Collectie van de Gentenaar

4.5.3 Model for cost and benefit evaluation

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1. Introduction

CoGhent began as a European Urban Innovative Actions project (hereafter UIA) running over three years under the leadership of the City of Ghent. The project is composed of a consortium of Group Ghent members (cultural institutions) and academic, non-profit and commercial partners. Each project partners is partly subsidized and partly provides its own input. The main focus of a UIA is to test innovative solutions to complex urban challenges in Europe.

CoGhent unlocks cultural heritage data in such a way that it is maximally exchangeable, retrievable and reusable and, as pioneers at an international level, using Flemish standards (OSLO) and technology (LDES). It implements a Digital Asset Management system that is linked to the institution's internal Content Managements Systems using LDES technology. This way, thousands of objects, stories, and documents are digitized and can be shown to the public. Different methods for bringing this collection closer to the public are applied. A web platform is created where users can browse the collections and create personalized stories with the documents found. Additionally, they can also upload content that is related to the heritage of Ghent. To bring the public even closer, an immersive experience room has travelled over three different locations in Ghent, where visitors can see the collections and add personal stories that are displayed on a wall of screens. Besides the development of novel technologies, a lot of effort is put into connecting with the different neighborhoods and interactions with citizens. Many initiatives around the box have taken place to connect individuals with each other and the cultural heritage of Ghent.

This deliverable has the goal to identify the benefits and costs of the CoGhent system in a qualitative manner and provide methods for quantifications. This output, together with deliverable 4.5.1, is relevant for stakeholders to motivate further investments and for other parties to motivate similar investments. Offering insights in the benefits and components is important to understand the value creation and serves as input for business model development. This deliverable can support future decision makers and provide insights to public stakeholders on how to evaluate comparable projects.

In the remainder of this introduction definitions of the different systems that are used by the institutions will be provided. In section 2, the applied methodologies are described. Sections 3 up to 6, discuss the results obtained.

1.1 Definitions for management systems in cultural heritage

Digital asset management (DAM) focusses on the management and processing of digitally stored assets or pieces of information (2005, Wager, S.; DAM Maturity Model). DAM system is used for planning, creating, managing, and distributing media content asset to its users (2017, Danhy, T & Badung, Y.). A DAM system has several key characteristics/functionalities that are listed and summarized in the table below (The DAMPlaybook; The DAM Foundation; 2017, Danhy, T & Badung, Y.)

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Table 1: DAMS functionalities

Ingest	Ingest metadata and assets including images, documents and audiovisual files. - Individually or in bulk. - Need for identifier to each digital asset. Importance of metadata is stressed: Some of the more innovative DAM vendors are starting to think of digital assets as entities, with information intrinsically associated.
Secure	Secure assets and metadata to ensure they are not misused or published prematurely. Focus on access, permissions and user management (inside DAMS environment) but also on rights management (outside DAMS environment) For example, usage of access control list (ACL) This element is often missing in DAM systems
Store	Store assets and metadata of different types Focus on the ability to handle different types of digital assets and metadata, and on customization. The more able DAMs will have what we'll call metadata profiling, which is any technique which aims to streamline the process of metadata markup, or personalize the experience based on asset type, user permissions or suchlike.
Render/transform	Transform assets from one format to another All DAM systems must be capable of converting file types, changing image sizes and resolutions and making at least simple edits such as cropping. It is important to consider how much automation is possible.
Enrich	Enrich and analyze via the use of audited data Goal to track user behavior, improve working practices and improve the way content is delivered
Relate/Versioning	Relate versions, derivate and similar assets. One asset which might have multiple versions which can be accessed if required. There must also be facility to create other types of relationships between digital assets.
Process	Process in the management, creation and review of assets with workflow tools. Via programmed workflows, DAMs allow for a decentralized workforce to collaborate in a centralized system. Requirements of this workflow depend on the nature of the business.
Find	Find through metadata, collections, workflows and access control tools. Filters, queries and boolean operators are examples of the type of things we now expect. Search should also be made more efficient with stemming, fuzzy search, and search facets. Your search requirements rely to an extent on your workflows and the nature of your business.
Preview	Preview different file types on the DAM without downloading them to reduce time when searching in DAMS Without this capacity DAM is nothing more than a file storage system where you need additional software to access your digital assets.

Produce, publish	Produce and publish internally and externally utilizing integrations and proprietary tools. This DAM function may be as simple as generating a URL on ingest or as complex as allowing users to build collections of items for sharing with a workgroup. Possibly the most common publishing medium is CMS, indeed many DAMs were built from CMS and many others alongside one.

Besides system requirements, the DAM Maturity model provides a more holistic approach. It addresses the requirements for 4 dimensions; people, information, systems and processes. The people dimension is crucial for the management of the DAMS and suggests several roles e.g. asset owners, DAM managers etc. This will be used in the value network analysis for task 4.5.1.

Media Asset Management system (MAM) is mostly used as content repository and content delivery solution which focusses on media types (2017, Danhy, T & Badung, Y.; 2005, Wager, S.). A DAM and MAM system have many similarities but a MAM is in practice more preferred for large audiovisual files (Backblaze, 2022; Zeticon)

A third system utilized for asset management is a Collection Management System or CMS. A CMS tracks the information about a physical asset and its movements, e.g. where it is stored (2020 Crockett, E.). Visual material is often not stored on a CMS.

2. Methodology

The different building blocks of the CoGhent system will be identified as well as the functionalities that they enable for the different stakeholders. Secondly, benefits will be mapped to the different building blocks as well as different costs. The difference in importance of functionalities will be highlighted, this way decision makers can prioritize in functionalities, and thus costs, when investing in similar systems. Identifications of cost and benefits and additionally prioritization of functionalities will be performed through in-depth interviews and evaluation of results during the project meetings. A comparison with other systems (both substitutes and complementary systems deemed relevant during interactions with partners) based on functionalities of the CoGhent system will be provided.

2.1 Change Request

A proposal to replace the original deliverable D4.5.2 (quantitative model) and thus also impacting the report D4.5.3, was submitted. We suggested to change the title of D4.5.2 from "Model for cost and benefit quantifications" to "Model for cost and benefit evaluations."

Originally the proposal suggested:

“4.5.2 Model for cost and benefit quantifications

A quantitative model will be developed to model the Total Cost of Ownership (TCO) of this project. This will include both the CapEx (e.g. investments in technology, infrastructure, education, etc.) and operational expenditures (e.g. people to facilitate participation, continued support for unlocking private collections, etc.). On the other hand, it will also describe and quantify the beneficial impact of the project for the different stakeholders. Both cost and benefits are important input to formulate a sustainable value network and supported business models (D4.5.1). A series of intermediate validations by key stakeholders will contribute to support of the results.”

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Instead of quantifying the results a qualitative model of costs and benefits for each of the functionalities offered by the CoGhent system will be presented. Quantification methods will be provided but will not be applied. This way, we can provide methods and suggestions for quantification when there will be a possibility to measure the identified benefits. Focus will therefore by on providing a methodology and a future-proof approach to evaluate the project. Rather than making accurate estimated for costs and benefits (which is impossible given the current stage of implementation), focus will be given to comparing the CoGhent system to other solutions (as a lot of potentially relevant other solutions popped up during the course of the project so far and the related discussions).

The following reasons were provided to motivate the change request:

• The development of the technical deliverables is delayed, which implies that the system cannot yet be used properly by the cultural heritage institutions. This results in an inability to measure benefits such as process improvements e.g. less time investments.

• The degrees of freedom regarding implementation of new disruptive changes are limited. This results in less flexibility towards business models. Technical expertise is spread within the project as well as the IPR. This limits the possibilities for use of the software/hardware thereby limiting both the go-to-market potential and the relevance of certain aspects cost/benefit quantification.

2.2 Analysis

A techno-economic research approach is applied where project costs are evaluated and compared to the benefits, in order to evaluate the investment decision. Further, an qualitative analysis of costs for each outcome scenario of the CoGhent project will be provided in deliverable 4.5.1. This deliverable will focus on identifying the costs and benefits and provide the tools to quantify them. The benefits of cultural heritage systems such as a Digital Asset Management System or DAMS are first studied in literature. Secondly, semi-structured qualitative interviews will be organized to question the cultural heritage institutions about the perceived benefits of those same systems. Both results will then be compared. For the analysis of the costs, the work breakdown structure methodology will be applied to identify all relevant activities and their respective costs within the project. This methodology provides a structured overview of the project as illustrated in figure1. Further analysis of costs depends on different outcome scenario’s and will thus be reported in deliverable 4.5.1.

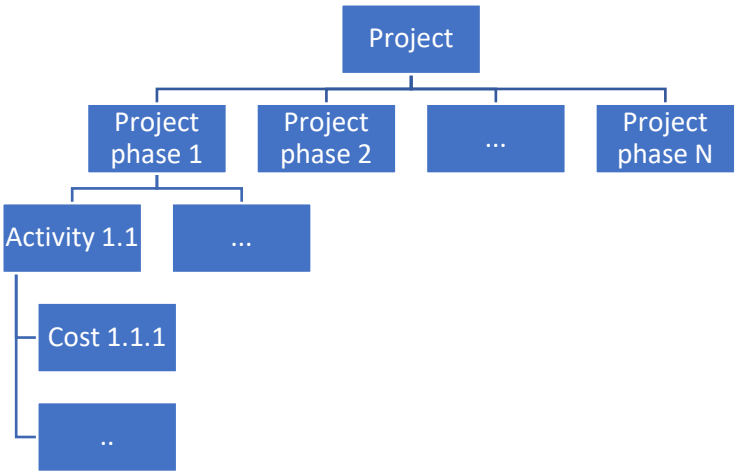

Figure 1: Work Breakdown Structure

Since not all benefits are quantitative in nature, this deliverable proposes a methodology for investment analysis considering social benefits, called the Social Return on Investment or SROI (Bhatt & Hebb, 2013; Jura Consultants, 2008). This methodology includes the social value creation resulting from a project by transforming social benefits into financial estimates. As stated by Jura Consultants (2008) this methodology is identified as having many benefits for the sector of museums, libraries and archives. However, at the current state of the project, it is not possible to include all benefits and costs within this deliverable.

2.3 Interviews

To identify the different (expected) benefits from the CoGhent project, we have chosen to organize semi-structured qualitative interviews with the different cultural institutions that are part of the CoGhent project. The target group for the interviews was the 5 different cultural institutions that are part of the CoGhent project. Therefore, Design Museum Gent, STAM, Industrie Museum, Huis van Alijn, and Archief Gent. Each institution was contacted and interviewed to identify the benefits they experience or identify by using the platform infrastructure provided by the project. In the table below, chronological oversight of the different interviews can be found. In this oversight, the cultural institution, the interviewee, and the interviewee's function are shown. As seen in the table, the ID section identifies a specific interview and shows that at some cultural institutions, multiple interviews were conducted.

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Table 2: Interviewees

ID	Cultural institution	Name interviewee	Function interviewee
1	**STAM**	*Bram Janssens*	Collections manager
2	**STAM**	*Brecht Dewilde*	Researcher - Exhibition maker
3	**Design Museum**	*Olivier Van D'huynslager*	Strategic Project manager & Content Lead (CoGhent) Head of digital (Design Museum)
		Sofie Teugels	Coordinator Data Intervention Team
4	**Industrie Museum**	*Thomas Desmedt*	Digital Strategist
	Huis van Alijn		
5	**Archief Gent**	*Guy Dupont* *Tine Decosemaker*	Archivist and curator Project employee CoGhent
6	**STAM**	*Chloë Van Gelder*	Project employee CoGhent

Table : Oversight institutions and representative interviewees

For the interviews, we chose to use a semi-structured qualitative approach. Because of this, we were not obligated to strictly use and follow a formalized list of questions. As a result, follow-up questions were asked during the interviews that were not prepared in the questionnaire, often related to the operations within the infrastructure and how components are related in terms of data streams. As a result, new information could be gathered about the infrastructure and its functioning, and we could gain better insight in the operations within the cultural institutions.

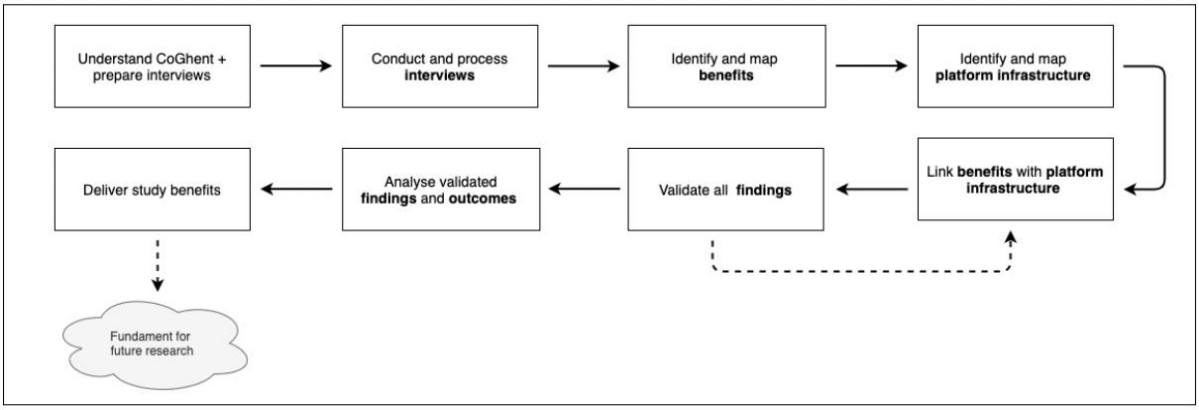

Figure 2: Methodology of interviews

3. Digitalization of cultural heritage

Benefits of digitalization in general mentioned in literature of cultural heritage and within the interviews are summarized in Table 3: Benefits of digitization of cultural heritage. These benefits can be attributed to the project as a whole and not to one specific component.

Table 3: Benefits of digitization of cultural heritage

Benefit	Literature	Interviews
Collections are no longer location-bound. Can	Heritage enthusiasts are no longer bound to a location to consult a collection. This makes it possible for visitors to immerse themselves in	Often people find something in their attic without really knowing what it is. Instead of physically going to a museum, they can explore the online

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be consulted online through central system.	different collections, regardless of location and geographical boundaries (Treasured, 2022).	collection themselves and see what the piece is thanks to the online collection. By making a collection or pieces of a collection available online, people will interact more with the collection or the piece, which in turn will lead to more responses and more questions. People will therefore be more active with the heritage piece. By digitizing a piece and making it available digitally, for example, researchers no longer have to remove the physical object, but can use the digital material to conduct their research.
Opening "hidden" pieces	Opening pieces that are normally not exhibited: most museums only exhibit a part of their collection to the public (8%). By digitizing these pieces, they can also be studied/viewed by heritage enthusiasts (Treasured, 2022).	The public is approaching collections in a different way. They are already noticing a discrepancy between the objects that museums put on display that they find interesting and the objects that people find interesting themselves. Appreciating objects that normally would not be exhibited in the museum. For example, a piece that normally stands in the depot and was not planned to be exhibited in the future would also be made available to the public. This allows the public to appreciate the non-visible pieces of a museum. This confirms that there is also an audience for the non-displayed pieces of a cultural institution.
Bringing younger generations into contact with cultural heritage	"Nearly all of the smartphone owners surveyed (89%) use the internet, so museums potentially have an untapped audience if they're not putting mobile websites and communication as part of digital strategies." This could also be the best way for cultural institutions to get in touch with millennials (Axiell, 2016).	Not mentioned

Better preservation of heritage		By digitizing pieces, they will be manipulated less physically, for example, by touch or movement. This will greatly reduce the cost of repair and maintenance. The advantage of digitization is that you can be sure to bring your material to an advanced and safe storage depot for storage.

4. High-level technical building blocks

For this techno-economic analysis, we started from the technical building blocks of the CoGhent system and those that are directly linked to it. Each of these building blocks lead to different functionalities that can be of value to certain users. In this section these blocks are described as well as the functionalities and benefits they bring forth.

For now, not all functionalities are present. This document will serve as an indication for which functionalities are perceived as beneficial to different partners. We captured these perceived benefits during a series of interviews.

Overall benefit of project mentioned during interviews:

“The introduction of the DAMS has provided specialized resources that were previously not available to efficiently set up a search system. These resources, including time, funds, and personnel, are now available thanks to the CoGhent project.”

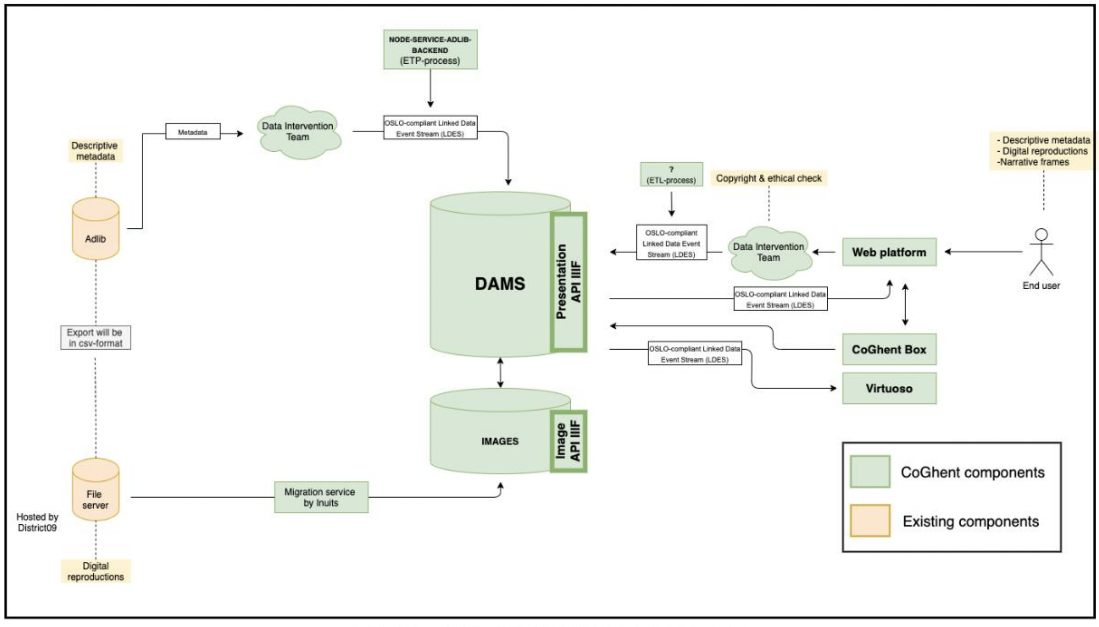

Figure 3: Overview of CoGhent system

4.1 CoGhent functionalities

The table below provides a high-level overview of all functionalities that were mentioned or discussed with project partners. This does not mean that all of them are present in the CoGhent

DAMS. For more details see report from project partner Inuits: https://drive.google.com/file/d/1GzdgD6gkVfmpSuv1AzoqPSi8O0TXNGw9/view?usp=share_link

In the following paragraphs we also included one the data team. This is not a technical component but nevertheless a very crucial team of experts that holds a lot of knowledge regarding the CoGhent project.

Table 4: Functionalities mentioned in interviews

	DAMS	LDES	Image storage	Box	Web Platform	IIIF
Read/search	x		x		x	x
Storage	x		x			
Validation	x				x	
Upload image/data		x				
Re-use of cultural heritage	x			x	x	
Zoom						x
Annotate	x				x	
Link systems		x				
Adding metadata		x				
Download data	x					x
Exchange data (interoperability)	x	x				x
Different access roles	x					
Change data	x	x				
Preservation						
Auto-complete	x				x	
Create derived image(s)						x
Integration		x				
Make collection(s) online (public) available				x	x	

4.2 CoGhent building blocks

4.2.1 Linked Data Event Stream (LDES)

An event stream is a collection of objects with version control and can be updated at any time. This way, consumers can easily discover new changes. The LDES within CoGhent is an API that connects existing CMS systems with new systems such as the DAMS. It ensures synchronization and replication of data. LDES can be used to publish both open and non-open data.

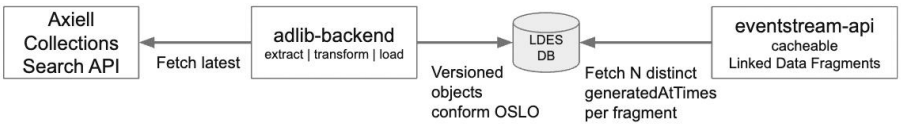

Fig. 1. Creating an LDES from Axiell collections uses two building blocks and an LDES DB.

Figure 4: LDES

Source: Van de Vyvere et al. 2022

In CoGhent, an LDES is implemented for each new system that wants to export data to the DAMS. An LDES does not publish images. It publishes manifests. A manifest is linked to one object, contains metadata about that object and refers to an image with an ID. One object can have multiple images related to it. The published data is structured as linked (open) data according to the OSLO standard.

Table 5: Benefits of LDES

Benefit	Literature	Interviews
Creative reuse of collections	By replicating and synchronizing with these LDESs, which can be done with the LDES client, other actors in the ecosystem can create derived query services. (Van de Vyvere, B. et al. 2022)	By using LDES, connections can be made between different objects that could result in new (creative) insights into how to manage the collection.
Sharing expertise about LDES on a large scale with other institutions/industries		CoGhent project is the first to implement LDES on a large scale and they will also share the knowledge gained from this implementation with other industries and institutions. For example, OSLO working groups are already being held to provide support to grantees who want to implement the standards in their organization.
Findability and accessibility	Linked Data Event Streams could be used to maintain and open up reference datasets to foster interoperability by advocating the reuse of the identifiers for which they are the authoritative source (SEMIC, 2022).	If you make changes to a website, the path will change, but with linked data that is not the case. This is applicable everywhere.
Increased efficiency through centralization and encourage collaboration	Institutions may request new features to the mapping algorithm, such as adding links to other external thesauri. When this happens, the ETL pipeline needs to extract every	Thanks to the LDES, work can be done more efficiently, avoiding situations where there is no uniformity of data between different systems. This is the benefit of centralization and central updates of your (meta) data and information.

	object again and append the mapped objects to the LDES. This way, older version objects are preserved and the life cycle of an object can be retained. (Van de Vyvere, B. et al. 2022) The extracted Adlib records from the institutions are returned in JSON format and are transformed to standardized Linked Data information models, this way semantic interoperability with other related Linked datasets is achieved (Van de Vyvere, B. et al. 2022). At the heart, a Linked Data Event Stream can be interpreted as a publishing strategy by which a data provider allows multiple third parties to stay in sync with the latest version of the data source in a resource and cost-effective manner (SEMIC, 2022).	Possibility for updates in bulk. It is an improvement of 'find and replace'. Currently, there is no e-depot to store scans. Therefore, they can currently link the GIAS; common information and archive system; to the DAMS as a temporary solution via LDES. The GIAS is the interface that will link to the DAMS. Connections are made between certain pieces that were previously unnoticed or links between objects that different museums did not know existed. For example, the Design Museum had a typewriter and the Huis van Alijn had a poster about that typewriter (they didn't know about each other!) Possible to create links and data exchange between different systems. The Adlib of the different cultural heritage institutions is linked to the DAMS.
Create (brand) awareness for the museums or collection		Firstly, you have the innovation, and secondly, you can access a particular piece that you would never have been able to access without linked data.

4.2.2 DAMS

Since the previous section already provides a thorough explanation of what a DAMS system is, we will only refer to the technical explanation of the DAMS by one of the partners (Inuits). In this CoGhent implementation of a DAMS, different cultural heritage collections can be connected with the use of linked data. It has multiple benefits which are listed below.

Benefits mentioned in literature and interviews:

Table 6: Benefits of DAM

Benefit	Literature	Interviews
One central uniform system	All content (in this case cultural heritage) from the different institutions will be collected in one central system (Hamm, 2022). As a result, there is also harmonization of the	Different possibilities to build APIs on top of DAMS. For example, a system with reminders for maintenance, jointly (across museums) scheduling intensive/expensive maintenance of top pieces would be interesting.

	different collections: anyone who wants to consult these will have the same (and most recently updated) version of the cultural heritage (Munoz, 2021).	Museums will be able to automate the request and publication of images without requesting them again using the DAMS. This process is now automated, resulting in time and cost savings. Professionally and standardized describe a collection The introduction of the DAMS has created an opportunity to describe all collections in a uniform, standardized, and professional way, and across projects (cf. Gent Gemapt). The DAMS could offer a solution to make the texts on the digital screens in the museum more accessible and useful by making them accessible through a central system rather than through an isolated system (e.g. CMS by Create used in STAM). Exporting texts through the DAMS would be much more efficient. Currently, to get things from Adlib to the CMS of Create, they have to export a CSV file from Adlib and then offer it to the CMS of Create. The reverse movement (CMS Create to Adlib) is prone to conversion errors, but the DAMS could provide a solution. The DAMS is publicly accessible, allowing end users (individuals) to interact with the DAMS to a certain extent. Here, they can independently search the database and download image material linked to heritage objects, resulting in time savings that can be used for other things.
Metadata for heritage	A DAMS will not only store the mediafiles, but it will also store metadata for the cultural heritage. The following information will be kept as metadata in the DAMS of the CoGhent project: collection, object number, title, title folder, folder number, description, depicted subject, photographer, printing company, street name, city, dating, legal status, and a combination of these previously mentioned elements (Munoz, 2021).	In cultural institutions, derived files of the master file are often used, resulting in a lot of storage. With DAMS, where you can access and manipulate images from the master file through the IIIF API, this results in significant savings in storage. Using a DAMS within museums promotes interoperability, the same standards, and complementary expertise. Museums will be able to quickly search for the rights status of an object using the DAMS. This was not possible in an efficient and fast way before and the exact rights status of an object was not always kept up to date.

	The maintenance of this metadata results in the following benefits: • Quickly finding and navigating between files (by using different approaches to locate the files). • No duplicates: thanks to the afore mentioned approaches and the linking of multiple objects, a document does not have to be duplicated, which in turn results in fewer errors. • By using metadata, it is possible to create clear overviews (working with views). • Often, organizations are looking for software that provides a suitable structure for information and files. With metadata, this is not necessary and the software adapts to the processes in an organization, allowing for maximum flexibility.	Discovering new links between objects: The archive has a construction drawing in its possession, the wooden pieces of which are now available in the STAM: It is thanks to CoGhent that this link came to light that the archive has the drawing and STAM has the pieces. More functionalities are possible e.g storing the dimensions of a piece of art.
Ability to perform advanced searches	Using a DAMS will make it possible to perform advanced searches on heterogenous sources (Van de Vyvere et al. 2022).	The DAMS is publicly accessible, allowing end users (individuals) to interact with the DAMS to a certain extent. Here, they can independently search the database and download image material linked to heritage objects. Additionally, the downloads have a higher resolution compared to Adlib. Faster search within a collection, for example, by using auto-complete or the advanced search strategy. Additionally, you can make use of a specific search strategy which makes it easier to find the right information.

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		Museums will be able to quickly request their public domain images. This was not possible in an efficient and fast way before. This results in time and cost savings for the museums. The downloads have a higher resolution compared to Adlib.
Limiting loss of heritage items	A DAM stores and organizes all digital assets in a central location, making them safely accessible from a single platform. As a result, files are much less likely to get lost (Canto, 2022).	
Streamlined collaboration	A DAM makes it easy for multiple contributors to quickly share heritage using upload links and special portals, rather than relying on email or physical media (Andreoli et al. 2018; Canto, 2022). This facilitates collaboration and speeds up the sharing process.	By using the CoGhent infrastructure, (meta)data regarding digital cultural heritage pieces is made publicly available. - These can in turn be consulted by external parties, such as the government, which makes it easier to identify top pieces, which can result in obtaining more subsidies. - This makes it possible to collaborate with external curators. - Government agencies will be able to extract numbers and statistics using the DAMS. - Third parties with the appropriate access rights can extract certain data without prior communication. This results in an efficient and fast extraction of information. Museums will obtain a cost saving with regard to their licenses using the DAMS: Museums currently have to purchase reading licenses for employees who do not register but still need access to the collection in Adlib. These licenses are extremely expensive. By making the collection available to everyone with a login through the DAMS, there is no need to purchase licenses per person. The DAMS can offer the possibility to offer datasets to third parties. Currently, this is done manually through email and WeTransfer. The DAMS could automate this process (excluding pieces with rights).

		More extensive management of roles and the allowed access and actions e.g. public vs cultural heritage institutions. Having knowledge of what material is available is an absolute added value in order to promote indirect communication between museums. This way, you no longer have to specifically ask each other if they have something or not. There will still be a need for direct communication between institutions for borrowing. In the future, there will be more digital applications possible with the DAMS, as it will make connections with other databases and museums (in terms of public outreach in museums).
Improved preservation	A DAM helps to preserve digital assets by ensuring that they are stored in a secure, centralized location and providing tools for managing and organizing them (Canto, 2022). This can help to reduce the risk of loss or damage to the assets. Additionally, a DAM may have features for preserving the integrity and authenticity of the assets, such as check summing or digital signatures. Even since the early 2000s, several digitizing projects curated by libraries were initiated with the intent of safeguarding the originals of valuable documents, often difficult to access, and promote digital services related to online use of digital collections (Andreoli et al. 2018).	Sustainable handling of data: The reuse of material is regulated in a sustainable way, where the information about copyright is explicitly explained to users (maker, when deceased, public domain or not...).
Stimulate reuse and visibility	In order to make this wealth of online content accessible, on various topics of appeal to a wider audience, it was necessary to modify the site design to enhance its use and	By using the CoCreationfund, one of the outcomes of the project and using the DAMS as input, people stimulated to work with the collections of heritage pieces.

	facilitate retrieval (Andreoli et al. 2018).	Using the DAMS to further open up access to heritage items on the website. Currently, this is done through an API through Adlib, which works to some extent but has limitations. The DAMS aims to promote maximum reuse by making collections available online and publicly accessible to anyone who wants to use them. Making items publicly available results in maximum reuse of the same items.

4.2.3 IIIF

Besides OSLO standards, CoGhent also makes use of IIIF (https://iiif.io/), which is a set of open standards for "delivering high-quality, attributed digital objects online at scale". IIIF makes sure that when an image is published, that the technical data on the source, e.g. licences. Additionally, IIIF allows for enabling deep zoom, comparison, structure (i.e., for an object such as a book, structure = page order) and annotation. This ensures the reusability and traceability of these images.

More info https://iiif.io/get-started/how-iiif-works/

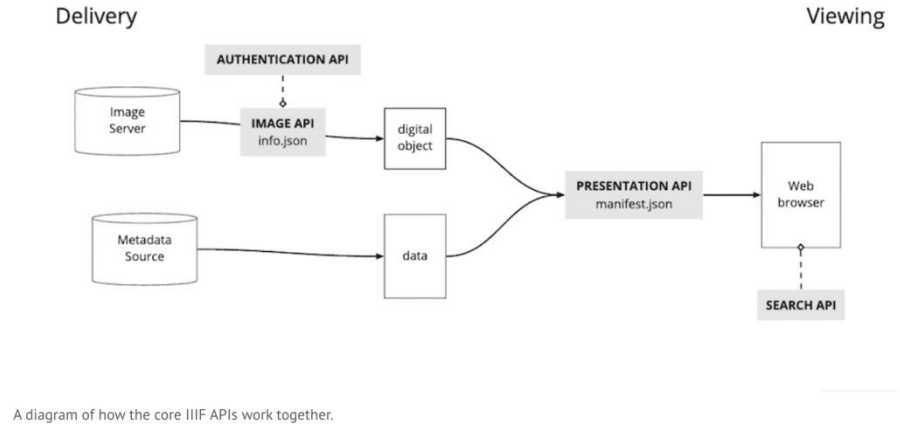

Figure 5: IIIF illustration (International Image Interoperability Framework.)

Table 7: Benefits of IIIF

Benefit	Literature	Interviews
Interoperability	IIIF is a way to standardize the delivery of images and audio/visual files from servers to different environments on the Web where they can then be viewed and interacted with in many ways (Internatioal Image Interoperability Framework).	The DAMS supports IIIF: The City of Ghent's image bank does not support IIIF. IIIF is an international standard that can promote this maximum interoperability, for example. This is a problem because, for example, the archive consists of map material and since you cannot zoom in on the original image, you will always get a derived image.

Advanced zoom functionality	IIIF allows for enabling deep zoom (International Image Interoperability Framework)	By using IIIF, it is possible to zoom in on images without creating a new manipulation of the image. This allows the user to see more details. Zooming in on an image. With the DAMS (and therefore also with the web platform), you can zoom in and do not have to work with derived images.
Storage savings	With IIIF one can directly link to a particular region and zoom level of an image (International Image Interoperability Framework).	In cultural institutions, derived files of the master file are often used, resulting in a lot of storage. With DAMS, where you can access and manipulate images from the master file through the IIIF API, this results in significant savings in storage.

4.2.4. Image Storage

Images are stored separately from the data which is stored in the DAMS. They are coupled through a manifest. There are no real benefits that can be attributed to this element alone since it is closely tied to the DAM system.

4.2.5 Data Intervention Team

The data intervention team is not really a technical component but it is of great importance to the project. For this reason we decided to include the team as a building block. Their main tasks are:

- Datacleaning: controlling content registration.
- Verifying and technical metadata coupled to the images.

Since this is not a real technical feature but the gain of human skills and knowledge during the project, no literature search was included here.

Table 8: Benefits of Data Team

Benefit	Literature	Interviews
Data cleaning and enrichment	/	Through the CoGhent project and the resulting DAMS, there has been a trend towards data cleaning and enrichment. Contacting heirs or creators to clarify certain rights results in the acquisition of new information that would otherwise not be obtained (partly because there was no real reason to contact those heirs or creators).
End-responsibility for clearing rights	/	With the arrival of the DAMS, there is now a specialized team that will be responsible for clarifying rights, which was not actively done before.

4.2.6 Web Portal

The web portal serves as a means to open up the collections and make them available to the wider public. Visitors can browse in the collections of the different partners. They can even create their own stories, meaning creating a flow of images that are related and they can save this on their

profile. Table 9: Interactions with web portalTable 9: Interactions with web portalprovides a snapshot of the number of objects present and the user interactions counted as number of stories created.

Table 9: Interactions with web portal

Webplatform - data.collectie.gent	10/2022	11/2022
Aantal unieke objecten	3.887	3.932
Aantal unieke objecten in de "Collectie van de Gentenaar"	187	25
Aantal verhalen aangemaakt door de burgers (= Aantal frames)	1	44

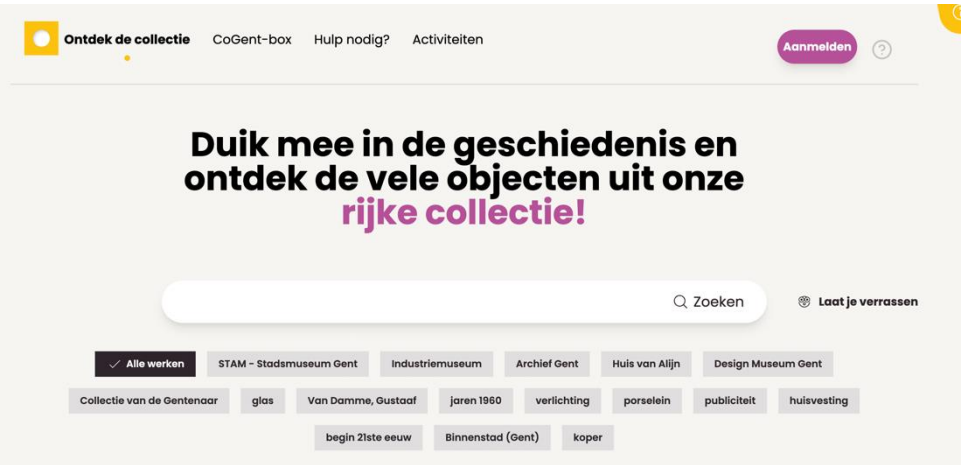

Figure 6: Screenshot from web portal

Table 10: Benefits of web portal

Benefit	Literature	Interviews
Accessibility of collections	Nearly all of the smartphone owners surveyed (89%) use the internet, so museums potentially have an untapped audience if they're not putting mobile websites and communication as part of digital strategies (Axiell, 2016).	By making the collections accessible online for a broader audience, it becomes easier for people to interact with cultural heritage without being physically present at for example a museum.
Guarantee accessibility to cultural heritage		Even if a piece from a collection is being borrowed for an exposition abroad or if it is too fragile for an exposition, the public can still access the digital version.
Reuse of cultural heritage		People are encouraged to interact with cultural heritage and use it for multiple purposes.

4.2.7 SPARQL endpoint

CoGhent also offers a SPARQL endpoint on top of a database management system for RDF Data or triple store. This way other developers can request data and use it for their own applications. Since the cultural heritage institutions did not use this component at the time of the interviews, no

benefits can be attributed to this building block. However, if we look at the consumers (systems that make use of it) one of the content partners, Design Museum Ghent, has showed the intention to use this endpoint. In literature, the ability to publish cross-domain semantic data is identified as the benefit of SPARQL-endpoints and triple stores, for the city of Ghent this is data such as public services, news articles, and parking availability (Van de Vyvere, B. et al. 2022). During the continuation of the project, monitoring of the use of this endpoint might be advised.

4.2.8 CoGhent Box

The CoGhent box is a physical space that provides an immersive and interactive experience with cultural heritage of Ghent. It is equipped with touch tables and a 180° wall of screens. This deliverable does not report benefits for this element of the project since deliverable … will report on the impact of the Box on the neighborhood. Nevertheless, the general benefits of the project also hold for this element since it can be defined as a means to reach the citizens of Ghent in order to create social benefits.

4.2.9 The 6th collection

Additionally, to the 5 collections from the content partners, the 6th collection in the DAMS is the one of the citizens of Ghent. They can upload images and information so that it can enrich the cultural heritage of the city. However, almost no content has been provided, making it hard to evaluate this part of the system.

4.3 Other relevant systems

Within this paragraph we describe other relevant systems that were mentioned during conversations with project partners. This can be both complementary systems as substitute systems for (parts of) the CoGhent system. This paragraph is included in the deliverable for completeness and as input for further scenario analysis.

4.3.1 Collection Management System (CMS)

Many Flemisch musea use the CMS offered by Flanders within Erfgoedinzicht or EIZ, called Axiell or Adlib. Musea cannot access each other collection. This CMS system is complementary to the DAMS system since it is an essential shackle in the data flow of the CoGhent system as illustrated in Figure 3: Overview of CoGhent system.

4.3.2 Meemoo: MAM

As defined in section **Error! Reference source not found.**, a MAM or media asset management system is mostly used as content repository and content delivery solution which focusses on media types (2017, Danhy, T & Badung, Y.; 2005, Wager, S.). Meemoo one of the CoGhent project partners is has developed such a MAM with focus on audiovisual material. It does not focus on visibility or opening up collections. Nevertheless, it does hold a lot of similarities with the CoGhent system in a sense that it can serve as either a complementary or substitute system. For this reason a comparative functional analysis was made between the MAM from Meemoo and the DAMS from CoGhent. Information was gathered from https://meemoo.zendesk.com/hc/nl and interviews with the director of Meemoo, Nico Verplacke and the manager of the archive team, Matthias Priem.

4.3.2.1 Products offered by Meemoo

1. MAM: Archiving of material and describing it. Different silo's, one for each content partner.
2. Front-end tools offered on top of MAM:

a. PlatformcatalogusPRO: contentpartners can access each other's collections according to the rules they choose e.g. information under embargo, VRT allows access to fiction but not to non-finction or commercial media parties.
b. Platform for education
c. Visitorstool
d. Hetarchief.be: search in metadata
e. Site 'Nieuws van de Grote Oorlog'
f. ArtinFlanders for public access

3. IIIF API on top of knowledge graph
   This is also an extension of the MAM. the metadata present in MAM follows a dynamic model. For each asset, the metadata can significantly differ from only a title to a very detailed description. Through the use of AI and alogrithms Meemoo wants to enrich the knowledge graph by generating additional information about the assets. A decision on accessibility of this API is not yet made. For different content types a separate policy of public availability and accessibility will be drafted.

4.3.2.2 Technical comparison between Meemoo and CoGhent

Table 11: DAMS CoGhent vs. MAM Meemoo

Functionality	DAMS	MAM
Ingest	(Audio)visual material: CSV file with template to couple data to audiovisual material Data and metadata: LDES as link between DAMS and CMS	(Audio)visual material: 1. Semi manual import: e.g. 10000 videotapes transfer via tapes because not possible through the web 2. Batch intake 3. Continuous intake via API Data and metadata
Secure	Access right management via KeyCloak	Additional logins are possible https://meemoo.zendesk.com/hc/nl/articles/6327416864273-Materiaal-delen-met-derden
Store	Data and metadata stored in DAMS with unique ID's Separate image storage linked to (meta)data through ID's Yes DMP, punt 2.2.4	MAM is used as a archive system by Meemoo and contentpartners. Backups are possible. Licenties can be turned off and on in MAM https://meemoo.zendesk.com/hc/nl/articles/6223353377297-Context-metadata-en-licenties
Render/transform	Via IIIF one can define different formats. IIIF allows for storing and viewing high-quality media Bulk editing of assets	Cropping of mediafiles for storage Ja, metadata be edited in MAM https://meemoo.zendesk.com/hc/nl/articles/6223359406353

	- Technical metadata in DAMS - Other metadata in CMS https://docs.google.com/document/d/10vdrdjDn9R5Ok2NkDRcGHRaBhWlDJh-kr7NVKW_DcDY/edit?usp=sharing	Meemoo will also put focus on implementing IIIF (2023)
Enrich	NA	Knowledge graph (planned, not yet implemented)
Relate/Versioning	LOD to make links between collections and thereby enriching collections Aggregates are possible eg. book = parent and child is an asset containing a page from that book https://docs.google.com/document/d/10vdrdjDn9R5Ok2NkDRcGHRaBhWlDJh-kr7NVKW_DcDY/edit?usp=sharing	Linking with other data sources (following OSLO standards) Machine learning/AI to enrich data in MAM (planned, not yet implemented)
Process	Job system is in place Through webplatform users can annotate on assets Validation of metadata on DAMS by DIT	Plural (meervoudige) files https://meemoo.zendesk.com/hc/nl/articles/6223279458193-Meervoudige-objecten-context
Find	Search via filters on assets and mediafiles, combining multiple search terms Access to collections of content partners	Extensive search via combining multiple search terms, number of results is returned, jokers or wildcards, search results are sorted, filters are possible,… No access to collections of content partners
Preview	Yes through dams.collectie.gent	
Produce, publish	Digital reproductions: IIIF Metadata: LDES Publish on data.collectie.gent and dams.collectie.gent, depending on rights downloads are possible Box: 180 wall In DAMS itself: partners can see other partners content Supports multiple languages	Share downloadlink to download from MAM API on MAM to provide input to CMS

The conclusion thar can be drawn from this analysis is that the difference lies in the purpose for which the system was designed. For CoGhent this is about visibility and opening up cultural heritage while Meemoo puts focus on preservation. CoGhent focusses a lot on the sharing of knowledge e.g.

you can share content across partners, find links throughout the collections etc. For Meemoo, this is only a next step, MAM is more about durability and gathering information where in a next step data can be opened up across organisations and content partners. In their opinion, the MAM is a step before DAMS from CoGhent and could potentially provide input for DAMS.

One remark should be made here. Both systems are considered by many of the content partners as alternatives due to budget constraints.

4.3.3 E-depot Flemish Government

The CoGhent system does not provide an e-depot that focusses on preservation. Besides the MAM of Meemoo, the Flemish government also offers a system for preservation.

More information: https://www.vlaanderen.be/informatiemanagement/archiveren/digitaal-archief-vlaanderen/e-depot

4.3.4 VSDS

Tools for data sharing made available by Flemish government, this could be potentially interesting to further disclose cultural heritage via the LDES.

More information: VSDS Vlaamse Smart Data Space - PJ024 - Confluence (atlassian.net)

4.3.5 Virtual Museum Flanders

Besides the concept not much is known about how this virtual museum will be implemented. The goal is to disclore the cultural heritage of Flanders. In this way, it could be a substitute or complementary asset to the CoGhent system. In further analysis of scenario's, a dialogue between CoGhent and Virtual Museum of Flanders will be initiated to explore the possibility of alignment in goals and infrastructure. First contact has been established where it was indicated that similar technologies will be included in the development (e.g. LDES, OSLO, IIIF).

More information: Virtueel museum (museumvanvlaanderen.be)

4.3.6 Erfgoeddatabanken

This is initiated by the Department of Media, Younth and Culture in Flanders to map and open up cultural heritage information in Flanders. EIZ is one of the two culturale heritage databases and builds further on Adlib.

More information: https://www.vlaanderen.be/cjm/nl/cultuur/cultureel-erfgoed/erfgoeddatabanken

4.3.7 Beeldbank of the city of Ghent

This is the predecessor of the CoGhent DAMS system. The annual cost was 17.000 euro, paid by District 09. Since supplier Zeticon will not continue to support the Beeldbank, an alternative had to be presented. However, this is not the only reason. The Beeldbank lacks several features and functionalities that are required to remain competitive and relevant in today's rapidly evolving market. Lastly, if the usage of the Beeldbank would be continued, this would require additional investment of 8.000 euro (estimated) to update it to a newer version, which still lacks some required features.

One remark here, one of the cultural heritage institutions (Archief Gent) has indicated that it still deems the Beeldbank as relevant for preservation of information and images. This will be included in the scenario analysis of deliverable 4.5.1.

More information: https://beeldbank.stad.gent/

5. Benefits of the CoGhent System

The benefit quantification happened in 2 steps, first the identification of benefits and then the identification of a relevant quantification methodology. Both are described within this chapter. For the benefit identification, this analysis makes a distinction between direct and indirect benefits.

Direct benefits can be directly quantified. They favor those who actively participate in the project such as the private and public stakeholders and employees. For instance, increasing in the estate revenues or more visitors for a museum.

Indirect benefits cannot be directly quantified since they are more qualitative in nature. They favor every one of those people who benefit from the service provided, such as the visitors. For instance, improved social cohesion or community engagement.

An important step in this process is the identification of the relevant indicators, that allow the quantification of social benefits, which are mostly indirect, actual monetization where the benefits are converted into euros and the social impact evaluation.

5.1Direct benefits

After completing the 6 interviews with every cultural institution related to the CoGhent project, the results are summarized in the following paragraph since a lot of the mentioned benefits are overlapping. One important note, none of the institutions already made use of the services provided by the CoGhent project, meaning that this matrix reflects partners expectations at that time in the project.

The benefits mentioned can be categorized under the following 3 general benefits:

1. Time and cost savings
2. Opportunities
3. New or improved revenue streams

In general, it can be concluded that the cultural institutions are experiencing benefits by using the CoGhent infrastructure. Especially the DAMS-component offers the institutions a lot of benefits. There is still a lot of potential research that can be done regarding the DAMS, as there was no active usage of the components by the cultural institutions at that moment. Important to mention here is that during the interviews, the cultural institutions also indicated the potential of the DAMS and what it can offer to them when they start actively using this. From this, it can be deduced that the cultural institutions are aware of the potential of the system and the value of collaboration. The fact that so many direct benefits were identified, even without the cultural institutions actively using the infrastructure during the interviews show the great value and potential of CoGhent.

5.1.1 Cost savings

Many of the mentioned benefits can be translated to cost savings. First of all, cost savings due to efficiency wins. If a cultural heritage institution can save time on certain activities, then this results in free time for other activities. We can calculate these cost savings by identifying the cost driver and applying it in Equation 1: Cost calculation for time saving. A cost driver is the measurement unit of an activity that causes a change in cost for that activity. Here this can be translated in direct labor hours.

Equation 1: Cost calculation for time saving

$$C_i^{Savings} = \Delta labor\ hours\ x\ C_i^{Activity} x\ f_i$$

$$with\ \ C_i^{Savings} = \ the\ cost\ savings\ for\ activity\ i$$

$$C_i^{Activity} = \ \ the\ hourly\ employee\ cost\ for\ activity\ i$$

$$\Delta labor\ hours = the\ amount\ of\ time\ saved\ in\ hours$$

$$and\ \ f_i = \ the\ yearly\ frequency\ of\ activity\ i$$

The cost savings that can be measured were identified in the interviews

- Time savings due to faster navigation, search and copyright retrieval.
- Bulk changes instead of one-by-one changes, however this is not present in the current version of the CoGhent system.
- Time saving due to automatic request and response process of images and data for external parties.

Besides direct savings on labor cost, that then result in time that can be allocated towards other activities. Several other types of costs savings were indicated by the interviewees. Since the objects become digitally accessible, this can result in a lower maintenance cost for objects that are not always on display and have to be moved or simply objects that are very fragile. Lower maintenance, or in other words less frequent maintenance, equals reduction in frequency of costs for both employee and equipment needed for maintenance.

Equation 2: Cost savings on asset maintenance

$$C_i^{Savings} = \left(labor\ hours\ x\ C_i^{Activity} + equipment\ cost\right) * \Delta f_i$$

A third cost saving mentioned was the reduction in licensing costs. Museums currently have to purchase reading licenses for employees who do not register but still need access to the collection in Adlib. These licenses are extremely expensive. By making the collection available to everyone with a login through the DAMS, there is no need to purchase licenses per person.

Equation 3: Cost savings on Adlib licenses

$$C_i^{Savings} = \ \Delta licences\ x\ C^{License}$$
$$With\ \ \ C^{License} = cost\ for\ one\ additional\ license$$

A last cost saving that is identified, is the reduced need for storage space due to the fact that there need to be less storage of derivates.

$$C_i^{Savings} = \ \Delta storage\ x\ C^{Storage\ costs}$$

$$With\ \ \ C^{storage} = cost\ for\ one\ terabyte\ of\ storage\ space$$

This results into a total cost saving, calculated with the following formula.

Dit project wordt mee gefinancierd door het Europees Fonds voor

Regionale Ontwikkeling via het initiatief Urban Innovative Actions (UIA)

$$C_{Total}^{Savings} = \sum_{i}^{N} C_{i}^{Savings}$$

5.1.2 Opportunities

Opposed to additional revenues or decreased costs, these benefits can possibly lead to time reductions or cost savings or long-term opportunities. These are harder to quantify but should be included in the calculations once they manifest.

Examples are:

- Opportunity cost of not having to invest into an additional system e.g. CMS from Create
- Opportunity to easily build new applications e.g. integration for collective maintenance of similar pieces owned by different institutions.
- Collaborations with external curators.

For both mentioned opportunity costs, the investment cost for an alternative system that not has to be purchased because of the CoGhent system can be included as a benefit.

Other opportunities are simply wins for the cultural heritage institutions but cannot be quantified such as high-resolution images can be offered in the system or the possibility to zoom in on object. According to EPEC (2011) this is not necessarily a problem, as these opportunities are actually an increase of quality of the system for cultural heritage institutions. Once the system is in use, these can be evaluated through for example questioning the satisfaction rate of users of the system.

5.1.3 Potential revenue streams

Interviewees mentioned how the CoGhent system could create a potential new or improved revenue stream. Since the system allows third parties to easily access data, this could provide the opportunity to connect with government to more easily identify the top pieces in collections. In case such a piece is identified, additional subsidies can be granted to the institution responsible for the piece.

One thing that was noticeable, none of the content partners explicitly saw this as an opportunity to attract more visitors to their museum but more as a means to reach people outside the physical environment of the museum.

5.2 Indirect benefits

As described in Collections of Ghent, the CoGhent project aspires to increase **cultural participation** and social cohesion by utilizing digitized cultural assets, particularly with new audiences. The ultimate objective is not only to open up cultural data; it is to make it valuable, useable, and helpful, to create Open Knowledge. They seek to encourage tolerance and **social cohesion** by providing tools to crowdsource citizen-stories and citizen-insight on their common cultural heritage, as well as by using connected data to support cultural variety and elevate their awareness. They want to contribute to the transition of heritage institutions into places of community sense making, in other words increase **community engagemen**t. In the following paragraph these concepts or indirect benefits indicated in bold are further defined and a methodology for quantification is presented.

Indicators of these indirect benefits in the CoGhent project are researched in deliverable … by applying the Theory of Change methodology. Different examples of how social cohesion is improved will be presented there.

5.2.1 Social cohesion

According to Jenson (2010) cohesion depends on the sociopolitical concept of the entity that studies it as well as the problem that is sought to be solved. Hence, the concept is constructed from three currents, social cohesion as: social inclusion, effect of social and economic transformations on inequality, as social capital, effect of social transformations on the networks of norms, values and common understandings that facilitate collective action, due to the increase in social exclusion and marginalization that permeate relationships and as governance and institutions, strengthening institutions and their governance to develop redistributive policies without opposition or cleavages.

By implementing a cultural project, such as the CoGhent box or the online collection of the Gentenaar, a space for interpersonal communication within the community is allowed, in which citizens can participate, meet neighbors, acquire knowledge and exchange ideas with other participants. Thus, that intercultural and intergenerational connection and understanding work opens the doors to making new friends, learning about other people's cultures and becoming interested in new things. Being pleasant experiences, in accordance with Green &Preston (2001) citizens develop a greater sense of community. Additionally, shared ideals, have the power to draw people together. By encouraging new interactions between individuals, groups, and organizations in the community, parties become better networked and social cohesion grows.

5.2.2 Community engagement

Throughout literature, there are various definitions and notions of community engagement. MacQueen et al. (2015) defines community as a collection of people who have a common social identity, whereas engagement refers to an interaction relationship between a community and a research institution. McCabe, Keast & Brown (2006) explain community engagement as the participation of communities in relevant decision making that is based on community interests and the promotion of community well-being. To complement, from the standpoint of social capital, community engagement is a technique for exploring common needs (reciprocity),building trust, agreeing on implementation strategies (shared norms, networks), and enhancing social agency.

The CoGhent project offers the environment to increase community engagement. The shared spaces are a valuable tool for enacting environmental and behavioral changes that will benefit the community and its members' health. Partnerships and coalitions are frequently used to mobilize resources and influence systems, as well as to change relationships among partners and serve as catalysts for changing policies, programs, and practices (Davis, 2011). Through annotating creating and saving stories on the web platform, it ties residents to their neighbors and their shared past, and it makes cultural heritage a concrete communal asset. In addition, once it is reached, community engagement, gives government decision makers and policy creators the potential to improve community services via greater communication brought about by integrated involvement with the community (McCabe et al. 2006).

5.2.3 Cultural participation

In accordance with Unesco (2014), cultural participation refers to the ability of people to engage in all aspects of cultural life, as well as their ability to choose and change their own cultural practices and activities, including the choice to not participating. Choice-based cultural participation, in this view, includes both access to and contribution to cultural life. Individual capacities are formed via exposure to choice-based cultural involvement. It does, in fact, help to build critical thinking skills as well as a constant learning process regarding creativity and cultural diversity. Furthermore, cultural participation provides experiences of what is meaningful for each person, resulting in the constant construction and transmission of individual and collective values that influence how individuals express themselves, understand diversity, and adapt to change both collectively and individually. Cultural participation based on choice is also a source of increased well-being and mutual understanding. Indeed, it allows individuals to make strong social relationships with their community while also experiencing cultural variety, which creates feelings of integration, inclusion, and mutual respect. Individual advantages of cultural involvement may therefore be translated into communal strengths, as higher levels of cultural participation are associated with higher levels of social capital (Espinosa & Martos, 2019). Cultural participation helps people feel 'included' in their society, which minimizes the danger of social friction. This is especially important in polyethnic and multicultural countries, where equitable and inclusive access to cultural life by all groups may be a powerful tool for building mutual understanding (MacQueen et al. 2015).

When applying this to the CoGhent project, a lot of effort is put into the cultural heritage of different groups within Ghent by for example highlighting different traditions. Emphasis is put on diversity and the rich culture of Ghent thereby attracting different groups of the population in age, origin and other features.

5.3 Social return on investment (SROI)

In order to evaluate the outputs, outcomes and impacts of the project, this deliverable suggests the Social Return on Investment method or SROI for evaluation (Bhat & Hebb, 2013; Jura Consultants, 2008). This method weights the benefits of the project compared to the investment cost as shown in Equation 4: Social Return on Investment. As stated by Bhat & Hebb (2013): "Outcomes are the observed effects of the outputs. Sometimes it takes years for outcomes to take place, but there may be observable changes along the way. Therefore, it is important to clarify the timeframe of the outcomes of your programs." Here the outcomes defined on the long term can then be defined as impacts. All of these are to be taken into account to provide an overview of achieved social value.

Equation 4: Social Return on Investment

$$SROI = \frac{NPV\ of\ benefits}{NPV\ of\ investment}$$

This methodology makes use of financial proxies, five methods to calculate proxies are suggested. Only one of the suggested methods, contingent valuation, seems applicable for this project. Contingent valuation means evaluation of the value perceived for stakeholders, in other words their willingness to pay. One option would be to question other cultural heritage institutions towards their willingness to pay to join the CoGhent system. Additionally, different city departments could be questioned as to how much they are willing to invest into improvement of the identified indirect benefits.

Additionally the SROI takes four factors in consideration that can affect the outcome positively or negatively.

1. Deadweight: What would have happened anyway? Meaning what if the project without the project.
2. Attribution: This follows from the first concept of deadweight and is the proportion of the outcome that is attributable to other organizations.
3. Dropoff: The effects of time, for example do benefits decrease over time or not.
4. Displacement: Does the project have a negative effect other groups or organizations?

Since this deliverable does not apply the methodology but merely suggest an appropriate method, more information can be found with Bhat & Hebb (2013).

6. Costs of the CoGhent system

As visualized in figure 5, the project can be divided in four bigger parts:

1. Overhead: This are all activities related to the organization of the project regarding management, collaboration and preparation.
2. Deployment: Everything related to the initiation phase of the project, in costs this is equal to the upfront investments.
3. Operational: All activities that are related to the normal working of CoGhent.
4. Continuation: All activities that relate to the additional investments to ensure continuation of the project.

For this breakdown structure, information was gathered from multiple partners. In the following section all these three main parts will be broken down with the use of a cost breakdown structure. However, as this will serve as input for D4.5.1 other identified cost categories are included in the visualizations for completeness and will be further discussed in the appropriate deliverable. The proposed methodologies will be included there.

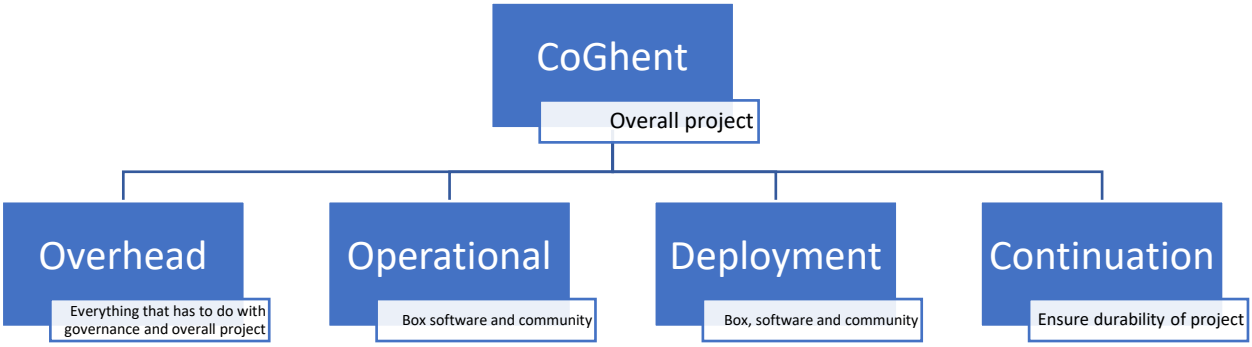

Figure 7: Overview main elements project

6.1 Cost modelling

Different cost modelling techniques exist, here a combination of two methods is proposed:

A. Fractional modelling: In fractional models, (preferably small) components of the costs are expressed in relation to (larger) components of the costs. Costs of maintenance and replacement of electronic equipment is often modelled in this manner, for example 15% of the initial investment costs

B. Driver-based modelling: In driver based models, we use so-called drivers to model and calculate one part of the cost. A driver based model is actually a function taking one (or a limited amount of) parameters (the drivers) and calculates from this the cost of the component. Of course additional (fixed) parameters can be used in this calculation function.

These methods and costs elements will be provided as input to deliverable 4.5.1, within each subsection a summary of cost drivers is given.

6.2 Cost breakdown

6.2.1 Overhead activities

None of the overhead activities can be directly attributed to the building blocks. 4 types of overhead activities are identified. The first related to management activities concerning budget, strategic decisions and daily operations. Secondly, the writing of a proposal which includes negotiations, alignment of partners and the writing itself. All of these costs are driven by the amount of hours spend by management and other personnel. Lastly, the visibility of CoGhent with the use of marketing including organizations of events e.g. the closing event on the 12th of February 2023. For the different cost elements in marketing, different cost drivers can be identified according to both the hours spend by personnel, allocated over the different activities plus equipment cost. For the event several other elements are influencing the costs such as the location, targeted audience (number of people) etc.

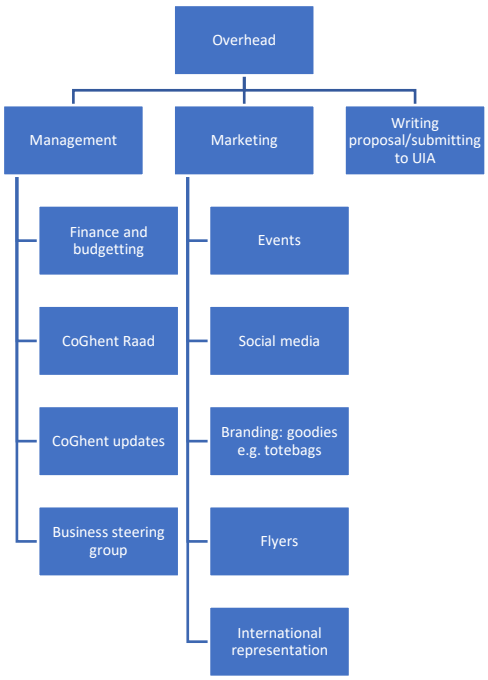

Figure 8: Breakdown of overhead costs

6.1.2 Deployment phase

The deployment of the CoGhent project can be further broken down in three clusters of activities as illustrated in figure 7. The first cluster contains all activities related to the CoGhent Box. This includes the construction of the framework thus everything that is tangible but not technology related, the installed hardware and accompanied software, connectivity and scouting of the neighborhoods. As

for the community cluster, the most important costs here include recruitment and planning. The part that is relevant for this deliverable, the DAMS system development, can be subdivided into the development costs for already named building blocks. Additionally costs for investment in hardware (servers) should be taken into account.

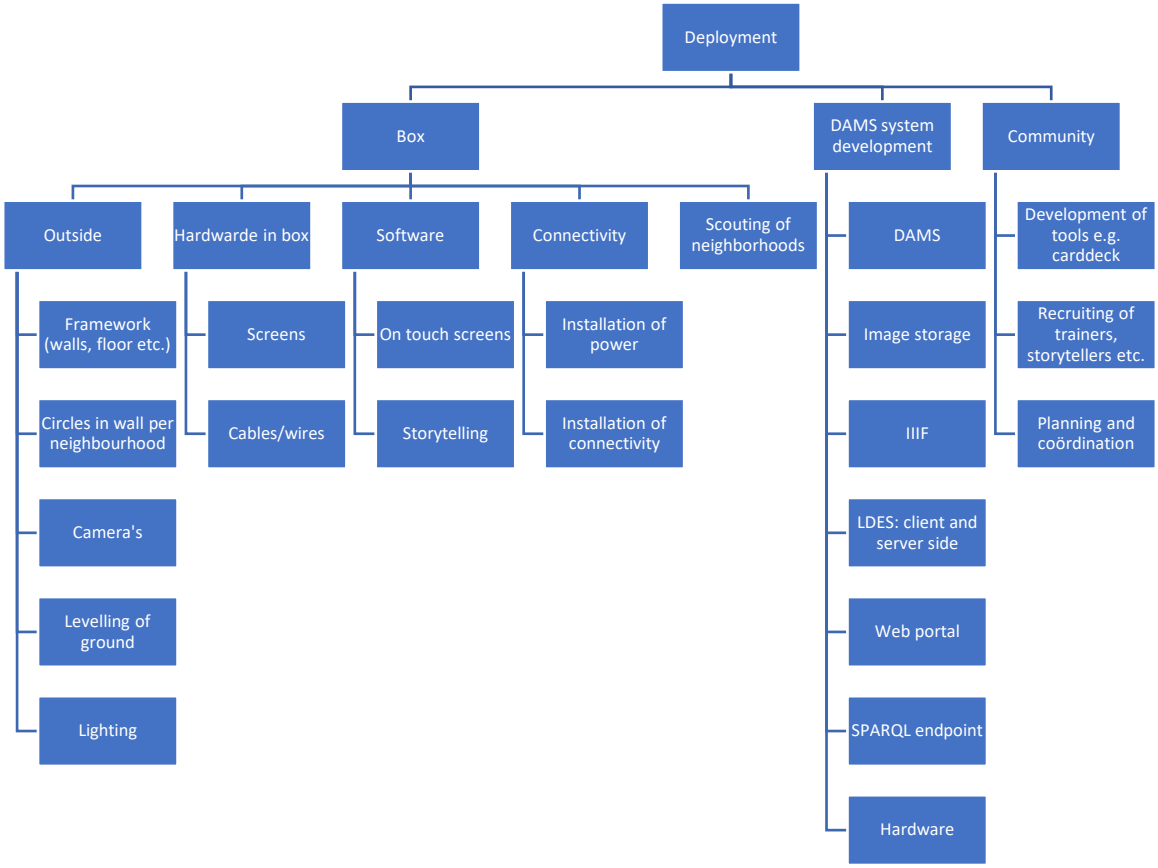

Figure 9: Breakdown of deployment costs

Table 12: Cost drivers for deployment phase

Deployment cost element	Cost driver
Framework (walls, floor etc.)	Surface to be covered (m2), manhours
Circles in wall per neighbourhood	Number of neighbourhoods
Camera's	Surface to be covered (m2)
Levelling of ground	Surface to be covered (m2)
Lighting	Surface to be covered (m2)
Hardwarde in box	Fixed cost
Screens	Number of screens
Cables/wires	Number of screens
Software On touch screens	Developer hours
Storytelling	Data team hours
Connectivity	Fixed cost
Installation of power	Manhours
Installation of connectivity	Manhours
Scouting of neighborhoods	Manhours, amount of neighbourhoods
DAMS system development	Developer hours

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Image storage	Terabyte of storage needed
IIIF	Developer hours
LDES: consumer and publisher side	Developer hours, number of participants
Web portal	Developer hours
SPARQL endpoint	Developer hours
Hardware	Fixed cost
Development of tools e.g. carddeck	Manhours, number of neighbourhoods
Recruiting of trainers, storytellers etc.	Manhours, number of neighbourhoods
Planning and coördination	Manhours, number of neighbourhoods

6.1.3 Operational phase

Similar to the deployment cluster, we can subdivide this into the box, the CoGhent system and community. For each of the building blocks hosting costs will have to be paid, depending on the outcome scenario this will either be internal employee costs or an external party (e.g. Inuits or District 09) will be involved. The same assumption holds for support, maintenance activities and R&D. One major operational cost that should be taken into account is the data team. This team holds the knowledge on how to clean and prepare the data and how to work with the DAMS system.

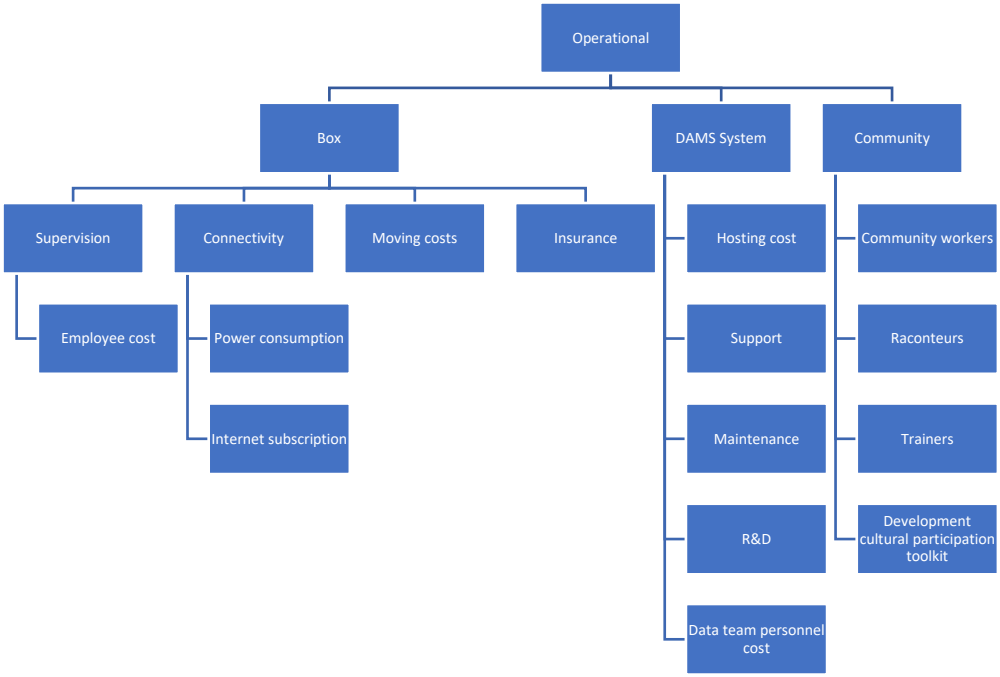

Figure 10: Breakdown of operational costs

Table 13: Cost drivers operational phase

Operational costs	Cost drivers
Employee cost	Manhours
Power consumption	Hours of opening
Internet subscription	Fixed
Maintenance of hardware	Manhours
Moving costs	Number of neighborhoods, manhours

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Insurance	% of investment cost
Hosting cost	Fixed
Support	% of investment cost
Maintenance of all software components	% of investment cost
R&D	% of investment cost
Data team personnel cost	Manhours, number of institutions
Community workers	Manhours, number of neighborhoods
Raconteurs	Manhours, number of neighborhoods
Trainers	Manhours, number of neighborhoods
Development cultural participation toolkit	Manhours

6.1.4 Continuation phase

The project will continue after 2023, however certain additional investments will have to be made to the system for viability and scalability. Different options will be further discussed in deliverable 4.5.1.

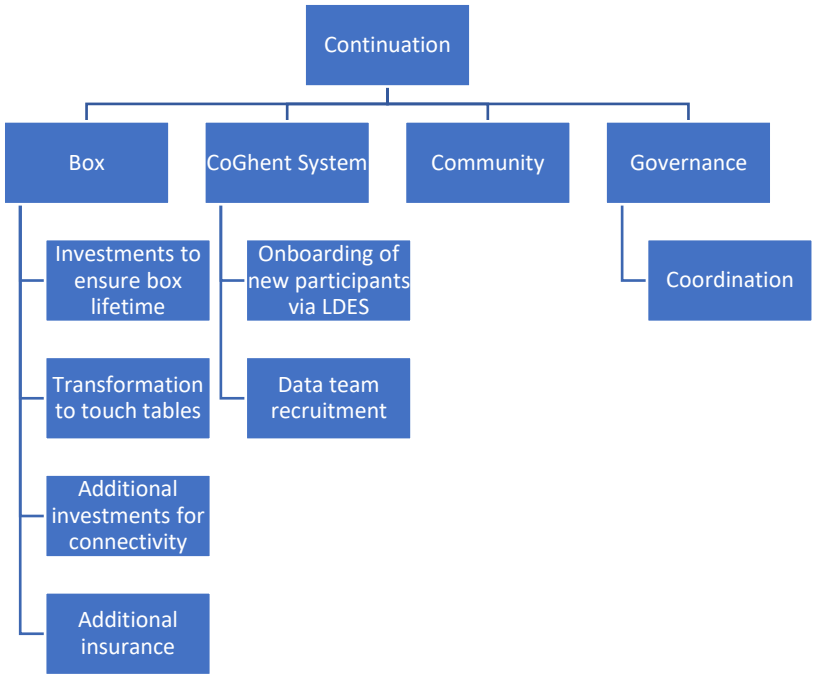

Figure 11: Breakdown of continuation costs

Table 14: Cost drivers continuation costs

Continuation costs	Cost drivers
Investments to ensure box lifetime	Manhours
Transformation to touch tables	Manhours
Additional investments for connectivity	Manhours
Additional insurance	% of additional investment
Onboarding of new participants via LDES	Developer hours
Data team recruitment	Manhours, number of institutions
Coordination	Not known yet

6.1.3.1 Scalability

If another institution would want to connect to the CoGhent system, several steps have to be taken.

1. Exploratory conversations
2. If the institution does not apply a similar approach to document their metadata, then a mapping of the data model to the one of CoGhent is required.
3. Setting up a Linked Data Event Stream from CMS institution to the DAMS.

Depending on the outcome and the ambitions for scalability, District 09 can only provide services to partners of the Groep Gent. For example GUM, Gents Universiteitsmuseum, cannot make use of their services. A solution could involve the creation of an alternative legal form that can offer services to other parties outside of the Groep Gent.

6.1.3.2 Viability

If the box is kept in its current state, certain elements will have to be renewed e.g. the roof. However, it is not certain that this will be the case, potential other scenario's will be evaluated. One option is to transform the box into separate touch screens that can circulate among the different partners. Depending on the outcome of this exercise, this will have an impact on insurance, movement costs and potential other connectivity costs.

For the continuation of the project, there will be need for an entity that is both neutral and invested in the project. This entity will need to align the different partners, implement decisions, and bare responsibility for the continuation of the project.

Additionally, there is a need for continuation of the activities of the data team, meaning budget has to be foreseen for the activities concerning data cleaning, clearing of rights etc.

7. Discussion

7.1 Are the benefits worth the costs?

It seems that the cultural heritage institutions that participate in the project do see the value of a shared DAMS system. Multiple benefits can be named. However, since it is too early to really measure the effective realization of these named benefits, it is difficult to provide a final answer. This deliverable does provide sufficient evidence that such a system has value, but the quantification of this value remains unknown at this moment.

With the methodology proposed in this deliverable, project partners should be capable of measuring and quantifying the benefits of the project over a longer timespan. Then it is possible to compare this result to the actual investment cost. Additionally, cities or organizations pursuing similar goals can use the proposed methodology for a pre-project evaluation to support (or not) their decision to invest.

7.2 Pitfalls encountered

- During the interviews, it appeared that some of the content partners were not aware of the progress or activities in the project despite the efforts taken with the CoGhent update to inform all partners.
- Not all partners were equally willing to share information.
- Not all partners were aligned in vision.

- Cultural heritage institutions did not and still do not use the CoGhent system. Knowledge is present but it is stuck with the Data Team. However efforts are being made to transfer this knowledge.

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