at the Erasmus University in Rotterdam, the Netherlands. I am currently writing my master thesis in cooperation with the Rijksmuseum and the Art Institute of Chicago on how museums' can generate multilayered educational media through interdisciplinary collaborations.

First of all, thank you for taking the time and participating in this research. The research aim of this study is two-fold. Firstly, it wants to gain a deeper understanding of the development of interdisciplinary collaborative work practices within museums. The first section of the interview will, hence, ask you about your experiences and opinions on drivers of interdisciplinary workflows. Secondly, my thesis aims at understanding and analyzing how multilayered educational media are created. Therefore, the second half of the interview is dedicated on your perception on these products.

By engaging in this interview, you give me the consent to audio record and transcribe this interview for the academical purposes only.

Please note that the interview will not be anonymized, and the interview and the results will only be used for the purpose of this dissertation.

You are always free to interrupt the interview, ask for clarification or not answer any particular question, at any time during the interview.

If you are ready, we can start!

Interdisciplinary processes

"Do you think interdisciplinary collaboration is important in museums? If so, why?"

"What are your concerns when engaging in a new interdisciplinary team project?"

Key foundations

"How dependent are you from your co-workers?"

"Is interdependency fundamental in interdisciplinary collaborations? If so, why?"

"Are clear, shared goals fundamental in interdisciplinary collaborations? If so, why?"

Design-Stage

"What is important when composing a new team and why?"

- Member's engagement with topic
- Size
- Inclusion from start

"What is important in terms of coordination efforts?"

- Clear tasks
- Clear responsibilities
- Clear capabilities of colleagues
- Time with colleagues outside work
- Written guidelines and action plan

Process-Stage

"What are important behavioral-relational dynamics in interdisciplinary collaborations?"

- Compromise
- Communication skills (listening)
- Respect (Democracy of talents)
- Flexibility
- Trust

"How do you evaluate the project?"

- Time: During process or/and afterwards
- Immediate corrective interventions

"Does your prior education influence interdisciplinary collaborations today? If so, why?"

"Do your prior experiences with interdisciplinary collaborations facilitate interdisciplinary collaborations today? If so, why?

Outcome: Multilayered educational media (Mem))

"How was the idea for this project generated?"

- In collaboration with whole team
- Other sources outside team
- Brainstorming
- With educational purpose in mind

"What is important considering the production of Mem?"

"What is important considering the content of Mem?"

- Complexity of information
- Amount of information
- Relevant layers

"What is important considering the mean of Mem?"

"What are/were goals and wished outcomes for the project?"

- Inclusion of wide audience
- Education
- Profit/Sponsorship

Appendix B: Coding tables

Selective Code	Axial Code	Open Code
Key foundations	Clear, overall goals	Clear goal: neccessary
		Clear goal: avoid time waste
		Clear goal: synergy
		Clear goal: written down
		Goal: shared
	Interdependence	Interdependence: expertise
		Interdependence: given
		Interdependence: research
		Interdependence: ressources
Design-Stage	Team composition	All actors involved
		Equal power of members
		Expertise needs to fit goal
		Guidance
		Coordinator: brings focus
		Coordinator: empathic
		Leader: neccessary
		Leader: not neccessary
		Moderator: creative aspects/brainstorms
		Size: managable
		Sub-Teams: if too many stakeholders
		Assumption: Topic engagement
		Process: Unfamiliar colleagues
	Coordination efforts	Budget: guides decisions
		Capabilities: clear
		Capabilities: ideally clear but not feasable
		Challenge: time
		Deadlines
		Decision: Board of director as final authority
		Decisions: clear
		Department duties

		Expectations: clear
		f2f meetings for new information
		f2f meetings: avoid rumors
		f2f meetings: compromise/consensus
		f2f meetings: increase with project-process
		f2t meetings: regular information exchange
		ff2f meetings: enhance compromise
		Formalization: necessary
		Personal time: ideal, but not feasable
		Personal time: not given
		Personal time: not necessary
		Personal time: senstitive topic
		Personal time: team harmony
		Project management department: coordination
		Rational workflow process
		Responsabilities: clear
		Shared tasks: not necessary
		Space barriers
		Tasks: change within process
		Tasks: clear
		Time waste: broad goal/tasks
		Time waste: too many actors
		Written Action Plan: clear
		Written Action Plan: clear responsabilities
Process-stage	Relational/behavioral factors	Appreciate other's expertise: facilitator
		Assertiveness: facilitator
		Collaboration readiness: facilitator
		Collaborational readiness: ifacilitator
		Communication: facilitator
		Communication skill: listening
		Compromise: assertiveness
		Compromise: Different department goals
		Compromise: facilitated through board of directors
		Compromise: for shared goal
		Empathy/Sensitivity: facilitator
		Flexibility: facilitator

		Flexibility = Openness
		Flexibility - Assertiveness
		Flexibility: idea of others hard to accept
		Flexibility: let own idea go
		Friction among different disciplines: Facilitator
		Language mirroring
		Personal relationship: valuable
		Respect: facilitator
		Respect: professional boundries
		Trust: facilitator
		Trust: challenge
	Interdiscplinary learning	Discipline art history: interdisciplinary
		Discipline: fosters rationalism
		Evaluation: about project outcomes
		Evaluation: catharsis
		Evaluation: for development
		Evaluation: ideally same colleagues
		Evaluation: needs time
		Evaluation: not about personal conflicts
		Evaluation: only special projects
		Evaluation: orally
		Evaluation: standard
		Multidisciplinary discipline: valuable
		Prior education: improves problem solving ability
		prior education: same language as colleagues
		Prior experience: dependent on situation
		Prior experience: facilitator
Outcome: MEM	Ideation	Idea extension: heads of department brainstorm
		Idea extension: preservation research
		Idea generation: board of directors
		Idea generation: brainstorm
		idea generation: curator
		idea generation: department
		Idea generation: individual, brainstorm, 3rd outside party

		Inspirationsource: conservator finding
		Inspirationsource: determined by different goals
		Inspirationsource: exhibition-addition
		Inspirationsource: existing resources
		Inspirationsource: National Science Foundation Grant
	Production	Production: automatically, since people are multilayered
		Production: Empathy
		Production: IC
		Production: IC 90%
		Production: impossible individually
		Production: inclusion of every perspective
	Content	Content: audience interested in tactility
		Content: accessible language
		content: can be complex
		Content: complexity needs more explanaition effort
		Content: comprehensible
		Content: compromise for audience
		Content: determined by museum collection
		Content: determined by platform
		Content: determined by target audience
		Content: essence, short
		Content: expertise contributes to hollistic understanding
		Content: Explanation of causality
		Content: Explanation of functional principles
		Content: Explanation of what and why
		Content: Facts supported by evidence
		Content: influenced by education
		Content: layer is either creation story or provenance
		Content: less research driven, presentationoriented
		Content: linkt to other means
		Content: multilayered
		Content: multilayered when added value
		Content: Multilayerer-communication not always necessery

		Content: not about prestige of museum
		Content: not overwhelming
		Content: scientific information can be too complex for art museum
		Content: selected
		Content: universal
		Content: visible
	Mean	Mean: Audio guide
		Mean: can change in the process
		Mean: close to object
		Mean: Combined to speak to diverse learning types
		Mean: dependent on budget
		Mean: determined by collection
		Mean: determined by exhibiton
		Mean: determined by staff disposition
		mean: digital label
		mean: digital label speaks to digital learning affine visitors
		mean: digital label-deeper understandig
		mean: digital label-prolonged engagement
		Mean: digital platforms-additional information
		Mean: digital platforms-in combi with analoge labels
		Mean: digital platforms-not for every target group
		Mean: digital platforms-sparingly used
		Mean: In-Zoomers
		Mean: Interaction with experts
		Mean: needs to be tested
		Mean: Teacher event
		Mean: text, challenge
		Mean: tour guide
		Mean: Visual media most appropriate
		Mean: Wall text
	Outcome	Accessibility: Outcome
		Education: Outcome
		Education: Outcome questioned
		Engagement: outcome

		Inclusion: Outcome
		Preservation: Outcome
		Research presentation: Outcome
		Sponsorship: Outcome
		Transparency: Outcome
		Talent recruitment: Outcome