A History of Digitization:
Dutch Museums

Trilce Navarrete

This study documented four main changes in museums' information processes brought by digitization of collections: (1) collection registration had a marginal and supporting role in the museum organization prior to the adoption of a digital work form, digitization positioned collection information processes at the core of the organization, overarching and supporting all other processes; (2) these processes were exclusively institutional in nature (collection information inside the museum walls), eventually expanding to become cross-institutional collaborating processes (networked information across sectors); (3) digitization changed the goal of all information processes from controlling content to communicating with the user; and (4) information production, dissemination and to a certain degree use was monopolized by professionals, digitization enabled a democratization of participation by all types of users throughout the collection information production process.

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List of acronyms

AAA – *Afdeling Museale Automatiseringsadviezen* (Department of Automation Advice for Museums)
AAT – Art and Architecture Thesaurus
AAT-Ned – Art and Architecture Thesaurus Dutch translation
Adlib – (collections' management software)
AMI – *Automatisering Museale Informatieverzorging* (Automation of Museum Information Committee)
ARCHIS – *Archeologisch Informatiesysteem* (Archaeological Information System)
BKR – *Beeldende Kunstenaars Regeling* (Visual Artists Agreement)
BRAIN – *Branchvereniging Archiefinstellingen Nederland* (Sector Association of Dutch Archives)
BRK – *Rijksdienst Beeldende Kunst* (National Fine Arts Office)
BMS – *Brabantse Museumstichting* (Brabant Museums Foundation)
CAR – *Commissie Automatisering Rijksdienst* (National Commission for Automation)
CATCH – Continuous Access to Cultural Heritage
CBS – *Centraal Bureau voor de Statistiek* (Statistics Netherlands)
CCDD - *Culturele Coalitie Digitale Duurzaamheid* (Cultural Coalition for Digital Preservation)
CHIN – Canadian Heritage Information Network
CHIO – Cultural Heritage On-line project
CIDOC – Documentation Committee of the International Council of Museums
CIMI – Computer Interchange of Museum Information
CRM – *Ministerie van Cultuur, Recreatie en Maatschappelijk Werk* (Ministry of Culture, Recreation and Social Work)
CWK – *Cultuurhistorische Waardenkaart* (Cultural and historic value card)
DANS - Data Archiving and Networked Services
DEN – *Digitaal Erfgoed Nederland* (Digital Heritage Foundation)
DiMCoN – *Digitaal Museale Collectie Nederland* (Digital Museum Collection Netherlands)
DIVA – *Vereniging voor Documentaire Informatievoorziening en het Archiefwezen* (Foundation for the Documentation, Information Services and Archives)
DmB – *Digitaliseren met Beleid* (Policy-based Digitization)
EAA – European Association of Archaeologists
EC – European Commission
EiOI – *Expertisecentrum internationaal Onderzoek en Innovatie* (Expertise Center for International Research and Innovation)
EIS – European Invertebrate Survey
EL&I – *Ministerie van Economische Zaken, Landbouw en Innovatie* (Ministry of Economic Affairs, Agriculture and Innovation)
EZ – *Ministerie van Economische Zaken* (Ministry of Economic Affairs)
FES – *Fonds Economisch Structuurversterking* (Fund for Economic Structure)
FP – Framework Program

GvN – *Geheugen van Nederland* (Memory of the Netherlands Project)
ICA – International Council of Archives
ICES-KIS - *Interdepartementale Commissie Economische Structuurverstreking – werkgroep Kennisinfrastructuur* (Interdepartmental Commission Economic Structure Improvement – group Knowledge Infrastructure)
ICN – *Instituut Collectie Nederland* (Netherlands Institute for Cultural Heritage)
ICOM – International Council of Museums
ICOMOS – International Council of Monuments and Sites
IFLA – International Federation of Libraries Association
IIAV – *Internationaal Informatiecentrum en Archief voor de Vrouwenbeweging* (International Information Center and Archives for the Women's Movement)
IMIS – InterMuseum Information System
IRGMA – Information Retrieval Group part of the Museum Association
ISDN – Integrated Services Digital Network
JISC – Joint Information Systems Council
KB – *Koninklijk Bibliotheek* (National Library)
KIM – *Koninklijk Instituut voor de Marine* (National Naval Institute)
KNAW – *Koninklijke Nederlandse Akademie van Wetenschappen* (National Academy of Arts and Sciences)
LCM – *Landelijke Contact van Museumconsulenten* (Netherlands Museum Advisory Foundation)
LVN – *Landbouw, Natuur en Voedselkwaliteit* (Ministry of Agriculture, Nature and Good Quality)
MARDOC – Maritime Collections Documentation System
MCF – Museum Communication Format
MCN – Museum Computer Network
MDA – Museum Documentation Association
MHKA – *Museum van Hegendagse Kunst Antwerpen* (Museum of Modern Art Antwerpen)
MMA – Museums, Monuments and Archives department of the Ministry of Culture
MusIP – Museum Inventory Project
NBBI – *Nederlands Bureau voor Bibliotheekwezen en Informatieverzorging* (Dutch Office for Library and Information Services)
NBLC – *Nederlandse Bibliotheek en Lectuur Centrum* (Dutch Library and Lecture Center)
NCDD - *Nationale Coalitie Digitale Duurzaamheid* (National Coalition for Digital Preservation)
NEMO - Network of European Museum Organizations
NIBG – *Nederlands Instituut voor Beeld en Geluid* (Netherlands Institute for Sound and Vision)
NINCH – National Initiative for a Networked Cultural Heritage
NIOD – *Nederlands Instituut voor Oorlogsdocumentatie* (Netherlands Institute for War Documentation)
NMV – *Nederland Museum Vereniging* (Netherlands Museum Association)
NWO – *Nederlands Organisatie voor Wetenschappelijk Onderzoek* (Netherlands Organization for Scientific Research)
OCLC – Online Computer Library Center
OCW – *Ministerie van Onderwijs, Cultuur en Wetenschap* (Ministry of Education, Culture and Science)

OKW – *Ministerie van Onderwijs, Kunst en Wetenschappen* (Ministry of Education, Arts and Science)

OVM – *Overleg Volkenkundig Musea* (Ethnographic Museums Group)

PMZ - *Projectbureau voor verzelfstandinging van rijksmuseale instellingen* (Office for Independent National Museums)

RACM – *Rijksdienst voor Archeologie, Cultuur Landschaap en Monumenten* (National Archeology, Cultural Landscape and Monuments Office)

RBK – *Rijksdienst Beeldende Kunst* (Netherlands Office for Fine Arts)

RCE – *Rijksdienst voor het Cultureel Erfgoed* (Cultural Heritage Agency)

RDMZ – *Rijksdienst voor de Monumenten Zorg* (National Monument Care Department)

RKD – *Rijksbureau voor Kunsthistorische Documentatie* (National Office for Art History Documentation)

RLG – Research Libraries Group

RMO – *Rijksmuseum van Oudheiden* (National Museum of Antiquities)

ROB – *Rijksdienst voor Oudheidkundig Bodemonderzoek* (National Service for Archeological Heritage Management)

RTD – Research and technological development

SCEN – *Stichting Computer Erfgoed Nederland* (Dutch Computer Heritage Foundation)

SCRAN – Scottish Cultural Resources Access Network

SIMIN – *Sectie Invormatieverzorging Musea in Nederland* (Information Retrieval Section of the Dutch Museum Association)

SNM – *Stichting Het Nederlands Museumregister* (Dutch Museum Register Foundation)

SOM – *Stichting Ondersteuning Musea* (Foundation for the Support of Museums)

SPECTRUM – UK museums collections management standard

SVCN – *Stichting Volkenkunde Collectie Nederland* (Foundation of Dutch Ethnographic Collections)

SZW – *Sociale Zaken en Werkgelegenheid* (Ministry of Social Affairs and Employment)

TMS – The Museum System (collections' management software)

UDC – Universal Decimal Classification

UKB – *Universiteitbibliotheken en Koninklijke Bibliotheek* (University and National Libraries Consortium)

VISDOC – Sweet Water Fishing Collections Documentation System

VRM – *Vereniging van Rijksmusea* (Association of National Museums)

VROM – *Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer* (Ministry of Housing, Spatial Planning and the Environment)

VUM – *Vereniging van Utrechtse Musea* (Utrecht Museum Association)

V&W – *Verkeer en Waterstaat* (Minsitry of Public Works and Water Management)

VWS – *Ministerie van Volksgezondheid, Welzijn en Sport* (Ministry of Health, Wealfare and Sports)

WOB – *Werkgroep Object Beschrijving* (MARDOC's Working Group Object Description)

WRR – *Wetenschappelijke Raad voor het Regeringsbeleid* (Scientific Advisory for Government Policy)

WVC – *Ministerie van Welzijn, Volksgezondheid en Cultuur* (Ministry of Wellbeing, Health and Culture)

WWW – World Wide Web

List of museums

Afrikamuseum (Ethnographic Africa Museum) in Berg en Dal
Allard Pierson Museum in Amsterdam
Amsterdam Museum (former *AHM*) in Amsterdam
AHM Amsterdam Historisch Museum (Amsterdam Historical Museum) in Amsterdam
Amsterdam Zoological Museum
Anne Frank House in Amsterdam
Biblesmuseum (Biblical Museum) in Amsterdam
Boerhaave Museum (Dutch National Museum for the History of Science and Medicine) in Leiden
Boijmans van Beuningen Museum in Rotterdam
Bonnefantenmuseum in Maastricht
Centraal Museum (Central Museum) in Utrecht
Computer Museum of the University of Amsterdam
EYE Film Institute in Amsterdam
Filmmuseum (Film Museum) in Amsterdam
Frans Hals Museum in Haarlem
Fries Museum in Leeuwarden
Geldmuseum in Utrecht
Gelders Geologisch Museum (Gelders Geological Museum) in Velp
Gerardus van der Leeuw Museum (Ethnographic Museum) in Groningen
Haags Gemeentemuseum (Gemeente Museum) in The Hague
Hermitage Museum in Amsterdam
Hortus Botanicus in Amsterdam
Industrion in The Hague
Jan Adam Zandleven Museum (virtual museum)
Joods Historisch Museum (Jewish Historical Museum) in Amsterdam
Kröller-Müller Museum in Otterlo
Limburgs Museum (Limburg Museum) in Limburg
Letterkundig Museum (Literary Museum) in The Hague
Marinemuseum (Naval Museum) in Den Helder
Maritiem Museum (Maritime Museum) in Rotterdam
Mauritshuis Museum in The Hague
Meermano Museum (House of the Book) in The Hague
Metropolitan Museum of Art in New York
Municipal Museums in Zierikzee
Museon in The Hague
Museum Gouda
Museum Nusantara in Delft
Museum voor Communicatie (Museum for Communication) in The Hague
NAi Nederlands Architectuurinstituut (Netherlands Architecture Institute) in Rotterdam
National Glass Museum in Leerdam
Naturalis Biodiversity Center in Leiden
Nederlands Fotomuseum (Photo Museum) in Rotterdam
Nederlands Muntmuseum (National Coin Museum) in Utrecht
Nederlands Textielmuseum (Textile Museum) in Tilburg
RGM Rijksmuseum van Geologie en Minerologie (National Museum of Geology and Minerology) in Leiden
NIMK Nederlands Instituut voor Mediakunst (Netherlands Media Art Institute) in Amsterdam
Openluchtmuseum (Open Air Museum) in Arnhem
Rembrandthuis (The Rembrandt House Museum) in Amsterdam
Rijksmuseum Amsterdam
Rijksmuseum Twenthe in Enschede
RMNH Rijksmuseum van Natuurlijke Historie (National Natural History Museum) in Leiden
RMO Rijksmuseum van Oudheden (Dutch National Museum of Antiquities) in Leiden
Scheepvaartmuseum (National Maritime Museum) in Amsterdam
Scheveningen Museum
Stedelijk Museum de Lakenhal in Leiden
Stedelijk Museum in ‘s-Hertogenbosch

Streekhistorisch Centrum Stadskanaal
Teylers Museum in Haarlem
Tropenmuseum (Ethnographic Museum) in Amsterdam
Utrecht University Museum
Van Abbe Museum in Eindhoven
Van Gogh Museum in Amsterdam
Veluws Museum van Oudheden (Museum of Antiquities) in Harderwijk
Visserijmuseum (Fishing Museum) in Vlaardingen
Westfries Museum in Hoorn
Willet-Holthuysen Museum in Amsterdam
Wereldmuseum (World Museum) in Rotterdam
Zuiderzeemuseum (Zuiderzee Museum) in Enkhuizen

1. Introduction

Over the past fifty years, a huge amount of labour and funding has been deployed for the introduction of digital technology in museums. Numerous projects have been carried out, initiated by individual museums, museum associations, government agencies and international bodies. In the course of this process, the nature of museums has been transformed.

The concept of digitization is difficult to define, notably because its interpretation has changed continually over the period described in this study.[1] In general, digitization involves the application of digital tools (e.g. computers, databases, networks). More specifically, the digitization of a museum can be defined as a three-fold process: the incorporation of digital tools in the museum's work methods, the creation of digital versions of its objects and object-related information, and finally the creation of a presence on the Internet (and through other digital modes of communication such as *apps*) that potentially might evolve into a full-scale digital equivalent of (if not a substitute for) the museum.

Digital technology has underpinned new forms of work, new relationships with users, new modes of access, and new definitions of key concepts such as objects, collections and the museum itself. To date, however, a national perspective to describe and explain the process of digitization in museums is missing. There have been numerous attempts to portray the digitization path followed by *associations*, like The Museum Computer Network Brief History written by Marla Misunas and Richard Urban, by *people*, like Mike Aschenfelder's account of the work of Clifford Lynch, or even of *periods* in a museum's history.[2] These accounts, to name a few, have an important role in documenting and discussing the processes. Nonetheless, the scope of the period and subject they document is limited. The history of the digitization of museums in the Netherlands, the projects, policies, funding and people involved, remain unknown.

This study aims to fill this gap by analyzing what constitutes the digitization of museums in the Netherlands during selected time periods and by describing the consequences of the choices made during the adoption of a digital work practice. The study aims to provide an overview of the history of digitization of heritage collections that

[1] See chapter 6.1.
[2] http://www.mcn.edu/brief-history; http://blogs.loc.gov/digitalpreservation/2013/05/digital-preservation-pioneer-clifford-lynch/?utm_source=feedly; Parry, 2007.

would, firstly, help to clarify the process followed when adopting digital technology, and, secondly, that would support a collective understanding of the effects this process has had. The national scope, covering the adoption of information technologies between the 1960s and the 2010s, documents defining moments that clearly have influenced Dutch museum practice during the process of "becoming digital".

Much has been invested since the first explorations of computers in Dutch museums; many people have devoted a tremendous effort in the digitization of collections, yet little is understood of the process or the outcome. This book provides a detailed account and analysis of the digitization process in museums, from an institutional, association, governmental and international perspective, that in turn can serve to better understand the adoption of a digital work form in other sectors, times and places. Organization of the content is based on the management level (e.g. institutional, governmental) instead of themes (e.g. costs, imaging) to facilitate future strategic analysis and decision-making.

1.1 How to read this book

This book describes the experience of Dutch museums adopting computers at work starting from an institutional perspective, then by the formation and involvement of associations, followed by government perspectives in supporting these processes, and an analysis of the international context. A theoretical context is explored with an analysis of the findings followed by final conclusions.

Table 1.1 Organization of the book

1. Introduction	Organization of the book and methodology.
2. Museums adopting computers	Institutional perspective.
3. Museums working together	Associations supporting museums.
4. National efforts	National policy towards digitization.
5. International initiatives	Global context.
6. History of adopting computers	Theoretic analysis and conclusions.
Summary	In Dutch and in English.

Following the introduction and organization of the book in Chapter 1, the rest of this chapter describes the research methodology.

Chapter 2 presents the experience of going through the introduction, adoption, institutionalization and regeneration of a digital work practice from the perspective of the Dutch museum field. The goal of the chapter is to map the major events that took place at a national level as reflected in individual institutions representing the field. Examples are for the most part drawn from six case studies.

Chapter 3 presents selected partnership experiences documenting their impact on the digitization process. The aim of this chapter is to identify the cross-institutional collaborations that have had a national impact. In contrast, chapter 4 presents the *government* perspective by mapping relevant policies and instruments that have been introduced to support digitization. The purpose of the chapter is to identify the mechanisms of financing, policy and regulation shaping the use of information technology in museums. Chapter 5 gives a broader international context with the focus on projects including Dutch museum participants and taking place within the European Commission Framework Programs. The goal of the chapter is to identify the role Dutch museums have had in international efforts with special attention given to the transformation of goals and structures influencing digitization of heritage collections back at home.

Finally, chapter 6 sets out to analyse the digitization of museums within a multidisciplinary theoretical context. The analysis has as goal to further discuss a number of fundamental questions found throughout the history presented here: Why did museums start to digitize their collections? What is the best way to digitize? What are the benefits gained and challenges encountered? And what lessons are to be learnt from the Dutch history of digitization of museum collections?

This book also includes a number of tables that present an overview of the historic change in the number of collections digitized, the people involved (as in the case of the Ministry of Culture), the policy documents reviewed, and the European Commission funded projects in which Dutch institutions participated. Being the first documentation of its type to date, it may be that omissions have been made.

1.2 Methodology

This research was driven by the overarching question: what processes have Dutch museums followed to adopt information technologies and how are these reflected in current (digital) museum practice?

Other questions addressed throughout respond to definitions (e.g. what is digitization?), to purpose (why do museums digitize?), to process (how do museums go about digitizing?), to content (how is content created and selected?), and to function (what do information technology and the resulting the digital collections represent for the museum?).

The research was performed in four parts: an introductory literature review was conducted to frame the scope of the project. Research has been limited to the perspective of Dutch museums, as the nature of the digitization processes in other sectors and in other countries proved to bring with them additional issues that fell outside of the scope of this project. At this point, legal aspects of digitization were identified to be fundamental but fell outside of the scope of this project, though mentions throughout the text can be found. The digital collection was placed at the heart of study, from which the process of adopting a digital work practice emerged.

The second part of the research project focused on the gathering of data to illustrate the Dutch experience. Data gathered included documents and interviews. A first analysis served to identify characteristic time periods, which turned out to fall nicely within the decades (1960-1990, 1990-2000, 2000-2010, and 2010-onwards). Then, general areas of impact were recognized to guide data analysis. These were (1) the museum organization, including concepts of digitization, and internal organization; (2) policy, including subsidies, rules and regulations; (3) technology adoption and adaptation; (4) the user, or consumer, and access requirements; and (5) the economic aspects of digitization and issues related to object valuation. These five areas of impact were then plotted against the time periods.

Data gathering involved the general experience of Dutch museums as well as the specific experience of a selected number of institutions (see further description of sources below). Data collected from the case studies was added. A summary of the results can be found in table 2.8. Case studies were selected to reflect the perspective of different types of collections, including the ethnographic collections of the *Tropenmuseum* in Amsterdam, the art and history collections of the *Rijksmuseum* in Amsterdam and the *Amsterdam Museum*,

the natural history collections of the *Naturalis Biodiversity Center* in Leiden, the maritime collections of the *Maritiem Museum* in Rotterdam, and the archeological collections of the *Allard Pierson Museum* in Amsterdam. The case studies were also selected to reflect national and regional institutions, as well as university collections. Accessibility of information (documents and people) also played an important role in the selection of the case studies, concentrated in Amsterdam, Rotterdam and Leiden (location of the majority of Dutch museums). Beyond the case studies, many other museums are mentioned throughout chapters 1, 2 and 3 (see list of museums at the beginning of this book). Individual trajectories of each case study were written and delivered to the institutions while highlights have been included throughout this book. Case study narratives are available upon request.

Undeniably, the case studies could have included a number of other combinations and ideally a greater number of institutions. Every museum has its own individual story, with specific players and characteristic circumstances. This, I hope, will inspire future researchers to take on the task at hand and contribute to documenting the history of digitization in Dutch museums, eventually also to include libraries, archives, and sites of national monuments.

The third part of the research involved a second level of analysis in which the Dutch work practice was organized and integrated into the identified areas of impact in the digitization of museum collections (institutional, political, technological, usage and economical). Qualitative analysis used documents and interviews while quantitative analysis involved, for so far as data availability allowed, the collection and assessment of statistical reports and survey data.

Finally, the conclusions of this analysis were positioned within a theoretical interdisciplinary background to further explain the findings.

Document sources can be divided into press (magazine articles), government documents (including official policy papers, reports, and communiqués) and documents from museums (many of which are plans, evaluations, and internal reports). In museums, availability of information was limited by the level of documentation of the digitization processes by the museums (some museums are more active than others), by availability of staff to facilitate access to materials (many of which are for internal use only), and by the institutional willingness to share private information. Financial information was discovered

to be particularly sensitive and rarely available. Only a handful of institutions publish detailed financial information in their yearly reports.

Financial information reported in Dutch Guilders can be converted into Euros based on the official transitional exchange of 2.20371 guilders to 1 euro. Dutch Guilders were used until 2002 when the European Euro currency was adopted.

Information was gathered from the personal narrative of numerous players who shared their vision and memories of the events presented here. Interviews were essential in the gathering of a contextual perspective to support the interpretation of the documents reviewed. Interviews were generally individual, and depending on the person, interviews were conducted as general conversations about a subject (e.g. a period, an organization), while others involved specific questions sent beforehand to gather particular information (e.g. production processes). All interviews were semi-structured and documented; the interviewee was given the report for review to make the necessary changes. Only approved reports were used as information sources. A total of 63 people were interviewed in the course of this research.

Some institutions figure more prominently than others in one period or another. Five types of collections were followed throughout the years to give continuity to their development and in order to provide a more or less comprehensive picture of the Dutch museum environment. During the following chapters, groups of or individual museums or institutions figure as representatives for the maritime collections, ethnographic collections, art history collections, natural science collections, and academic and archeological collections of the Netherlands.

All information sources, documents and interviews, are referenced throughout the text.[3] Online sources have changed in time for which the Internet Archive proved to be an invaluable resource. All URLs were updated, when possible, on October 2014.[4] Conflicting perspectives are presented as clearly as available documentation has allowed. The narrative, although written as a chronologic sequence of events, cannot be a start to telling a story that has taken many years, involved numerous people and institutions, changed strategies and visions repeatedly, and that continues to evolve. What follows is a first

[3] This project would not have been possible without the kind contribution of a number of individuals, a list of which is found in the acknowledgments at the end of the book. Special appreciation goes to the community of Dutch heritage workers for their dedication and conviction to make heritage materials accessible.
[4] Automatic redirect is not allowed in all URL links, which is fixed with a URL copy and paste.

attempt to document the memory of Dutch museums in the process of adopting a digital information technology network.

The result of the research before you hopes to serve as a first reference on the subject of heritage digitization. It further aims to present an account of events, giving a voice to those involved in the process of adopting computers in Dutch museums, and to inspire future advancements as well as future research on the subject. My main goal has been to draw a series of broad lines to characterize the various periods and processes to serve in analysis and strategic decision-making.

This historical account is meant for an international reader interested in issues of policy, digitization, financing, history and museums. For this reason, all information is given in English, using the official translation when available. All other translations have been done by the author. Secondly, this book can be useful to all the people involved in advancing access to heritage in the Netherlands as an aid to memory and as a tool for reflection on the immense work that has taken place.

2. Museums adopt computers

The work of museums has been greatly influenced by the use of technology to manage information. Registration of information is the first step in object management. Museums have always had some form of inventory to assist with object identification, either in the form of an index, an acquisitions logbook or a catalogue of collections. In a manual system, data elements, data fields and syntax do not need to be strictly controlled because a human brain serves as the processing device for information retrieval. When a system is automated, a machine, which cannot think, does the processing.[5] This realization brought a new awareness of the choices made during the organization, collection, storage and retrieval of information processes. Adoption of computers has been marked by the developments in information technology as much as by the changes in practice to structure and organize information related to museum objects.

Why digitize? Administration of collections was driven by a post-war generation who had witnessed the movement of collections and realized the importance of proper registration: without a record, objects could easily be lost. Administrative applications gained much attention and support in the international post-war museum community, by governments seeking efficiency, and by museum institutions improving collections management. The formation of CIDOC, the Documentation Committee section of the ICOM in 1950,[6] brought professionalism to the documentation of collections. Most of all, registration of collections served to protect cultural property by accounting for objects (location and state) and by recording their acquisition (and place of origin).[7] Computers were initially deployed to assist this administrative process. However, they also transformed the production, distribution and consumption of heritage information, in turn changing the makeup of the museum organization.

This chapter presents the major themes that have marked the adoption of computers at the institutional level, starting with the international influence that

[5] Sarasan, 1995:192.
[6] http://network.icom.museum/cidoc.
[7] Fahy, 1995:11-12.

inspired experimental adoption and the first efforts to stimulate the use of computers, followed by wide-scale adoption and the issues involved (e.g. data migration), and ending with the possibilities offered by technological advancements in data distribution (driven by the World Wide Web) and in information presentation (visualizations).

2.1 How it all started

Adoption of computers in museum work was initially linked to object registration and documentation, collection administration and management efficiency. The administration of collections in Dutch museums was guided by what was known as the *White Book*, a publication from the 1950s with a series of directives for the administrative management of objects.[8] This was the first guide of its sort, which intended to harmonize national museum work practice.[9] The book's introduction makes reference to the second Museum Day that took place on 30 October 1948 at the *Tropenmuseum* in Amsterdam, during which the problems of inventory and registration of museum objects were discussed. The book presented "the course of the object" (*de gang van het object*) as it enters the museum and undergoes a series of administrative processes. The book explained the process of registering collections using a limited data model, but did not, however, describe the process of documentation in depth. Although the White Book was published as a response to the uncertainty regarding registration, it failed to address the need for a unified practice of the documentation of objects.[10]

[8] *Richtlijnen en wenken voor het administratief beheer van museumverzamelingen* (1953; second edition) 's Gravenhage.
[9] In contrast, the Dutch libraries initiated standardization for the description of titles in 1912 developing rules for the description of titles and, by 1941, a National Commission for advice was established. Since 1960 standardization has taken place at an international level culminating in the adoption of the International Standard Bibliographic Description (ISBD) in 1971. Due to the uniqueness of museum objects, such a standard would be unattainable (Ouwerkerk, 1989). There have been, however, standards for object registration to facilitate machine retrieval, including the Cultural Heritage Metadata formulated by the Dublin Core.
[10] MARDOC, 1977; Ouwerkerk, 1989:91. At this time, the *Tropenmuseum* was still known as the *Indische Instituut*.

The, *Nederlandse Museumvereniging* (NMV - Netherlands Museum Association),[11] responded by publishing a two-part book of guidelines for the administration and management of museum collections in 1974. Part I presented registration for the identification and general administration of objects, based on international best practice and national experience. The guidelines focused on simplicity (based on clarity and specificity), a healthy administration, unified terminology and knowledge acquisition that would lead to further problem solving. Part II presented registration to inform and improve the collection, e.g. by including more contextual information. This was an expanded third edition of the White Book.[12]

Controlled vocabularies for the documentation of collections were developed in the 1970s. One example is the data organization system conceived in 1978 by the American Robert Chenhall, published as the *Nomenclature for Museum Cataloging*.[13] This thesaurus divided all man-made objects into 11 categories, which were further divided into subcategories.[14] The extent to which this thesaurus was used in the Netherlands is not well documented. It did, however, form a basis for the Dutch Hierarchical Description of Objects developed in the early 1980s.[15]

ICOM developed a Basic Registration Card that was adopted in the Netherlands during the 1980s. The Municipal Museums in Zierikzee (including the Maritime Museum and the Stadshuismuseum) was one of its users. The adoption of the ICOM card resulted in a restructuring of the collection's basic description, totaling about 1,500 objects. In 1981, the museum began

[11] The NMV has origins in the *Vereniging Directeurendag* (Association of Directors), which made a separate union to look for the interest of museums in 1926. In 1947 the name changed to *Vereniging Museumdag* (Museum Day Association), and in 1969 to *Nederlands Museumvereniging* (Netherlands Museum Association) (Grondman, 2010:189-190). Per 1 January 2014, the Association for National Museums (VRM) merged to form the *Museumvereniging* (Museum Association).
[12] The Guidelines included measures for the identification of acquisitions, for ensuring findability and for processing transportation and loans (NMV, 1974).
[13] Jones-Gamil, 1995.
[14] Hogenboom en van de Voort, 1982.
[15] Jeanne Hogenboom en Jan van de Voort (red.), *MARDOC-Handleiding voor de beschrijving van afbeeldingen* (Rotterdam, 1982; MARDOC-publicatie no. 4).

photographing the collection, so that by the end of 1988 2,600 objects were registered and photographed.[16] These information systems were run manually.

In the late 1960s, computers appeared to provide a solution for the management of information, yet not all museum workers responded enthusiastically. Everett Ellin wrote:

> "Given the high cost of computer use relative to the modest funds typically available to the museologist and his understandable opposition to machine intervention in the performance of his traditional functions, it is not at all surprising that museums have been rather slow to awaken to the evident potentialities of this new technology as a tool for research […] Museums are fast approaching the point of stagnation in serving their own requirements for information."[17]

Efficiency in the management of collections, catalogues and libraries was the driving force behind the exploration of the use of the new technology. An international survey of museum computer activity was conducted in 1968, in which Everett Ellin identified three types of pioneering work: (1) comprehensive (national) data banks, (2) conversion of collection information at an institutional level, and (3) specific research problems.[18] Though not developed in this report, the Netherlands engaged in the three types of pioneering work starting a decade later.

International influences

Four international events have inspired digitization in Dutch museums: (1) the 1967 formation of IRGMA, the Information Retrieval Group part of the Museum Association in the UK;[19] (2) the 1968 conference entitled Computers and their potential application in museums, organized by the Metropolitan Museum of Art in New York with a grant from the IBM corporation; (3) the eighth ICOM

[16] GMZ, 2004.
[17] Ellin, 1986:65.
[18] Ellin, 1986:65-66.
[19] MARDOC, 1977. IRGMA's early objective was to define a Museum Communication Format or MCF by establishing a standardized classification and terminology for museums (Parry, 2007:19). This would lead to what was to be known as the MDA-card.

General Conference in the same year, where computer projects in museums were presented; and (4) a special ICOM magazine issue about Museums and Computers in 1970.

The 1968 conference at the Metropolitan Museum of Art made a great impact on museum staff in the Netherlands. The foreword of the published proceedings exemplifies the computer adoption process in museums, written with excitement about networks made possible by computers, the tools that support a new type of analysis but that also "impose a rigorous […] discipline upon us. They will require us to rethink some of our assumptions, re-examine some cherished presuppositions, sharpen our perception, cleanse our terminology […] because computers deal in irreducible and stubborn facts."[20] Computers brought both feelings of awe due to their potential and, at the same time, concern for the work involved. One curator visiting the conference was appalled because, as Hoving explains, he was "set off [by] a paper on the Analysis of Quantified Data in Numismatic Studies which described the great Sultan Saladin as a *test variable*."[21] That is, computers were seen as tools that minimized content to a field value, while disregarding the actual information value.

Edmund Bowles, IBM employee and former museum staff, introduced the conference by suggesting that computers would be instruments in a renaissance where museums would go from being "repositories and scholarly retreats to […] an instrument of total accessibility and involvement with the artifacts of man, playing a vital role in education and cultural enlightenment."[22] These goals remain relevant after 40 years. At this conference, various museums presented the work that was initiated using a computer, which was highly limited and experimental yet opened new doors for querying collections. Chenhall presented what would become an important system for the organization of objects in a computer based information system. He emphasized the importance of first understanding the information system (what is communicated and why) before establishing the technical, physical information system (how is information

[20] MOMA, 1968:ix.
[21] MOMA, 1968:ix.
[22] MOMA, 1968:xx.

accessed). Chenhall advocated for the use of microfilm because it was cheaper (compared to magnetic tape), it could solve the problem of storing data with "great reluctance to being codified in machine-language form" (such as images), and processing was fast.[23]

Early adopters

Computers were extremely expensive and only large institutions (generally linked to universities) ventured to explore the potential application in museum work. One exception was the Streekhistorisch Centrum (Centre for Regional History) in Stadskanaal, an early pioneer in the application of microcomputers for the management of object information. Their system was developed using the museum's own object keyword system, available through a screen main menu on a CBM/Commodore 3032 micro with 32KB memory and a CMB dual floppy disk.[24] This early example of microcomputer application in a small museum can be perhaps explained in that the son of the museum's director was knowledgeable about computers. This is one good example of the impact that personal interest has had in the adoption of computers in museums and the development of digital collections.

Another early example can be found at the *Museum voor de Nederlandse Zeevisserij* (Fishing Museum) in Vlaardingen, with important repercussions. The museum received *f*1,500 (or €680)[25] in 1969, the first subsidy to be awarded for the digitization of collections by the Ministry of Culture.[26] A national automation commission (*Commissie Automatisering Rijksdienst*) was established to coordinate and monitor the use and application of electronic machines for all departments of the government. Funds were also made available to support efforts in "other institutions that would be eligible to receive funds."[27] In the *Financieele*

[23] MOMA, 1986:73. Robert Chenhall's systems would lead to the Nomenclature for Museum Cataloguing (1978), which was fundamental in the forming of the Dutch system for Hierarchical Description of Objects (1980s).
[24] Degenhart Drenth, 1981.
[25] The Dutch Guilder was used until 2002 when the Netherlands adopted the Euro. All calculations are based on a *f*2.20371 to €1 exchange rate.
[26] CRM,1969:4.
[27] MARDOC, 1977.

Dagblad newspaper of 14 August 1969, the commission was cited saying that the government was interested not necessarily in fishing (the subject matter to be digitized) but in the possibilities offered by the automation of information in general, and in the further implementation of the technology in museums in general.[28]

The subsidy was granted to an ad-hoc commission for the documentation of salt water fishing collections to develop a documentation system and to pay for the manual labour needed to work on the museum documentation system. The commission advised a progressive approach to documentation of collections and requested a computer.[29]

A year later, in 1970, the Ministry of Culture gave €6,800 to further advance automation activities.[30] The resulting documentation system (VISDOC) included the registration of literature on the Dutch sea fishing history, utilizing the experience and documentation methods used in libraries. The VISDOC-system was operational in 1973 and by 1977 there were 2,200 book entries in the system. The success of this project led to the development of a documentation system for museum objects (objects and images) beyond the subject of fishing and including the entire Dutch maritime culture. The commission changed its name in 1976 to become the *Commissie Documentatie Nederlandse Maritieme Collecties* (Commission for Documentation of Dutch Maritime Collections) also known as MARDOC. The documentation system was also named MARDOC.[31]

2.2 The MARDOC years

MARDOC became an organization that would provide support to numerous museum institutions by advising, teaching, developing standards, and eventually distributing software for the adoption of computers in museum work practice. The team was made up of (art) historians, working as registrar specialists, and ICT specialists, who were responsible for system development

[28] MARDOC, 1977.
[29] MARDOC, 1977.
[30] CRM,1970:3.
[31] Van de Voort, 2002; MARDOC, 1977.

and analysis.[32] MARDOC was to be an important interdisciplinary network for collection information exchange.[33]

In the first publication by MARDOC in 1977, project coordinator Van de Voort explains that images and objects "were brought into the system as information carriers, just like the literature documents." However, the document continues, with the new system the first problem developed: "a choice had to be made regarding the information that would be documented and the used terminology required standardization." Collaboration between museums was of the essence. To resolve this task, a working group was formed for the description of objects in 1975 with two main goals: (A) to choose the data that would be documented and thus link the object to a format for the description card (registration card); and (B) to standardize the terminology used for the object description and later identification (findability).[34] These two elements, basic registration information and standardization, would remain at the core of all digital related work as museums negotiated the development of digital catalogues for museum object registration.

The group decided to start with the documentation of ship models from 19 museums, using the manual for the description of ship models developed by MARDOC. Because museums were understaffed, MARDOC's staff visited museums and recorded the objects. However, due to unfamiliarity with the objects and documentation practice, "recording a ship model on a History Artifact Card (including typing) took 62 minutes on average," it was later reported. The test database developed included 600 ships. In the 1978 conference in Den Helder organized by SIMIN,[35] the MARDOC Foundation presented on-line data searching, which included descriptions of 50 ships from three collections. At the time, data was housed at KIM (fig. 2.1). This was the first time data was searched remotely from previously entered data.[36]

[32] MARDOC, 1985:285-290.
[33] Hogenboom, 2013.
[34] MARDOC, 1977:6.
[35] See section 3.2
[36] Maurits, 1981; Van de Voort, 2002; Van de Voort, 1986:260.

Figure 2.1 Presentation at Den Helder (1978)

In 1979, MARDOC performed an inventory of the documentation practice, funded by a grant from the Prince Bernhard Fonds, gathering information regarding the characteristics of the maritime collections, the type of documentation, the use of the registered data and the general registration practice. 31 museums were surveyed, containing some 200,000 maritime related items. The results from this inventory showed that only a small part of the collections were registered (about 1,600 objects), that recording quality varied and that museums used a great variety of documentation procedures. 22 museums used record cards in 25 different formats, though that did not mean the cards were filled-in completely or even at all, and rarely (only in 10 museums) did the card contain more data than the accession register (table 2.1). Only 9 museums had their entire collection documented and most museums only registered the important administrative data. Most museums did not record their photographic collections. From this survey, two main recommendations were made: that a structured inventory card be used to ease the registration process while supporting standardization of information, and that more time be spent in the research and

documentation of objects to achieve a responsible documentation practice.[37] It was not only about developing a system to manage information, museums also had to produce the content through labor-intensive research.

Table 2.1 Documentation practice in maritime museums 1979 (N=31)

Total registration of collections	Museums with entire collection registered	Museums using a record card
1,600 objects (estimated at 0.8%)	9	22 (using 25 card types)

Source: adapted from van de Voort, 1986.

The library of the *Maritiem Museum Prins Hendrik* in Rotterdam adopted the MDA card (developed by the Museum Documentation Association in the UK) to register slides, as a way of organizing the visual collections.[38] MARDOC later formed a working group for the description of images, commissioned to produce a manual to describe what makes up half of the maritime collections, namely paintings, drawings, prints, photos and slides.[39] Objects were organized based on the Nomenclature for Museum Cataloguing from 1978. The painting collection of the *Maritiem Museum* was documented using an average of 3,700 characters per object. In the spring of 1982, a list of descriptors was collected and sent to the MDA in the UK for processing. The printout of the catalogue and the index arrived back to the Netherlands after some considerable delay in November 1982. The delay was apparently caused by the absence of a processing agreement to input the Dutch data, being in Dutch language, into the mainframe used by MDA, which was a newly installed IBM at the University of Cambridge.[40]

The MDA offered computer services to member and non-member museums, also from abroad. The Computing Service involved data preparation (data input in a computer to make it machine-readable); advising (regarding costs, benefits, and practice); computer processing; presentation of data (in multiple

[37] Aarts, 1979; AMI, 1981; Van de Voort, 1986.
[38] Hogenboom, 2013.
[39] Hogenboom en Van de Voort, 1982.
[40] Hogenboom en Van de Voort, 1982. Hogenboom recalls having to consider the fields to request for indexing the data, as only selected entry points were available to query collections information (Hogenboom, 2013).

forms, i.e. micro-fiche, machine-readable, camera-ready); maintenance (including correction and update); and information retrieval (searching procedures). MDA also offered Software Services for museums that used the GOS-package, developed by MDA. Data preparation had a cost of £4.30 per hour for members and £6.00 for non-members. Computer processing would cost about half the price of data preparation. Preparing a catalogue of about 1,000 objects would cost £600.[41] Until 1983, MARDOC had an annual budget of about €2,700 for outside computer processing and of the €68,000 annual budget in 1981, staff costs represented 80% of all expenditures.[42]

The description format for images was based on the History Artifact Card (90 fields) and the Pictorial Representation Card (106 fields) of the MDA.[43] By 1982, the *Maritiem Museum* in Rotterdam had registered close to 250 paintings, 800 slides and 150 photos using the Pictorial Representation card.[44] Until 1982, all data was recorded manually on the MDA cards with an annual production of 800-1,000 records of around 1,700 characters and 500-700 records for larger records of around 3,800 characters. Knowledge of the recorded data and the quality of available documentation influenced production.[45] Consequently, manual work represented the largest allocation of resources.

The Basic Registration Card

The MARDOC group adapted the MDA Historic Artifacts Card in collaboration with SIMIN, the result of which would become the Basic Registration Card (*Basisregistratiekaart)*.[46] MARDOC decided not to reinvent the wheel and instead had a policy of adopting and adapting available technology. The Basic Registration Card was launched nation-wide in 1988 and has since established a basic structure for the documentation of objects in Dutch museums.

[41] Van de Voort, 1980:98.
[42] Van de Voort, 1986.
[43] In the UK, collaborating museums had developed 8 standard inventory cards by 1976, all of which were suitable for working with computers. The MDA card was based on the work of IRGMA (Ouwerkerk, 1989; Van de Voort, 1986).
[44] Hogenboom en Van de Voort, 1982:8.
[45] Van de Voort, 1986; Van de Voort en Hogenboom, 1989.
[46] Van de Voort, 2002.

Its main structure has been adopted into the Art and Architecture Thesaurus currently used in the Netherlands, the AAT-Ned.[47] The card was not quickly adopted, as was to be expected. Large institutions already had a developed information system while small museums found the card to be too complex.[48]

The Basic Registration Card required museums to inventory objects using structured keywords, or controlled vocabulary. This meant an important change in work practice that intended to professionalize vocabulary and end the sometimes lyrical prose that was used to describe objects. A great benefit of this card was that it was simple and that it could be used for objects as well as for images. The card resulted in a compromise made for a developing field (regarding the professional museum object documentation standard) and resolved the considerable backlog. It was expected that museums would automate the basic information while keeping a manual information system "to store the 'story' and further documentation of the object."[49]

A specialized card for natural history museums was to follow. In 1985, the natural history section of SIMIN decided to work on a standardized registration system. A Natural History Object Card was developed (called NHOK for *Natuurhistorische Objectkaart*) based on the international standard for minimum registration made by CIDOC. The cards were made available to the field and partly financed by the NMV. A manual was also developed, yet automation was never mentioned. The cards were meant for a paper information system.[50]

In 1987, the *Rijksmuseum van Natuurlijke Historie* (Natural History Museum) in Leiden received a grant from the Ministry of Culture (WVC) to use the card to automate the educative collection (about 10,000 objects). The Natural

[47] The AAT Art and Architecture Thesaurus was developed in the USA and has been managed by the J. Paul Getty Trust since 1983. The AAT was built to support the work of scholars and researchers while providing a controlled vocabulary system to organize collections. The AAT, currently an important collections organization tool for museums in the Netherlands, was redubbed AAT-Ned after its Dutch translation in 1994 by the National Office for Art History Documentation, or RKD. The translation was supported in part by a grant from the Mondriaan Foundation of *ƒ* 60,000 (€27,226) (Jones-Gamil, 1995, p.6; http://www.aat-ned.nl/over-deze-site; Mondriaan, 1995; Mondriaan, 1998).
[48] Ouwerkerk, 1989:93.
[49] Ouwerkerk, 1989:94.
[50] Van Etten, 1988:6-7.

History Museum in Nijmegen also requested a subsidy, which was granted on the condition that the natural history museums work together and that the product be made available for the rest of the field.[51] The following year, this effort led to the development of a software version of TINman for the natural collections, called TINnhm.

Object description was regarded as the most important preparation activity before digitization. For the MARDOC group, the publication of the *MARDOC-Handleiding voor de beschrijving van afbeeldingen* (MARDOC Manual for the Description of Images) from 1982,[52] their fourth and last publication (and the first to be produced using a microcomputer) was an important milestone. It was greatly influenced by Chenhall's *Nomenclature* (second edition from 1978).[53] The first and second level descriptions were quite general and by the third and fourth level it was possible to enter more detailed data, all in alphabetical authority files.[54] By the following year, 3,600 museum records were available in machine readable form made up of 1,250 history artifacts, 630 pictures and 1,475 literature documents.[55]

MARDOC and the computer

1983 was an important year. First of all, a team of three was formed at the *Maritiem Museum* in Rotterdam. Allocating three people dedicated to MARDOC full-time meant continuity of the work. Most importantly, by 1983 the MARDOC office started to work with computers. By 1984 there were four microcomputers. The computers were acquired thanks to a project subsidy from the Ministry of Culture.[56]

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[51] Van Etten, 1988:7.
[52] Jeanne Hogenboom en Jan van de Voort (red.), *MARDOC-Handleiding voor de beschrijving van afbeeldingen* (Rotterdam, 1982; MARDOC-publicatie no. 4).
[53] Van de Voort, 2012.
[54] From www.den.nl.
[55] MARDOC, 1983.
[56] Van de Voort en Hogenboom, 1989; Maurits, 1981; Van de Voort, 2002; Willemsen, 1984; Van de Voort, 1986. The first acquired microcomputer was a Phillips P2500 with 64kb of memory, connected to an Epson MX 100 printer, with Datastar (for the design of data recording formats) and Supersort (for converting the entered data into lists) software. This was followed by a Prime 2250 computer with a storage capacity of 300 million characters used for data communication (and intelligent terminal).

The MARDOC team developed special software for both statistical analysis of data files as well as for the InterMuseum Information System, or IMIS, using an early version of Adlib software imported from the UK (from Lipman Management Resources). This system was meant to connect all the museums in Rotterdam. Although that was never fully realized, the *Maritiem Museum* and the *Museum voor Land en Volkenkunde* (now known as the World Museum Rotterdam) were linked together and the two museums worked using the same computer system.[57] Two years later, during a conference in 1985, the first remote thesaurus based search was demonstrated using the image collection of the *Maritiem Museum*.[58]

The first computerization of images at the *Maritiem Museum* was done using a film master. Approximately 23,000 stills were shot to represent the objects. These were linked to a Prime 2250 via a video-disk with a storage capacity of 40,000 pictures (photographs and plans of ships). Digitization of images had a cost of about €272,000 for a six-man team involved in getting objects out of storage and filmed.[59] These stills were transferred to a Philips laserdisc. The image metadata were displayed using a normal computer terminal, connected to a Philips laserdisc system using a serial RS232 connection. The object records were stored in a computer system and linked to the image. The project of digitizing images was made possible by a grant from the Ministry of Economic Affairs.[60] Late in 2009, the original films were reviewed, and rescanned using a high-resolution (4K) film scanner. Using current equipment, the images resulting from those first scans show the limitation of past technologies: the granularity of the film and the light used for the photos made them of extremely poor quality compared to what is possible with current high resolution imagery.[61]

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[57] Van de Voort en Hogenboom, 1989; Degenhart Drenth, 2010.
[58] Maurits, 1981; Van de Voort, 2002; Willemsen, 1984.
[59] In comparison, the Gouda museum invested €377,000 EUR in 2009 to digitize 60 vases using 3D scan technology. This may sound like a great deal of money, but Gouda museum was the first museum in the Netherlands to use 3D imagery (http://www.den.nl/project/250/).
[60] Maritim Museum, 1988.
[61] Degenhart Drenth, 2010; Willemsen, 1984.

In 1986, director Pieter van Empelen was succeeded by interim-director Piet Schoots, director of the Rotterdam City Library. At the time, the city library was using PICA, the Project for Integrated Catalogue Automation, with good results. PICA was implemented at the *Maritiem Museum* in 1987 and the museum collection was placed alongside the library collection. Joining collections from the various sectors in one system was an innovative idea and its application remains a desire and a challenge. However, the registration of museum objects in a system designed for library collections was fraught with continuous limitations. The museum collection was transferred back to a museum management system (Adlib) in 1997.[62]

The IMC

Though the goal of MARDOC was to give advice and develop tools to support museum automation, the technological developments and the needs of the market made the profit side of business inevitable. It was decided that MARDOC was to separate its activities into a not-for profit and a for profit organization.[63] In 1986, the MARDOC Foundation became the *Stichting Nederlands instituut voor geautomatiseerde Informatieverzorging in Musea en andere Culturele instellingen* (IMC - Information Services for Museums and other Cultural Institutions), with W. Goossens as its interim director.[64] A for-profit branch, an IMC Office was developed so that the Foundation could raise its own funds and ensure that the advising role of the Foundation would remain independent. Both the IMC Foundation and IMC Office were housed in the *Rijksbureau voor Kunsthistorische Documentatie* (RKD - National Office for Art History Documentation) from 1986 to 1988.[65]

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[62] Brand, 2009. The Project for Integrated Catalogue Automation, or PICA, was created in 1969 as an initiative of the KB and a group of university libraries. PICA was bought by the Online Computer Library Center, or OCLC, and was fully integrated into OCLC by 2007 (http://en.wikipedia.org/wiki/OCLC_PICA).
[63] Hogenboom, 2013.
[64] The change from MARDOC to the IMC Foundation resulted from a 1985 cultural policy document that favored privatization (Vaessen, 1986). In this same line, museums that belonged to the state were privatized, meaning that staff members were no longer government employee, yet the collections remained state-owned (Ketelaar, Huysmans, van Mensch, 2011).
[65] Hogenboom, 2013.

Figure 2.2 Screen shot of TINman Main menu and Option menu (see larger view in annex)

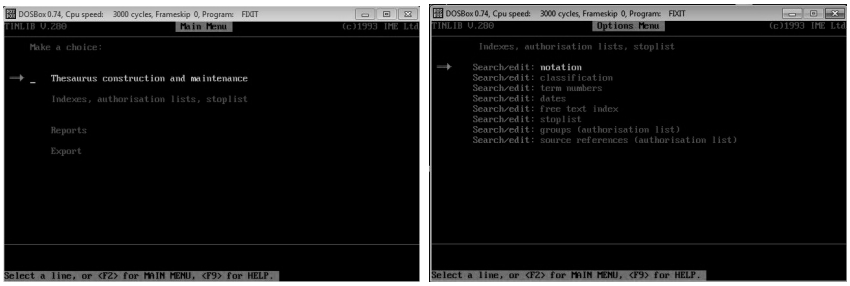
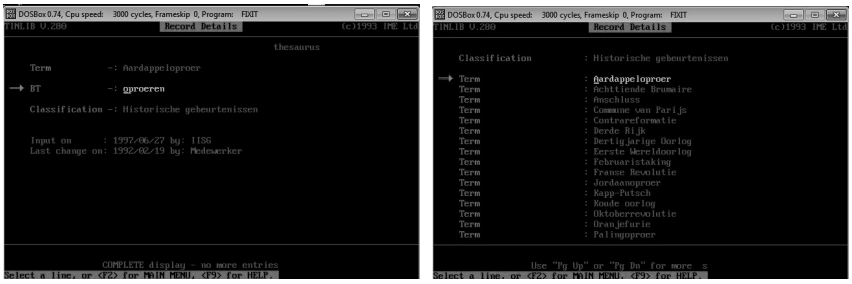


Figure 2.3 Screen shot of TINman Record Detail pages (see larger view in annex)

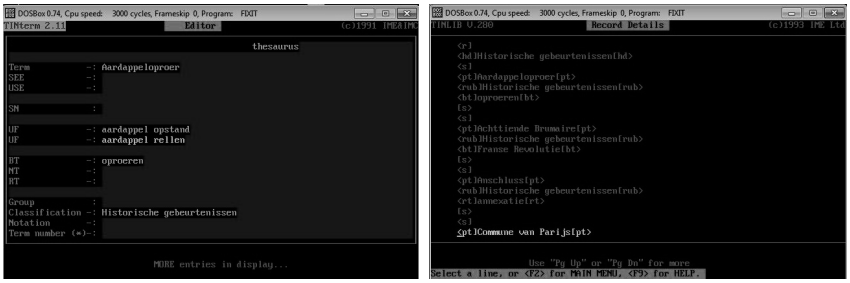


IMC Office started to sell Q&A applications. Q&A (for Question & Answer) was an American product made by Symantec, with French, German and Dutch versions. IMC Office also sold implementations of TINman software, a DOS (and later Unix) based program made in the UK by Peter and Kate Noerr from IME. Later they decided to build their own Windows-based software, named IMC modules.[66] In collaboration with the NMV, IMC Office developed several versions of TINman, including TINreg for the registration of museum collections, TINbas for basic registration, TINlib for the registration of libraries, and TINnhm

[66] Van de Voort, 1994b: 65; Degenhart Drenth, 2010.

for the natural history collections (fig. 2.2-3). By 1995, 165 museums used Q&A and 40 museums used a version of TINman.[67]

Figure 2.4 Screen shot of TINman Editor and Export pages (see larger view in annex)



TINnhm was chosen over dBase III because programming of the latter was very complex, the database had to be split up to use less memory space, making it almost unworkable, and building a thesaurus was not possible. TINnhm in contrast, was more expensive, was new and unknown to the sector, and was not compatible with Apple; yet it did allow building the desired database.[68] The system was based on the Natural History Object Card of the MDA. In the late 1980s, 16 natural history museums had bought the software but only 4 were really using it. Museums attributed this to not having enough staff to manage two systems (the manual and the new digital), not having IT knowledgeable staff, having collections that were too large to handle per unit (insects could easily amount to a hundred thousand specimens), and the diversity of the collections was not well represented in TINnhm.[69] "The user-friendliness was moderate, uniformity was difficult to achieve with many different sub collections, and the exchange of registered data seemed arduous." By 1989, a Natural History

[67] Van der Starre and Van de Voort, 1995:10.
[68] Van Etten, 1988:7-8.
[69] Woeltjes, 1995:7.

Museums automation users group was established to offer courses and to improve the system.[70]

The IMC Foundation conducted a survey in June and July of 1987, receiving 128 responses from museums on the state of digitization of collections (table 2.2). 52 museums (or 41%) had not yet begun adopting computers, 41 museums (or 32%) were considering adopting computers, and the remaining 35 museums (or 27%) were in the process of adopting or were already using computers. Financing was the most important impediment for the adoption of computers. Of the 41 museums looking into the possibilities of digitizing collections, 46% would have to self-finance the entire process while the 35 museums that already owned computers had financed 67% of the total cost from their own budget.[71]

The 128 participants also reported on the institutional registration practice. 19 museums (or 15%) were not able to report on the size of their collections. The rest of the respondents reported registering their collections using a self-developed system (49%), using an adapted registration method (32%), and using a standard method for collection registration (19%). Of the registered objects, 46% had *subject* as searchable data, mostly connected to the description of the collection and the acquisition registration. The most important reason to adopt computers was to improve access to collections (84%).[72]

Table 2.2 State of digitization of museum collections 1987 (N=128)

Use of computers	Not yet adopted	Considering adopting	Adopted (or in process)
	41%	32%	27%
Registration practice	Use a self-developed system	Use an adapted registration method	Use a standard system for collection registration
	49%	32%	19%

Source: Stichting IMC, 1987c.

Results from the survey conducted by the IMC Foundation were used to determine the need for automation courses, with priority given to the introduction

[70] Slieker, 2001:10.
[71] Stichting IMC, 1987c.
[72] Stichting IMC, 1987c.

to computers, followed by registration, printing, data management, administration, documentation skills, thesaurus creation, training users, and planning, organization and coordination.[73] Automation training also included registration training, camouflaged as part of a technical skill that actually influenced the entire gathering and processing of information. This allowed training to be provided even where the management of museums did not see the need for registration training. Often, training took place without the use of a computer, to lower costs and avoid confusion while learning to use the computer (fig. 2.5).[74]

Figure 2.5 Computer courses organized by IMC Office

By 1989, the IMC Foundation was absorbed by the RKD becoming the *Afdeling Museale Automatiseringsadviezen* (AAA - Department for Automation Advice for Museums). The IMC Office continued to deliver software and consultation services to the field.[75] Together, they supported the adoption of systems to register collections to increase access to information. AAA continued the work of the MARDOC group yet the name changes brought much confusion to the field. In their sporadic newsletter, distributed together with the NMV

[73] Stichting IMC, 1987c.
[74] Hogenboom, 1992.
[75] Van de Voort, 1991a; RKD, 1991; Bureau IMC, 1995:2.

magazine *Museumvisi*e, the AAA department reminded the field of its role as independent advisors and trainers supporting the development of standards.[76]

Not everybody appreciated the increased transparency that resulted from the application of computer systems. Hogenboom recalls selling one separate system to each collections department of a museum that did not want to share sensitive information, particularly related to the value of objects and acquisitions budgets among departments, and was prepared to pay a higher cost for multiple systems. Transparency was experienced as confrontational, as potential errors in the information processes were made evident. Access to information was further organized according to the organizational structure: access to collection information went via curators, access to loans information went via secretaries, and so on.[77]

IMC Office continued to be the Dutch representative in international organizations, including the European Museum Information Institute (EMII). IMC Office coordinated the survey of standards used in the Netherlands, using the European Standards Survey and resulting in the European Standards Map online. Results were available online only for partner organizations. Results from the Netherlands showed that knowledge about standards was scattered, initiatives were isolated and new projects did not build on past work. Data was not always harmonized. For instance, the total Dutch heritage collection was estimated to be 36 million, yet a natural history inventory could report 100 million objects.[78]

Wider adoption of computers

AAA conducted a study commissioned by SIMIN in 1990 in response to the lack of an overview of the level of automation in museums. A survey was prepared, following the ICOM/CIDOC survey format from 1988 and sent to the 870 museums (table 2.3). Findings included an account of the most frequently used systems, which turned out to be those provided together with the computer hardware supported by government subsidy (the Philips AT computer with the

[76] RKD, 1992b (No.3).
[77] Hogenboom, 2013.
[78] Beijers and Hogenboom, 2000:49-50.

Q&A software). Of the 292 participating museums, almost half (42%) had a computer. The computers used were generally Philips (23%), IBM (10%), Olivetti (10%), Tulip (10%) and Apple (5%). The Philips AT was offered with a discount during the PC-museum project, which explains its popularity. The software used included WordPerfect, Dbase, Q&A, TINman, and others (table 2.3).[79] Institutions reported that computers supported the management (82%) and inventory (77%) of collections, followed by scientific documentation (53%), public information (39%) and the making of catalogues (36%).[80]

Table 2.3 Adoption of technology overview 1990 (N=292)

Use of computers	Type of computer used	Type of software used	Type of use
Own a computer 42%	Phillips 23%	WordPerfect	Management 82%
	IBM 10%	Dbase	Inventory 77%
	Olivetti 10%	Q&A	Documentation 53%
	Tulip 10%	TINman	Public information 39%
	Apple 5%	Others	Publications 36%

Source: based on Fontijn, 1990:12-17.

From the responding institutions, those managing ethnographic and botanical collections were more likely to have computers (83%), followed by photos, film and video, library and art collections (67%-70%), then by archeology, and technical and archival collections (61%-64%), and ending with history collections (49%). Only a few institutions reported having more than 25% of their collections automated. However, it should be added that few institutions reported the percentage of collections digitally registered at all, which raised questions as to the extent to which the gathered data represented the field.[81] Not surprisingly, very few institutions (4.9%) had a budget line for automation activities or were able to say what percentage this represented of the total institutional budget. Three institutions reported an automation budget representing 25% of the institutional budget.[82] By 1990, it appears, there was still little

[79] Fontijn, 1990:11.
[80] Fontijn, 1990:12.
[81] Fontijn, 1990:12.
[82] Fontijn, 1990:16-17.

knowledge about computers and not enough financial support for the digitization of collections.

In 1995, a follow up survey about the automation in museums was commissioned by SIMIN and conducted by AAA. 372 institutions responded (of a total of 893), reporting the use of various programs for the registration of collections including Dbase (7%), Filemaker (2%), Q&A (44%), TINlib, TINnhm and TINreg (10%), WordPerfect (6%), others (31%). The survey also asked about the software used for word processing, administration, financial management, educational work, and exhibitions support. In addition, institutions reported the total number and type of computers used, including DOS (217 museums), Apple (32 museums), UNIX (1 museum), and other (8 museums). Almost half of the respondents had between one and three computers, and a third had between four and ten. Digital imaging was relatively new, yet 41 museums reported storing digital images, particularly small art museums. Images were generally made in-house with a scanner (27 museums), with photo CD (12 museums), or with video cameras (10 museums). A great deal of attention was given to digital images, yet the costs withheld institutions from adopting the technology full-scale. Still, the majority of adopters were smaller museums. A total of 62 (16%) institutions had a network, including Novell (72%), Appletalk (8%), Banyan (3%), Lantastic (3%) and other (14%). However, only 27 museums reported being connected to the Internet. Internet was used for email (18 museums), discussion lists (4 museums), for the www or gopher (14 museums), or for other uses (7 museums). 6 museums reported having their own website (table 2.4).[83]

In 1993, RKD started automating its collection, including all documentation and images. This was an important accessibility project, given the prominent use of the biography and bibliographic database of artists from the Low Countries, which included 80,000 names by 1995. The standardization of artists' names served as index to give access to the 3.7 million objects. Digitization of images and the creation of large image banks were, however, not seen as cost effective. Most institutions chose to have a *classic* text information system that

[83] Starre, 1995.

would serve as a digital index to the paper photo archive. By the mid 1990s, digital images were made with a scanner (also available for slides) or with a (video) camera in multiple formats (with no agreed standard), in either raster or vector format.[84]

The AAA group estimated however that digital images were going to gain importance as hardware and software became more accessible (i.e. less expensive), easier to use and as standards emerged. The group also expected a wider use of telecommunications and a greater personalization: "the individual user [can] appropriate the found information, reuse it and manipulate it without disturbing other users."[85] By the mid 1990s, however, it was clear that it would remain utopian to provide universal remote access to all text and image information from museum collections.

MARDOC, and later the IMC Foundation and the AAA department of RKD, had a significant advisory role in the museum sector regarding adoption of computers not only through their courses but also by gathering data and disseminating survey results. They also advised the Ministry of Culture on digitization matters (see chapter 4 on national policy). Eventually, AAA was absorbed by RKD and become an internal collections management department; it no longer functioned as national advisor. Other institutions available to give advice regarding digital activities in the early 2000s included the *Museum Consulent*, the NMV via SIMIN, the ICN via various projects, IMC Office as for-profit advice organization, the Reinwardt Academy through their teaching programs, MusIP and the recently created *Digitaal Erfgoed Nederland* (DEN - Digital Heritage Foundation for the Netherlands). By the end of the 1990s, a coordinating organization that ensured collection and analysis of data was missing.[86] MusIP would take a leading role in data gathering in the early 2000s (see chapter 3, section 3.3).

[84] Van der Starre and van de Voort (1995):17-20.
[85] Van der Starre and van de Voort (1995):25.
[86] Beijers and Hogenboom, 2000:49.

2.3 Organizational transformation

Adapting work processes to the use of computers for the management of collection information across the Netherlands proved to be no easy task. Dutch museums had developed paper-based information systems with multiple systems of order, dimensions and locations, so that information about one object was found in several cards, books, and people. These systems were labor intensive, carefully expanded over the years, and reflected the organizational structure of museums. The existence of the manual systems, and their quality, turned out to be a barrier to the introduction of new, computer-based modes of work.

At the archeological *Allard Pierson Museum* in Amsterdam, for instance, objects were first registered in the acquisitions book, with date of acquisition, inventory number, donor (or previous owner), short description, measurements, place of origin, date of creation, material, and price. Sometimes a hand-made illustration was added in Indian ink. Some entries included a note on the insurance value. Objects were then registered on an object card, filed under the inventory number, with additional information to document the exact object location (in storage or in an exhibition hall), full loan information, restoration report, state of the object, related literature, further comments, and date of last check with name of staff member. The card system was searchable only through the inventory number. There was also a photo book in which information about exhibitions was documented. The curator at the museum in charge of acquisition registration and of updating, maintaining and managing the card system, knew the collection intimately and could find objects with ease. Some information was never documented because there was no need to do so. For example, noting the name of the registrar was unnecessary because this was easily identified based on the handwriting.[87]

The *Amsterdams Historisch Museum* (Amsterdam Historical Museum) had a uniquely efficient manual information system in place, which prevented the museum from considering automation in the early period. On the initiative of the director of the museum, a central registration was started in the 1950s and the

[87] Frenkel, 2013.

Department of Collection Inventory (*Kunstinventaris*) was created.[88] The director was part of a generation marked by the Second World War: people realized that without proper registration, objects could simply be lost. Object registration gained unprecedented importance.[89] Each object was given an inventory number (*stamboeknummer*) and was recorded in an inventory book (*stamboek*). Each object had several different cards, such as a registration card (*stamkaart*) and a photo card. The registration cards included data about the object (content) and administrative information that was expanded as it became available (i.e. additional references), making the centralized system stronger as time went by. Objects also had a reference card to include further information about literature, exhibitions, available documents, a photograph, and restoration reports linked to the object. The administrative card included acquisition invoices, provenance, and location, in addition to the inventory number and keyword for identification. In addition to these cards, there was an elaborate index system with iconographical and topographical index cards.[90] Automating a system like this was to prove not an easy task.

The 1990s represented a period of much organizational change, of learning new ways of working and of developing solutions to the emerging problems. It was common to question the impact of a new technology because, after all, museums had been conducting object registration for a very long time. How could object registration be so different using a digital tool?

The fragmentation of information facilitated and supported a *task*-driven workflow, where individuals worked in isolation, while the digital networked technology connected information and required an *integrated* work style, with individuals contributing to an overall process. Many early digitization projects failed to transform the organizational structure and only translated the fragmented work style to a digital environment. As digital systems developed, organizational structures were gradually adapted, with major transformational implications.

[88] Reichwein, 1998:5.
[89] Reichwein, 2012.
[90] Reichwein, 1998:5.

Organizational change at the Rijksmuseum

One good example can be found at the *Rijksmuseum* in Amsterdam. Though computers were introduced in the early 1980s, it was not until the museum closed for renovation and underwent a major reorganization in 2004 that a more digital work form was adopted. Several organizational changes took place in the 1990s, including the IT department splitting in 1995 into two departments: one in charge of serving the growing information need of the entire organization and the other responsible for the collection management system.[91] Still, information was fragmented. The use of various software systems and the growth of multiple information systems continued. Responsibility for object management was not always clear: an object could be registered as being part of a collection (e.g. Fine Arts) and under a different inventory number it would be registered as part of another collection (e.g. History). A study carried out in 1999 showed that information was still to be found in 144 (!) different information systems. There was no fully functional central system and each department continued to work with its own archives, some left from previous employees.[92]

In 2004 staff moved to a temporary location during renovation of the main building. The library, offices, print room, curators, photo department and documentation departments moved to a single location.[93] Having most of the collection-related staff in one location had positive effects for collection management and for documentation.[94] The reorganization of 2004 merged all curatorial staff into 3 departments (Art, History and the Prints Gallery) and two new department sections were created: a Conservation section and a Registration and Documentation section (re-named Collection Information section in 2012), also under collections, with the Library as additional section. Under the new structure, all objects were registered and documented by the same department independently of curatorial responsibility. Starting in 2006, this change facilitated the development of a stronger department able to ensure that data input was more

[91] Rijksmuseum, 1995:13.
[92] Van Gelderen, 2012.
[93] Rijksmuseum, 2004.
[94] Sigmond, 2012.

uniform and to establish guidelines that resulted in a centralization of work from all collections[95] The Collection Information section was commissioned to become a knowledge center, to develop a uniform system for the management of object information (physical and administrative) and to improve access to the information. The mission statement of the department is to "collect, order and document information about the collection so that it is and remains easily accessible for everybody."[96]

One of the goals of the new Collection Information section was to establish a production line where objects would be registered and digitized with the highest quality. The Prints Gallery Online digitization project was launched, with an output of 25,000 digitized prints, but with extremely high labour costs (table 2.4), representing 91% of total costs in the first year rising to 93% of total costs in consecutive years. Material costs decreased from 9% in the first year to 7% in consecutive years. The excellence of the work would become a quality standard in the museum.

Table 2.4 Rijksmuseum's Prints Cabinet Online project budget

	2010	**2011**	**2012**
Personnel Costs	429,511	435,000	435,000
Material Costs	41,500	32,500	32,500
Total Costs	**471,011**	**467,500**	**467,500**

Source: Internal memo, 2 September 2009.

Production was also streamlined for digital imaging: quality standards were established in accordance with the national standard developed for the so-called Metamorfoze project, so that photos were always done the same way ensuring a harmonized color profile. [97] Planning ensured efficiency: currently there are set days for photos based on type of object and format (a day for mirrors and so on) where all objects are shot with the same style of gray color background. Ordering images used to take months, it now takes 5-6 days. In 2006,

[95] Van Gelderen, 2006; Jacobs, 2011.
[96] Jacobs, 2011.
[97] van der Harten, 2012.

the *Rijksmuseum* had about 20,000 images in the collection management system Adlib. By 2012 there were 150,000 images (about 6 images per object representing about 25,000 objects) of which 60% (or 90,000) are new photos following the new standard and about 3% (or 5,000) are old scans.[98] The museum decided to establish a structural budget for quality registration of the collection to make it available and increase access to a broad public, while reducing backlog.

The formation of the Collection Information section and the development of a streamlined digitization process that identified information about objects such as facts, stories and personal perspectives, are developments that reflect a key turning point for the museum. Information, created together with the public, was to form the base for future knowledge production, and digitization was seen as a key enabler.[99]

Digital work forms at the Tropenmuseum

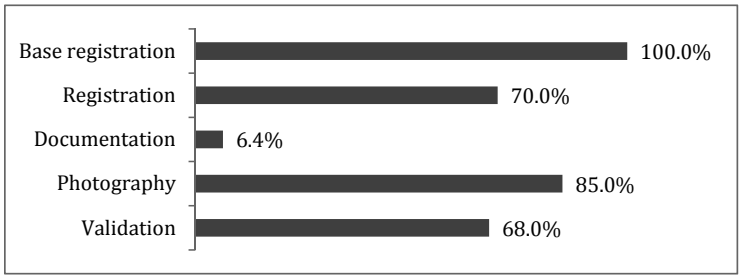
In contrast, the ethnographic *Tropenmuseum* in Amsterdam adapted the digital work form to support evaluation and strategic planning. Exploration with computers started in the 1980s and by 2000 the current information system (TMS) was adopted. The adoption and implementation process (including migration) was carefully planned. A quality handbook was devised for the registration and documentation of collections. It was created based on the experience and demands of the staff for a bottom-up approach, ensuring the acceptance and application of new work methods.[100] Using TMS as an information system required a change in work practice but also signified a culture switch: a new work process meant staff had to think differently. Object registration and documentation in TMS was supported by a large location registration project starting in 2003. All objects and storage locations were given barcodes, which were scanned with a hand-held scanner, and included basic information: object inventory number, title, geographic and cultural origin thesaurus terms, department and sub-collection. Even though TMS was not perfect, it was a central repository of information that

[98] Van der Harten, 2012.
[99] Stuurgroep ICT, 2010(a):17-22.
[100] Beumer, 2008:31,42-43.

supported access to collection information. TMS allowed adding images, sound, video and multimedia (e.g. hyperlinks) to every object record. Images were of great use, particularly to complement partial records. For example, objects have recorded interviews that support contextualization.[101]

Quarterly reports were produced that served to manage production, identifying any gaps, and to communicate the work that had been done to the rest of the institution. The reports have been the basis for the annual report, for accountability and for increased transparency. More recently, the reports include information about online information use.[102] The *Tropenmuseum* is unique in its regular documentation of digitization of collections. Examples of the information provided are given in fig. 2.6 and tables 2.6/7.

Figure 2.6 Levels of digitization and values at 1 January 2013



Source: TMS.

[101] Hellemons, 2007.
[102] Van Brakel, 2013.

Table 2.5 Digitization growth for the Material Collection Tropenmuseum

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	**Total of 156,889 objects**	%
Digital image	50,622	4,667	9,010	11,982	4,544	4,599	-8,083	-	-	-	-	-	-	88
		(-91%)	(+93%)	(+33%)	(+62%)	(+1%)	(-275%)							
Registration	15,619	26,144	28,538	15,162	8,166	2,449	7,464	9,667	12,655	4,115	8,892	5,280	**144,151**	91
		(+67%)	(+9%)	(-47%)	(+46%)	(-70%)	(+204%)	(+29%)	(+30%)	(-67%)	(+116%)	(-40%)		
Documentation	5,404	3,266	1,663	1,009	907	991	151	480	1,156	451	2,411	1,044	**2995,953**	12
		(-39%)	(+49%)	(+39%)	(+10%)	(+9%)	(-84%)	(+217%)	(+140%)	(-61%)	(+434%)	(-56%)		
Validation	11,339	21,658	28,140	6,492	7,531	2,659	22,831	7,924	8,422	12,511	7,265	5,971	**142,743**	90
		(+91%)	(+30%)	(-77%)	(+16%)	(-64%)	(+758%)	(-65%)	(+6%)	(+48%)	(-42%)	(-17%)		

Source: adapted from TMS 2012 4th quarterly report. All objects have been registered in the digital system using the Basic Registration level.

Note: In 2007, a new storage system was in place, the Jukebox. A selection of image files was moved from TMS into the Jukebox, which meant a negative growth in TMS. The Jukebox was meant to ease the server capacity of TMS, which has now the ability to hold high-resolution JPEG image files.

Table 2.6 Digitization growth for the Photo Collection Tropenmuseum

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	**Total of 217,489 objects**	%
Digital image	16,733	11,094	27,359	9,564	1,903	110,612	-123,954	-	-	-	-	-	-	88
		(-34%)	(146%)	(-65%)	(-80%)	(+5,712%)	(-212%)							
Registration	1,737	8,973	8,172	6,588	4,927	48,289	9,487	9,274	13,269	8,448	3,836	2,203	**125,203**	57
		(+416%)	(-9%)	(-19%)	(-25%)	(+880%)	(-80%)	(-2%)	(+43%)	(-36%)	(-54%)	(-43%)		
Documentation	109	252	345	1,213	174	302	156	536	746	393	554	882	**4450,213**	3
		(+131%)	(+37%)	(+251%)	(-85%)	(+73%)	(-48%)	(+243%)	(+39%)	(-47%)	(+40%)	(+59%)		
Validation	1,617	7,660	9,522	2,252	7,495	7,638	16,000	7,796	13,515	9,388	4,888	12,236	**100,007**	55
		(+374%)	(+24%)	(-76%)	(+232%)	(+2%)	(+109%)	(-51%)	(+73%)	(-30%)	(-48%)	(+150%)		

Source: adapted from TMS 4th quarterly report. All photographs have been registered in the digital system using the Basic Registration level.

Data migration

Organizational change also led to data migration projects, involving the transferring of data from one system to another, usually related to the introduction of new systems and technology. Migration became inevitable as information systems developed. Large digitization projects led to large-scale migration of data. For instance, the Q&A program was launched nationwide, with the support of the NMV, making possible for many museums to adopt the system, sometimes requiring a first migration experience. At the end of the 1990s, the Q&A system was no longer supported and data had to be migrated to another system, generally to its follower ICM-modules, to AdMuse (predecessor of Adlib), or to TMS (The Museum System).[103] Adlib gained visibility and field recognition when the system was adopted by the RKD and by the *Rijksmuseum* during the Delta Plan. Because of the dependency on municipal funding, a cluster of museums in a region would together adopt the Adlib system, requiring further migration.[104]

As an example, the *Allard Pierson Museum* has been involved in several migration projects that reflect the changes at its parent institution, the University of Amsterdam Library (see table 2.8 below). Sometimes, data had to be re-entered into the new system by curatorial staff. At other times the university's technical staff conducted the migration but, without previous experience, many decisions were made that resulted in major data errors, including the merging of data fields (e.g. place of acquisition and place of origin) and the use of preferred identification numbers (e.g. inventory number instead of place of location). One main issue that was encountered was using the object date *Before Christ (BC)*, as the library system adopted was designed to only accept *Anno Domini (AD)* dates. The data set required much cleanup work and staff had to learn to use the new systems, all greatly time-consuming activities.[105] Several major data migration projects have taken place (table 2.7),

[103] GMZ, 2004; Taekema, 2007; Volkers, 1998.
[104] Adlib provides information systems for libraries, archives and museums. Libraries make up less than half of the customers but provide more than half of the revenue. Many museums do not share the same information system that their libraries do – which would be beneficial from a business perspective, unless the system is exclusive for one or other collection. For example, the Rijksmuseum uses Adlib for the management of objects but the library uses KOHA for the management of books. The Van Gogh museum decided to merge all collections into Adlib in 2010.
[105] Jurriaans-Helle, 2013.

changing work practices just as the dataset appeared to have been fully cleaned up. Staff experienced the changes as "unpleasant," as "having to start all over again".[106]

Table 2.7 Migration trajectory at the Allard Pierson Museum (1980s-2010s)

Migration year	Software adopted	Organizational change
1980s	Dbase III+	Adoption of digital system at museum.
1985	TINman	Adoption of PC (Commodore 64) at museum.
1986	TINman	Adoption of new PC (Olivetti M24) at museum.
1993	Access	Establishment of exclusivity contract with Microsoft at University level.
2002	PICA	Reorganization: museum became part of the University Library department.
2011	Aleph	Update of information system at University Library.
2013	Adlib	Adoption of parallel information system, Aleph continued to be used.

Source: own.

New information systems usually require a new approach to work that was not always developed or communicated throughout the institution. Museums generally translated the old information system into the new software, avoiding the challenge to approach migration as an opportunity to redesign access to information.

Looking back at the history of digitization in museums, it becomes clear that the adoption of a digital work method requires major organizational change, as is the case in other organizations as well. However, there was a certain *naïveté* in museums when adopting computers. Automation projects were started with vague project goals, and few went further than data entry, with too much data entered per object (or specimen), and lack of a careful data input/output plan. "It came as a shock to many that retrieval considerations should have preceded the start of data entry."[107]

Museums adopting the emerging digital information technology were initially confronted with a tool that was costly to adopt, required much organizational effort, and was not permanent enough so that the effort to transfer data from the old to the new system did not achieve the expected efficiencies. The early development of information systems meant that certain unstable systems would lead to migration of data and to what Parry would describe as "false starts". Parry argues that systems in the 1990s were not meeting museum specifications and poorly prepared adoption of systems led to frustration. The early information systems turned out to limit rather than enhance the registration of museum objects, for instance by constraining the

[106] Frenkel, 2013.
[107] Sarasan presents the case of American museums with a similar experience (Sarasan, 1995:189).

descriptions of objects to 254 fields or by making information fit into one screen.[108] These technological limitations were felt throughout the adoption of digital technologies well up to the 2010s.

2.4 Presentation of collections and exploration of the WWW

Computers eventually became much more than a tool to administer collections and to facilitate information retrieval, with the internet as the key enabling factor. The possibility to access information remotely, from multiple sources and at the same time, brought a series of new possibilities for museum organizations. The efforts from the mid 1980s to access networked thesauri remotely were only a glimpse of what was to come with the World Wide Web. In the 1990's the Web fundamentally transformed the notion of information distribution and exchange at all levels, opening up opportunities for the public to take a new participating role. It generated a space where to exchange data, to publish material, to share information and to establish a 'digital presence'.

The early history of museums on the Web

Although the World Wide Web was invented by Tim Berners-Lee and Robert Cailliau in 1989, it was only in the late 1990s that Dutch museums launched their first websites. An early Dutch museum website was set up in 1994 by the *Teylers Museum* in Haarlem. The museum had an opening page with images that showed a tour of the museum which would take about 20 minutes to download.[109] The viewer could walk from room to room, finding information about the collection in the library. Other functionalities included a guest book, a catalogue to purchase books, information about exhibits, Pieter Teyler, education and a video showing images of an electrostatic generator.[110] This is often referred to as the first Dutch museum website.

An even earlier application of the web was the launching of the ICONCLASS Browser in 1991, developed by the Iconclass Research and Development Group in Utrecht. The browser showed a translation of the 17-volume classification to the online environment in addition to a few extra search possibilities.[111]

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[108] Parry, 2008:48,50.
[109] MBZ, 1998.
[110] Taekema, 2007.
[111] RKD, 1991:3. Iconclass is an index system thought of by Henri van de Waal in the 1950s, from the University of Leiden. Iconclass was managed by IRDG the Iconclass Research and Development Group, responsible for adding new concepts, expanding and updating the bibliography, translation of

With the coming of the Web, the first systems were developed that gave the general public access to museum information. The *Boijmans van Beuningen Museum* in Rotterdam launched in 1992 an image bank which allowed access to the objects in the Ancient Art collection.[112] In 1990, the *Rijksmuseum* began exploring with a self-built information system called ARIA, which stands for Amsterdam Rijksmuseum Inter-Active system. A first proof was launched for the Rembrandt exhibition in 1991, followed by a feasibility study. Funds were raised between 1993 and 1995 and by October the museum was able to start the implementation of the plans. The system was launched early 1998 presenting about 700 objects including presentations that linked to the objects. The information center was opened at the same time.[113] ARIA was designed for the public to access collections and was not meant for museum workers. As an internal networked system it was not meant for on-line access.[114] However, because the information center was closed soon after opening due to the remodeling of the Night Watch room, ARIA eventually resulted in an online display of collections for the public.

In 1996, the NMV organized a New Media and Multimedia day in Maastricht where 130 museum staff met to learn about the Internet and CD-ROMs. The meeting was closed with an hour surfing the Internet where, unintentionally, all the disadvantages became clear: the transmission speed was very slow and sites were not accessible because the Net was often overloaded (particularly on a Friday afternoon). The RKD was able to present its website, launched earlier in June, by downloading it beforehand, unlike the *Teylers Museum* and the French ICOM site, unreachable due to the poor connection. [115]

Costs for using the Internet were not high, yet *creating* a website easily became quite expensive. In this period, getting onto the Internet was like jumping into a moving train without knowing where it went to.[116] Nevertheless, theweb presence of Dutch museums expanded rapidly between 1998 and 2002 (table 2.8).

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the system, development of the software, and publishing of the Iconclass Browser (http://www.iconclass.nl/about-iconclass/history-of-iconclass) (RKD, 1996b:2). Iconclass can be accessed at http://www.iconclass.nl/.

[112] Van Meeuwen en van de Starre, 1996.

[113] Van der Heiden, 1998a:8-10; RKD, 1998; Rijksmuseum annual report 1997.

[114] Van der Heiden, 1998a:8-10; Volkers, 1998.

[115] RKD, 1996; Maurits, 1996.

[116] Van der Starre in Maurits, 1996:8.

Table 2.8 Museum presence online

Year	1994	1995	1996	1997	1998	2002
Museums with a website	1	6	7	21	25 (2.7%)	670 (81.1%)

Source: based on Taekema (2007); Starre (1995); Web Archive (searching on 1996, 1997, and 1998), and NMV and DEN (2007). Note: data gathered after 2007 does not include the number of museums with a website.

Early museum presence on the web included the *Openlucht Museum* in December 1996, the *Rembrandthuis* in March 1997, the *Stedelijk Museum* in December 1997, the *Natuurhistorisch Museum* in Maastricht in February 1998, the *Joods Historisch Museum* in November 1998, *Naturalis* in Leiden in December 1998, and the *Maritiem Museum* Rotterdam in December 1998 (with the site mmph.nl).[117]

Based on the list of museums online around the world published by the Oxford University Computing Laboratory, at least 13 Dutch museums had a website by 1997.[118] In their 1999 annual report, the *Rijksmuseum* in Amsterdam proudly announced having 6,000 pages of text, over 4,000 illustrations and 150 film clips (for the virtual tour) available on their website. The same year, *Naturalis* reported 50,000 sessions of people spending a total of 2,300 hours on their website.[119]

[117] These dates do not reflect the launching of the website but a mere presence at least since the date reported, as can be gathered from data taken from the Web Archive.
[118] Based on data found using the Internet Archive (https://archive.org/), snapshot on 11 December 1997 at http://www.comlab.ox.ac.uk/archive/other/museums/world.html.
[119] Rijksmuseum Annual Report 1999; Naturalis Annual Report 1999.

Table 2.9 Available on-line collections based on digitization and website launch

Museum	Year first digitization	Year first website (ca.)	% collection digitized in 2008	% collection available on-line in 2008 (catalogue form)
Allard Pierson Museum in Amsterdam	1983	-	25%	25%
Amsterdam Museum in Amsterdam	1992	1999	47%	13%
Bonnefantenmuseum in Maastricht	2003	2000	65%	10%
Museon in The Hague	1985	1997	21%	20%
Museum Meermanno in The Hague	1984	1999	10%	0%
Geldmuseum in Utrecht	2006	1998	2%	-
Rijksmuseum van Oudheden in Leiden	2001	1998	22%	-
Rijksmuseum van Natuurlijke Historie (currently Naturalis) Leiden	1974	1998	10%	-
Rijksmuseum in Amsterdam	1985	1999	5%	10%
Scheepvaartmuseum in Amsterdam	1991	1999	4%	0.9%
Stedelijk Museum in Amsterdam	1996	1999	-	-
Stedelijk Museum de Lakenhal in Leiden	2000	2001	15%	1%
Stedelijk Museum in 's-Hertogenbosch	1990	2000	100%	70%
Tropenmuseum in Amsterdam	1992	2002	100%	63 %
Teylers Museum in Haarlem	1990	1994	20%	5 %
Wereldmuseum in Rotterdam	1981	2000	70%	25 %

Source: DEN 2009, interviews, webarchive.org.

By 2008, museums with smaller and homogeneous collections seemed to have a higher percentage of digitized collections, with the *Tropenmuseum* being an exception achieving 100% digital registration of a heterogeneous collection (Table 2.9)

Early internet-based museum projects

The Internet inspired many projects. One of the first was a digitization project at the *Amsterdams Historisch Museum*. At the end of 1996, a project was started for the full registration of the glass collection (700 objects), leading to the publication of a new catalogue. All the glasses were measured and re-photographed. Their basic information was entered into the system and complemented with data about provenance, insurance value, origin, literature, and references. The object entries also

included comment texts written by Bert Vreeken, the curator of Applied Arts. By 1998, all data was in TINreg. Selected data was transferred to WordPerfect, including object keyword, maker, manufacturing location, period, inventory number, description, comments and literature. This formed the entries of the paper catalogue entitled *Glas in het Amsterdams Historisch Museum en Museum Willet-Holthuysen,* published in 1998.

Figure 2.7 Glass Collection opening screen and main menu (see larger view in annex)

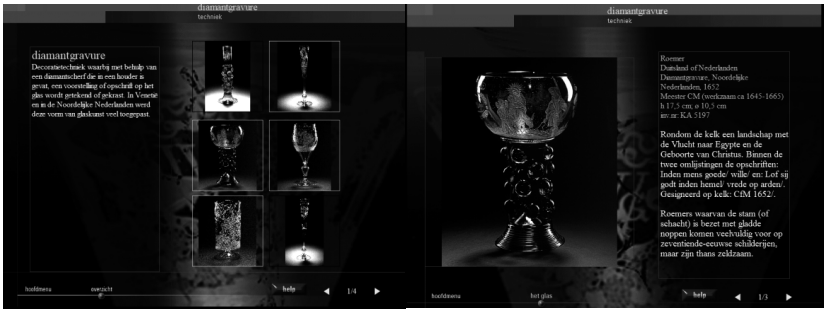
The idea was also to publish the catalogue as a website (fig. 2.7/8). To do this, the exports from TINreg were converted into HTML codes. A program was created based on these HTML codes, in collaboration with software supplier Bureau IMC and Netlinq designer agency, and was shown on a computer in the glass exhibition at Museum Willet-Holthuysen (*Roemers, fluiten en bokalen*).[120] The interactive digital design of the catalogue was impressive. Unfortunately, the program did not use standard fonts and was designed to be viewed on an 800 x 600 pixels screen, which limited visualization online. Re-design was too expensive and the project was terminated.[121]

Several important lessons were learnt from this first online project: the museum learnt about aligning goals between collection registration and the publication of the catalogue, sometimes with diverging interests even if both had the aim of providing access. Collection registration was about the systematic recording of facts while the creation of a catalogue involved creating a story and an interpretation of facts. In addition to the several in-house departments working on the project, the

[120] Reichwein and Den Dekker, 1998:55,59.
[121] Reichwein and Den Dekker, 1998:56-58; Van Gent 2012.

museum depended on external technical experts to make it all happen (4 different firms participated in the production process). The project served as a pilot for further digitization projects.[122]

Figure 2.8 Glass Collection diamond engraving and object view (see larger view in annex)



A series of *portals* were also launched in the late 1990s. By 1998, four museum related sites were launched: museumvereniging.nl, museumplein.nl, museumserver.nl and hollandmuseums.nl. *Museumvereniging.nl* was launched by the NMV as a modest website meant for museum professionals, which was updated monthly. *Hollandmuseums* was designed to showcase Dutch museums for an international public. A virtual room space was available for museums to place up to 5 objects, each with its own page to display an image and text. By 1998, there were 7 participating museums and a list of museum candidates.[123]

Museumplein provided free cultural information, designed by Clockwork, but sold the use of sites to content providers and advertisers. The site had links to museum websites, an event agenda and a discussion forum. Content could be searched by art categories to reach exhibits and museum. Historical, technical and other museums were not included. Maarten Rens Produkties ran *Museumserver* in a similar way. All museums appeared in a list free of charge, including those with or without a website. Museums could also rent their own website space. Museumserver linked to the *Nationaal Bureau voor Toerism* (NBT - National Tourism Office), and to the gallery

[122] Reichwein and Den Dekker, 1998:62-63.
[123] Van der Heiden, 1998b:42-45.

listings at ArtSite. Museumserver published a monthly newspaper called *De Museumkr@nt*.[124]

In 1997, the RBK launched the Network Collection Netherlands, or NCN, a computer network with a national infrastructure, where museums could post their objects available for loan or for deaccessioning. It was a closed network (Intranet) based on Lotus Notes software by IBM, and only registered institutions could access the data. This site was formed in response to the Delta Plan where museums were requested to relocate objects not supporting the collection (alienated in content or form). The site also responded to museums' desire for such a platform, as communicated in a survey conducted by the collaboration of the RKB, the LCM and the NMV. Half of the project costs were financed by the Ministry of Culture and by the Ministry of Internal Affairs (as part of the National Action Program for an Electronic Highway) and the other half was provided by the ICN.[125]

Seven museums joined in the first year. One year later, there were still only 50 participants and many complaints. A survey conducted showed that acceptance of the NCN depended on the content available for member museums, and that costs were not experienced as limiting factor; it was the technical aspects of the NCN which prevented museums to become members. Knowledge about computers and the Internet was lower in museums than in other sectors, so the NCN struggled to get content published due to an inadequate infrastructure. Museums further experienced competition between the various online initiatives, primarily with their emerging institutional websites but also with the *Hollandmuseum* and EDUnet, projects supported by the Ministry of Culture. Museums did not feel responsible for the success of the project, especially due to the lack of an active role during the planning and design of the NCN. Because of this, NCN shifted its targets and goals to supply relevant information for museum professionals.[126]

[124] Van der Heiden, 1998b:42-45.
[125] Kok and de Zwaan, 1996; Scholten, 1998:45-46,51. The ICN, now the RCE, would later launch the Deaccessioning Website and would continue to coordinate collection mobility efforts.
[126] Kok and de Zwaan, 1996; Scholten, 1998:45-46,51. ICN would later be responsible for the Collectiewijs and later Cultuurwijzer websites, developed by DEN and used to exchange professional information, later managed by RCE and currenty a project of Stichting E30 (http://erfgoed20.nl/collectiewijzer-2-0/).

2.5 Wide use of online platforms

The 2000s saw a large increase in the number of websites for museums and for cultural heritage in general. In 2001, DEN Foundation launched two platforms for the display of and access to cultural heritage. The *Cultuurwijzer* (Web Guide to Culture) (http://www.cultuurwijzer.nl) was a selective portal to a large number of digital heritage information resources for the general public. It was envisioned as a guide to all the information about cultural institutions (museums, monuments, archives, archeology and libraries), information about collections, and information about the objects, all texts prepared by the DEN staff. The other site, *Cultuurwijs*, built in a similar way, was directed at school-age children: museums could provide authorized content for an education environment. In 2005, ICN took over the management of the *Cultuurwijzer*. The site became an online space for cultural managers and not for the general public.[127] The site included information about people (cultural professionals), information about training, information about cultural heritage work (portal to exchange knowledge), and information about digital collections. Eventually, in 2009, this last section about collections merged into the DiMCoN project, the *Digitale Museale Collectie Nederland* (Digital Museum Collection Netherlands).

Other sites launched by heritage institutions include the relocating website, launched in 2006 as a platform "for and by museums to offer objects which are being considered for relocation (the so-called surplus objects)." Ideally, objects were transferred to museums that gave objects a more prominent place in their collection. The website was linked to the publication of a revised "Guidelines for the Deaccessioning of Museum Objects", or LAMO (*Leidraad voor het Afstoten van museale Objecten*), which does not allow the selling of objects between national museums. However, once objects have been made available but not selected by national museums, the objects can be sold and proceedings are to be used solely for the improvement of collections (new acquisitions or active restoration). The Guidelines require full documentation of the entire process.[128]

ICN conducted an art auction through eBay on the internet in 2007. The collection of 350 objects made available for purchase to the general public started on 4 July 2007, changing every Sunday until October. The auction yielded a total of

[127] DEN, 2004; Tan, et al., 1999.
[128] The LAMO was drafted in 1999 and since has been accepted as the national professional standard for the selection and deaccession of museum objects. The document has been revised in 2004 and in 2006. (Bergevoet, Kok and de Wit, 2006:21).

€83,000 for the participating museums. A second auction of about 350 objects took place in October at The Hague. Some of the artwork for auction came from to the so-called BKR art subsidy project.[129]

Objects auctioned were left over from a selection of objects needing relocation or deaccessioning from the collections housed at ICN (580 objects), the *Centraal Museum* in Utrecht, the *Communicatiemuseum* in The Hague, the *Museum Gouda* in Gouda, *Industrion* in Kerkrade, and from *Stedelijk Museum de Lakenhal* in Leiden. The 1,330 objects were first made available to Dutch museums via the relocation website (www.herplaatsingsdatabase.nl).[130]

Museum alliances

Museums also organized themselves to present content on the internet, and thematic or geographic alliances were formed. An example of a geographic alliance for the presentation of heritage content from across the sectors was IGEM, the *Internet Gelderse Museums* project (Gelderland is one of the Dutch provinces). The project was started in 1999 and later re-named *Collectie Gelderland*. After a failed offer made by Computron to transfer collections data from Q&A into Access so that museums could access each other's collections through a browser, Adlib Information Systems was hired to design the project. With funds from SNS Reaal Fund, Prince Bernhard Fund, and from the Gelderland province, the project started with five museums.[131]

Museums described their collections with information that was interesting for the public (e.g. creator, title, description, keywords) using AAT terminology and their standard software system (Q&A, IMC-Modules, Adlib, TMS), and provided a digital image to be placed on-line. Procedures and instructions were written for the IGEM website. Data was updated four times a year and participating members met quarterly to discuss research and development as well as potential further collaboration and exchange of data. The first website was launched in 2001 with less than 1,500 objects. By 2004, the province took part in MusIP. Data from the inventory raised concerns

[129] http://www.8weekly.nl/artikel/6085/erfgoedinstellingen-veilen-ook-in-2008-museale-voorwerpen-via-ebay-een-tijger-in-de-zak.html. For an explanation of the BKR project see chapter 2 section 2.2 on The MARDOC years.
[130] Centraal Museum Utrecht Jaarverslag 2007/2008:5.
[131] Museum Elisabeth Weeshuis, Liemers Museum, Flipje en Streekmuseum Tiel, Stadskasteel Zaltbommel and Stadsmuseum Harderwijk. Cf. Stam, 2010.

about the level of digitization and for the quality of the photos. A photographer was sent to make quality photos.[132]

In 2005, Gelders Erfgoed formulated a new policy. With subsidy from the province, Department of Economic Affairs, the third website was developed. By 2006, there were 20,000 objects in IGEM and features included Stories, Object of the month, and Inside the storage rooms. By 2010, a new website (www.mijnGelderland.nl) was developed to showcase the collections of 21 museums. The goal of the project was to support small and middle-size museums to increase the visibility of their collections, while lowering costs through collaboration, supporting registration and documentation of objects. Important benefits, in addition to the increased visibility of collections, were the collaboration among heritage organizations and the ease to access information for the general user.[133]

Another geographic alliance was made in the city of Deventer by the *Stadsarchief*, the *Atheneumbibliotheek*, *Museum de Waag*, *Centrum Beeldende Kunst*, and *Stichting Cultureel Erfgoed*. They started working on a pilot in 2001 using Dublin Core to present collections jointly online. Access was given as a catalogue of the collections, with a description and image of the objects where the top pieces were used to tell a story about the area. The project encountered the difficulties of working with different information systems, where books were registered in PICA (object description) while objects were registered in Adlib (administrative information). Dublin Core provided a solution to the structuring of information for online publication, as it was simple to understand and apply.[134]

A geographic alliance project www.friesverleden.nl was terminated on 1 January 2007 for reasons that remain unclear. The project was organized by the DEN Foundation and intended to make heritage content available online from 11 heritage organizations located in the Friesland province.[135] Other national organizations participating included DIVA, NCM, SNA and NMV.[136] The fact that the project was

[132] Stam, 2010.
[133] Stam, 2010.
[134] Zandhuis and Dijksterhuis, 2001.
[135] The website of the project is redirected to http://www.tresoar.nl/Pages/Default.aspx, the information center about the Friesland Province.
[136] Helmus, 2007. DIVA was the Documentation and Information Services Foundation for Archives, the umbrella organization for archives and records directed by Richard Hermans, in 2007 merged with SNA, the Foundation of Dutch Archeology (*Stichting van de Nederlandse Archeologie*), the NCM, or National Monument Center (*Nationaal Contact Monumenten*) and *Erfgoed Actueel* to become the Netherlands Institute for Heritage (*Erfgoed Nederland*), organization terminated in 2012. BRAIN, the

discontinued brings up questions of sustainability of content: what happens to all the material produced for online publication once the website is no longer supported?

An example of a thematic alliance for the presentation of heritage content was *Maritiem Digitaal.* The website was launched in 2002, bringing together the collections of 10 maritime museums. The website is hosted and managed by the *Maritiem Museum* in Rotterdam, with the support of the *Scheepvaartmuseum* in Amsterdam. Data is collected from the participating maritime museums, including museums from Germany and Belgium, and sent to the *Maritiem Museum*. Data are transferred into Adlib and translated when needed. Participation is free of charge and there are no technical requirements for data sent. This means that participating museums are responsible for their own data, which includes 10 fields of basic information and an image. Quality of data access is thus dependent on the individual institution participating.[137]

Also in 2002, the AMH, or Atlas of Mutual Heritage, was launched. The site included an overview of seventeenth and eighteenth century locations (forts and outposts) of the Dutch *Verenigde Oost-Indische Compagnie* (VOC, the East India Company), and of the *West Indische Compagnie* (WIC, the West India Company). The database included illustrations identifying the VOC & WIC locations, containing images found in 14 institutions.[138]

In 2008, the RKD and the *Mauritshuis Museum* in The Hague launched *The Rembrandt Database* project. Funded by a grant from the Andrew W. Mellon Foundation conservation of documentation in digital form programs, the project ran from March 2008 until August 2010. The database expanded from the RKD database in Adlib with license-free additions. The site incorporated conservation, technical and

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Sector Association of Dutch Archives (*Branchevereniging Archiefinstellingen Nederland*), was launched in 2008 to serve the archive sector.

[137] SM, 2002; Brand, 2009. The Maritiem Digitaal website includes collections from the following museums: Baggermuseum Sliedrecht, Fries Scheepvaartmuseum, Marinemuseum, Museum in 't Houten Huis, Noordelijk Scheepvaartmuseum, Maritiem Museum Rotterdam, Nederlands Scheepvaartmuseum Amsterdam, Reddingmuseum Dorus Rijkers, Visserijmuseum Vlaardingen, Zuiderzeemuseum, Zeeuws Maritiem muZEEum Vlissingen, Nederlands Instituut voor Militaire Historie, and National Maritime Museum Greenwich.

[138] Images presented in the AMH come from Amsterdam Historic Museum, Atlas Van Stolk, Badische Landesbibliothek, National Library of France, Bodel Nijenhuis / Universiteitsbibliotheek R.U.L., British Library, Fries Museum, Groninger Museum, KITLV, Royal Library, Maritime Museum, Museum Bronbeek, Nagasaki Municipal Museum, National Archive, National Library of Indonesia, Österreichische Nationalbibliothek, RACM, Rijksmuseum Amsterdam, Scheepvaartmuseum, Stedelijk Museum Alkmaar, Tropenmuseum / KIT, University Library / UvA, Westfries Museum, and Zeeuws Museum.

art historical information from multiple institutions. All content was presented in English to facilitate international collaboration.[139]

Also in 2008, the *Stedelijk Museum Amsterdam* launched a special website called *Stedelijk in de stad* (Stedelijk in the City).[140] It served to inform the visitor about the various activities, including the construction of a new wing, through photos in Flickr, films in YouTube, podcasts, vodcasts and blogs (including from the director Gijs van Tuyl). The site also served as virtual platform where visitors could respond and provide content. In 2009 the site received a total of 283,448 visitors, compared to the 500,000 online visitors (and 138,250 onsite visitors) received two years later.[141] The website served to maintain a presence while the museum was closed for remodeling and until the opening in 2012. Having that in mind, the museum embraced social media: it joined Hyves in 2007, YouTube in 2008, and Flick, Twitter and Facebook in 2009.[142]

Video channels flourished through YouTube but also with specialized sites like ARTtube, financed by SNS Reaal Fund and the Mondriaan Foundation, a platform where five museums presented art and design videos. Museums participating included *Boijmans van Beuningen* in Rotterdam, the *Stedelijk Museum* in Amsterdam, MHKA in Antwerp, *Gemeentemuseum* in The Hague, and *De Pont* in Tilburg.[143]

In January 2010 the *Nationaal Glasmuseum* (National Glass Museum) in Leerdam presented a new website. The entire collection had been digitized, numbered, and made accessible online in 2006, including 7,000 glass objects, 40,000 drawings, catalogs and 15,000 photos and negatives. During the following years, staff and virtual volunteers supported the process of linking the collection to show possible relations (e.g. designer, photo, drawing, object). The collection was presented in an innovative way, with a timeline, with multimedia, and with contextual information in addition to the general registration information.[144]

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[139] CODART, 2009.
[140] Via the Internet Archive, snapshot on 7 May 2013 at www.stedelijkindestad.nl.
[141] Stedelijk Annual Report 2009:47.
[142] Stedelijk Annual Report 2009:47.
[143] Via the Internet Archive, snapshot on 11 May 2013 at http://arttube.nl/nl/over#.UbRasethqHk.
[144] https://picturae.com/uk/projects/308-360-photography/1323-digitizing-of-glass-objects; http://www.nationaalglasmuseum.nl. Picturae was started as a photographic studio in 1998, adopting database development and other digital information management activities, including production, storage, distribution, and crowdsourcing projects. Production includes 360 degree panoramic room images or object photography, as was done for the Teylers Museum in Haarlem. Picturae has played an important role in the national digital production, for museums outsourcing their scanning and photography projects, particularly gaining attention after participating in the Images for the Future

2.6 Public participation

In the *Tropenmuseum* Online policy document for 2011-2015, the museum considered using the internet (or "the cloud") as an interactive information space in which to communicate with the public. This has two important implications: firstly, the museum building and website are no longer seen as central for communication. The Internet is adopted as an extension of the museum by injecting content into the existing information places (e.g. Wikipedia, Flickr or Europeana). Secondly, objects are no longer the starting point but are one of the actors in creating meaning and interpretation, along with experts and the public. The *story*, instead, takes up the central position in the online, "virtual" museum. The meanings, interpretations and stories that are produced (including by the users) are gathered by the museum and stored to ensure sustainable access.[145]

The consequence of such an approach is that digital activities are no longer a means to increase the number of onsite visitors, but rather a tool to enhance the knowledge transfer role of the museum in a digital world. This shift from the website as entry point to the museum, to "the cloud" as a space for interaction and knowledge transfer, has become one of the prominent developments of recent years.

Social media and user participation

With the development and adoption of social media, or the use of online communication and participation services, the public's active dialogue with the museum has taken new forms. In fact, however, visitor's feedback, participation and communication in general, precede digital technology. Early forms of the so-called crowdsourcing (a mixture of crowd and outsourcing) can be found in the work of volunteers and activities of members of the various friends of the museum associations. The difference brought by digitally mediated public participation can be found in the increased number and diversity of potential participants, as well as in a greater flexibility of participation.

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project digitizing negatives (57,000 glass negatives, 394,000 full-frame and 8x10 inch negatives, and 550,000 6x6 inch negatives). Picturae has also proposed data visualization techniques, as in the National Glass Museum linking collections' information or the History of the Stamp showing the collection through a timeline, and collaborated in the development of new production processes, as in the Scanning of Demand project of the Amsterdam Municipal Archive or the Many Hands crowdsoucing projects (https://picturae.com/).

[145] Tropenmuseum, 2011.

Digital technology therefore has not only changed the way to publish and to present collections online but it has also transformed communication with the public. In the mid 2000s, projects abroad emerged where museums engaged in co-production, co-editing and co-managing together with the public. Museums in the Netherlands also began exploring the possible applications, and a number of projects emerged, with varying levels of engagement with the public. In an article by Oomen and Aroyo, crowdsourcing projects were categorized into six types, based on the activity performed by the public: correction and transcription tasks (users improve digitized material), contextualization (users share stories), complementing collections (users add new content), classification (through metadata or tags), co-curation (e.g. through votes), and crowdfunding (users contribute resources). These projects were mapped in the various steps of the Digital Content Life Cycle, showing how crowdsourcing supported all steps (creating, describing, discovering, and (re)using), except for managing which remained primordially a responsibility of the museum itself.[146]

In 2013, *Naturalis Biodiversity Center* began the *Glashelder!* (Crystal Clear) project where the public was asked to label the information found in almost 100,000 digitized images of specimens (mostly mites and lice). The project was part of the *VeleHanden* (Many Hands) crowdsourcing website managed by Picturae. Other projects in the *VeleHanden* platform included the military registers from 1814 to 1941, from the Amsterdam City Archives, where the public indexed the name, date of birth and place of birth found in 326,437 scanned registers in the period between 6 June 2011 and 15 January 2013.[147] This was the first project of its kind emerging from the collaboration of a heritage institution and a private scanning firm. *Naturalis* was the only museum participating, all other projects were run by archival institutions.

An example of using crowdsourcing for co-curation was the Expose project of the *Kröller-Müller Museum* from 2009, where the public voted on their favorite three images from a collection of 100 works on paper. The 20 winning art works were exhibited.[148] This was repeated in 2010 where children selected the top 20 landscapes and again in 2012 where the public chose 50 small sculptures.[149]

[146] Oomen and Aroyo, 2011:3,7.
[147] http://www.naturalis.nl/nl/kennis/doe-mee/glashelder/; https://velehanden.nl/.
[148] The site http://museumavond.wordpress.com/2009/12/03/expose/ is unfortunately no longer available; http://editie1.kmmexpose.nl/.
[149] http://editie2.kmmexpose.nl/; http://kmmexpose.nl/.

Crowdfunding

Crowdfunding projects, aimed at obtaining financial support from the public, have been quite successful for museums in the Netherlands in recent years (table 2.10). One of the largest was Save Museum Boerhaave, from 2011, organized by *Museum Boerhaave* the Dutch national museum for the history of science and medicine in Leiden. The Ministry of Culture (OCW) required the museum to raise 17.5% of its budget (or €700,000 for the period 2013 to 2016) in order to be eligible for government subsidy. The museum called the public for support, which started with an anonymous donation of €100,000 and was followed by a series of smaller donations. The public could *adopt* an object for three years by donating €1,000, €5,000 or €10,000, and received a certificate, an invitation to a private event, a working copy of the object (for selected objects), and a special reception at the museum depending on the amount.[150] Similar budget cuts drove the *Meermanno Museum*, the museum of the book in The Hague, to launch a fundraising campaign with the title *Boek zoekt vrouw, man en bedrijf* (Book seeks wife, husband and firm), alluding to a popular dating program on Dutch television entitled *Boer zoekt vrouw* (Farmer seeks wife). The museum received more than €100,000 in donations, which covered the quota requested by the government in order to received funding for the period 2013-2016.[151]

Table 2.10 Crowdfunding projects 2011-2013

Museum	Amount raised	Project
Museum Boerhaave	€700,000	Save Museum Boerhaave, to raise 17.5% of total budget and receive government subsidy.
Meermanno Museum	€400,000	Book seeks Woman, Man and Firm, to rise own income and receive government subsidy.
Boijmans van Beuningen	€75,000	To fund an exhibit about Van Eyck (total cost of €1.3 million)
Amsterdam Museum	€51,000	To preserve an artwork.
Van Abbe Museum	€30,000	Save the Wood Circle, to purchase artwork.
Tropenmuseum	€13,150	To digitize photo albums and develop an app for visualization.
Newspaper Museum	€3,815	To develop an exhibit.

Source: own.

Another project involved the funding of an exhibit at the *Boijmans van Beuningen Museum* in Rotterdam which, due to budget cuts, requested public support to finance the long planned exhibit. The funds were raised in a personal chain (person

[150] Museum Boerhaave Annual Report 2011:2; http://www.museumboerhaave.nl/steun/adopteer-een-object/adopteer-een-object/.
[151] http://www.meermanno.nl/index/-/p-boek-zoekt-vrouw-1061.

to person invitation) through The *Kring Van Eyck*, a member group donating €1,000 per year to finance acquisitions, research, exhibits and restorations, bringing much attention to the fundraising action. Thanks to the positive media attention, the museum was able to raise €75,000 via crowdfunding and further received the support of large private sponsors (local asset manager Robeco as head sponsor).[152]

The public was asked to *save an artwork* at the *Van Abbe Museum*, the museum for contemporary art in Eindhoven. After the owner of the piece decided to sell, and thus end the public exhibition of Richard Long's Wood Circle (1977), the museum raised funds to purchase the piece. The museum was able to raise the additional €30,000 needed through a crowdfunding website (*voordekunst.nl*), where 120 people contributed.[153] The *Krantenmuseum* in Amsterdam raised €3,815 from 64 donors to develop an exhibit about Islamic comic strips and the *Tropenmuseum* in Amsterdam received €13,150 from 232 donors to digitize 335 photo albums and to develop an app to facilitate visualization.[154] Not all projects were able to raise the full desired amount. The *Huygens Museum Hofwijck* in The Hague called the public to support the restoration of wall paintings with the additional €11,000 yet only collected 2% of desired funds.[155]

A problematic area

Even though museums had experience in working with the public, through the Friends of the Museum or the many types of volunteers, mediating the participation through a digital environment was experienced as radically different. This apparent difference was found in the amount of potential participants, making crowdsourcing projects large scale, in the novel nature of the contribution (e.g. co-curation), and in the variety of possible contribution forms.

Crowdsourcing seems to bring two major benefits: increasing user engagement while providing a source of (free) resources to enhance access to collections. However, from the Dutch experience, not all participations were sustainable. Fundraising, for instance, works best for specific iconic projects (an important art work, building, or event) but is not a source of infrastructural funding.

[152] Boijmans van Beuningen Annual Report 2011:108.
[153] http://www.voordekunst.nl/vdk/project/view/141-wood-circle-save-an-artwork.
[154] http://www.voordekunst.nl/vdk/project/view/578-foto-zoekt-familie; http://www.voordekunst.nl/vdk/project/view/561-chouf-qra-kijk-lees-strips-en-cartoons-in-de-arabische-wereld.
[155] http://www.voordekunst.nl/vdk/project/view/1126-schenk-een-grisaille.

Provision of long-term resources proved to be possible for projects to correct, transcribe and contextualize collections information, yet these projects did require a robust institutional infrastructure. Museums have struggled with issues of available technology, organizing public participation and management of contributed information.

2.7 3D, AR and VR projects

The use of computers to create a 3-dimensional visualization of an object, within its spatial context, was not picked up by museums until the later part of the 2000s. The technology was fully adopted in architecture, where the study of buildings and cities greatly benefited from the Computer Aided Design software, or CAD, established in the 1970s and 1980s. The use of CAD replaced the manual drawing of architectural models to make 2 and 3-dimensional models by mapping the x, y and z coordinates of lines (or areas). This facilitated the movement of objects to be viewed from different perspectives, something impossible to do with one manual drawing unless a number of drawings were made to show the various perspectives. A characteristic of CAD visualization was that it made evident how computers only work with exact data - visualizations cannot be made with inaccurate (or estimated) measurements. Missing data leads to *holes* in the objects.[156] This realization was perhaps most evident during visualizations, and less for the textual documentation of collections, even though the same applied to all computerized data.

Along with the need of exact data, computer visualizations worked based on interpretations of various information sources. That is, objects were not *self-explanatory* and required contextual documentation. This was particularly the case with historic representations. As systems developed, along with the memory to support increasingly large and complex renderings, so did the type of metadata. Objects gained additional attributes such as author (architect), date of design, date of construction, address and so forth, making the objects findable through various entry points. Linking CAD models to GIS (Geographic Information System) information, in addition to other text, images, maps, sound and video, made 3D objects grow in complexity.[157] In a way, CAD was a system that developed from the visual object to later include the data, as opposed to museum management systems evolving from

[156] Alkhoven, 1995:39,43.
[157] Alkhoven, 1995:48-49,55.

identifying and describing text (data) to images. Both systems managed to combine multiple information sources to enrich object representation and documentation.

Visualization projects in the 1990s often involved the input of as much data as possible, responding to the fascination of the *beauty* of the visualization. More data input would result in more realistic visualizations. Focusing on the labor intensive data input, including the accompanying research, led to neglecting the organization of the data in the system: more often than not, data in the system (input) could not be taken out (output). Multimedia became key in supporting interactivity with large amounts of heterogeneous data (organized in different structures), particularly for a greater user group from various disciplines. The production of 3D environments (objects, places) improved the visualization of historic research and greatly facilitated the further distribution of information. The knowledge about the objects (and historic subjects) was optimized by linking different types of large data sources within one visual object.[158]

In 2008, the *Museum Gouda* began experimenting with 3D. A small selection of objects was sent to London to be scanned three-dimensionally, while the rest of the selected objects were photographed in house with a less expensive technique. The project *Hebbes!* (Gotcha!) had a budget of almost €400,000, partly financed by a government grant.[159] The images were available online in 2010. The goal of the project was to present fragile objects to a broad public.[160]

In 2011, the *Teylers Museum* in Haarlem presented its 4-year work on the "Teylers Universe". The project began in 2007 and ended in 2011 with the presentation of a new website with a thematic organization of content. The website showcased the collection, stories, films and 360° photographs of a selection of instruments and of the Oval Room. The Oval Room is the oldest room - still in its original style - in the museum where instruments from the eighteenth century are presented.[161] Unfortunately, a 3D presentation of the instruments at work, as originally planned, was too expensive for the project budget.

[158] Alkhoven, 1995:52,54.
[159] From the subsidy program *Digitaliseren met Beleid.*
[160] http://www.den.nl/project/250/; AD.nl, Aanraken mag in museumgouda, 8 December 2008.
[161] Slijkhuis, 2011.

At the end of 2012, the SNS Reaal Fund[162] launched a new subsidy program to support Digital Innovation. The subsidy program was designed in collaboration with the NMV and with Virtual Platform, with participation from the University of Applied Sciences in Utrecht. During the planning for the new subsidy scheme, representatives from the field observed that museums were transforming from institutions about objects, to museums about stories. Digital media were seen as a tool to support narrative, understanding and access. The subsidy was therefore designed to support the use of social media, augmented reality, mobile (GPS) routes, games, apps and so on to bring stories to visitors in multiple ways. The core elements were narrative, dramaturgy and public participation and interaction. Museums were able to request up to €25,000 for the development of a project.[163] The first round of 13 honored grants (of 96 submissions) included the *Allard Pierson Museum* with a project on Natural Interaction integrated in the museum to further develop kinetic technology based on sensor technology.[164]

Virtual Reality (VR) technology allowed constructing, deconstructing and reconstructing sites, all useful parts of the research process. VR projects brought up issues of reliability while merging the available data, interpreting it and making a visual reconstruction of a site. Some sites had multiple reconstructions, showing the variety of possible interpretations and use of available data. VR visualizations synthesized the knowledge from multiple specialized disciplines and presented them simply to the public. However, projects did not always follow the London Charter for the computer-based visualization of cultural heritage to ensure best practice in the use of context, use and sustainability.[165]

[162] The SNS REAAL Fonds is a private Dutch fund that gives grants for arts, culture, the youth and society since 1998. It has a yearly grants budget of about €16.5 million (http://nl.wikipedia.org/wiki/SNS_REAAL_Fonds).
[163] http://www.snsreaalfonds.nl/programmaregeling/digitale-innovatie-in-musea/thema; http://virtueelplatform.nl/nieuws/sns-reaal-fonds-lanceert-programmaregeling-digitale-innovatie-in-musea/. In 2013, Virtual Platform became part of the New Institute, a merge of NAi, Virtual Platform and Premsela.
[164] Pietroni and Hupperetz, 2012:3.
[165] Patricia Luloff and Wim Hupperetz seminar presentation on 24 May 2012. The London Charter was conceived in 2006 "as a means of ensuring the methodological rigor of computer-based visualization as a means of researching and communicating cultural heritage [supporting intellectual transparency]. Also sought was a means of achieving widespread recognition for this method" (http://www.londoncharter.org/).

Augmented reality

Augmented Reality (AR) applications also provided new forms of content presentation. The idea behind AR is to provide a user with additional (digital) information about his or her environment in a way that blends almost unperceptively into that environment. The *Netherlands Architectuurinstituut* (NAi) developed in 2009 the UAR, or Urban Augmented Reality project. It gave access to stories and 1,200 architectural objects (including current and planned buildings, plans never realized and buildings from the past), 100 of which were 3D models, for a total of 1,000 points of interest (including metadata, text, photos, maps, drawings, images, audio, film and 3D material). Starting in Rotterdam, the project grew to include a number of national partners and apps were launched in Utrecht, Hillversum, Amsterdam, Zwolle and Breda. In Amsterdam, Rotterdam and The Hague, a UAR Underground version was launched, with images of archeological findings, subway stations and other underground constructions. Partners included the *Amsterdam Museum*, the *Haags Historisch Museum*, and the *Museum Hilversum*, as well as a number of archives, heritage organizations (e.g. Virtual Platform), touristic institutions and a variety of companies (e.g. ProRail, Layar).[166] UAR was a fluid platform where a section was made for the public contribution of buildings, images and text. Because of the increasing use of digital means for dissemination and consumption of heritage information, the project was able to expand relatively easily. Eventually, the project was able to finance itself. The project required much work externally for the collaborations but also internally, staff needed to see UAR as more than a publication to be protected and continuously edited.[167]

The *Stedelijk Museum* in Amsterdam developed an AR exhibit with the project ARTour, financed with a grant of €547,200 Senter Novem. The goals of the project were: to research the possibilities of mobile augmented reality technologies, to create a prototype to give access to collections, and to develop a new business model.[168] The project worked with several partners to develop prototypes using different applications, *Ik op het Museumplein* (Me on the Museum Square) with Layar, to view artworks outdoors (spring and summer 2010), and *ARthoteque* with QR codes, to view

[166] http://www.den.nl/project/495/.
[167] http://www.den.nl/project/495.
[168] Stedelijk Annual Report 2011:9,55.

artworks in an outdoor festival (August 2010).[169] Plans were confronted with technological limitations: the hardware was not ideal (smart phone screens are small), the software had to be made (collaborations required a lot of legal negotiations on intellectual property and further exploitation rights), and the amount of work needed in repositioning the collection information was underestimated (incurring labour costs). The museum has been unable to deliver a final product (at the time of writing) but did learn a number of important lessons. New projects were to use only the technology already proven to work in other institutions - having developed their own system took much time, effort, resources and ultimately took the innovative edge out of the final product. Content developed required maintenance (digital images made some years ago were obsolete). Most importantly, a future vision was sketched: the museum aims to facilitate enriched access to collection information and to allow the public to manipulate it inside and outside the museum through an immersive experience.[170] This is characteristic of the experience of an increasing number of museums. As in the 1990s, the 2010s represented years of experimentation with new technology. These experiments brought museums closer to a future where users would have access to collections information in enriched, immersive and interactive ways.

[169] http://www.stedelijk.nu/en/now-at-the-stedelijk/spotlight/artours.
[170] Schavemaker, 2013.

2.8 Conclusions

Museums in the Netherlands began the process to work with computers from the late 1960s, with the first subsidy towards digitization being granted in 1969. The first available hardware made museums dependent on national centres housing the costly infrastructure, to an extent limiting and slowing down experimentation. Where the 1960s were characterized by the discovery of the new technology, the 1970s were about the introduction of computers in the museum work – as yet only in a handful of institutions. Initial work involved developing methods to organize content for the new mode of information processing. Since the start, controlled vocabularies (e.g. thesauri) and standards for information processing (e.g. registration cards) were identified as important as the system itself (hardware and software). This led to a huge national effort, with assistance from the international community, to develop and implement the Basic Registration Card as a data format for describing museum objects in computer systems. In the end, the card resulted in an impoverishment of data for museums with mature information systems while for others the card was too complex to be adopted. Eventually, the card has been accepted as the *minimal* standard for object registration.

By the 1980s, national attention (and funding) was given to the adoption of computers and much preparatory work took place, yet the field as a whole had difficulty accepting the new digital information carrier. The Personal Computer brought the possibility of exploring various applications in museum work (administration, curation, dissemination and publication). The first software systems for collection information management were developed during the 1970s.

By 1990, more than 30 museums were able to acquire microcomputers and adoption of digital solutions took place on a larger scale, bringing rapid change through the adoption of networked systems and eventually the Internet. Information management and access were transformed, and with it the museum organization. This was necessitated by the fragmentation of the work in organizations, where departments functioned as islands (curators, registrars, photography, education), but also by the process in which technology developed. Choices of hardware defined selection of software and thus applications. Since the start, and reinforced by most standardization projects and national subsidies, preference was given by registrars to DOS based systems for collection inventory above mouse-driven graphical interfaces.

Meanwhile, curators experimented with graphical interfaces for querying the collection, exhibition and publication layout and label design. Different goals demanded different applications, yet few institutions were able to explore both technologies. Gradually, technology developed and museums were able to expand the application of computers at work allowing registrars, curators and other departments to contribute to the digital collection. There does, however, remain a certain divide and curators still are seldom the most prolific contributors to the digital collection.

The 2000s were marked by an explosion of websites and portals for the publication of collections, which encouraged collaboration. Joining resources allowed institutions to advance further. The wide use of the web made the real benefits of digitization clear, especially for a public with a general or specialized interest in cultural heritage. Most museums adopted computers for the management of collections and the publication of basic institutional information. Eventually, museums adopted a production driven process to streamline output based on process (registration, documentation, imaging) and no longer by type of content (differentiated by theme or format). The introduction of information management systems required a great deal of labour, to prepare and to input the data. Standards evolved internationally and were slowly adopted nationally. Working with the digital tool brought major organizational change, while it also facilitated work and enhanced internal and external communication. The need to embrace digital technology was also driven by users increasingly expecting information to be available online. Museums were initially fully in charge of the online publication of content. This proved to be an impediment to the development of applications due to limited know-how of the new digital medium. Increasingly in the 2000s, the design and publication of content was outsourced to specialized firms.

The first decade of the new century saw a new generation of digital collections with the wide exploration of 3D, VR, AR and app technologies. The public gained a new space in the information chain as digitization projects called for crowd participation. Museums slowly began to open up their knowledge walls: collections were published online as open data, in various portals and outside of heritage contexts. Information plans reflected awareness of these new developments, even though many if not most collections still remain offline. The 2010s have also brought new questions of communication, access, sustainability, financing, management, ownership, and general organization of the digital activities in the museum sector. The

questions as such are not new. The novelty comes from the magnitude and urgency of the matter: digital collections are larger, access is broader, content is more complex (e.g. multi-media, multi-lingual, multi-dimensional, multi-ownership) and resources remain limited.

Throughout this history, the relation between people working at museums, the available resources and the public has changed to adapt to the available technology. People have been pivotal. Particularly in the initial years, certain individuals saw the potential benefits of adopting the digital technology and it was their dedication and continuous effort that eventually led to the funding of digital activities, the formation of associations and the wider dissemination of the digital tools for museum work. The members of the MARDOC team had an essential role in the way computers were adopted because of their broad advisory role to the sector and to policy makers. MARDOC and other communities of practice were instrumental in the consolidation of computers in museum work practice.

Museums have largely depended on government subsidies for their digital activities (a theme discussed in chapter 4). Communication with funders and policy makers was not always clear, and so the sector's needs were not always properly addressed. Subsidies for digital related activities were often of a short-term nature where a long-term infrastructure was required. Still, as will be discussed in chapter 4, the government was able to support much exploration, development and implementation of the digital work practice. It was only in the 2010s that museums used alternative funds to advance digitization projects. Financial data remains scarce. Still, it is clear that the adoption of the digital technology involves much more than the hardware, software and computer expertise. Instead, adopting a digital work form requires strategic planning and organizational transformation in addition to a continuous flow of resources to ensure the digitization, management and development of collections.

Fundraising through platforms like *Voordekunst.nl* may provide an open space for the public to voice preference of activities. Ideally, such platforms would perfectly match offer and demand, yet experience has shown that projects receiving more media attention tend to raise more funds. Additional research is needed to evaluate the efficiency of such financing models. Building a digital infrastructure through crowdsourcing, as the *VeleHanden* transcription project illustrates, requires a robust

organization to process the external content. Such projects raise issues of ownership of content and challenge the role of museums as sole experts in their field.

Over the years, museums have integrated the user to the increasing digital activities. User surveys, user studies, and user logs have contributed to the effectiveness of online systems. Results from such research is rarely made public, though that may change if funding is made contingent on (user) evaluations.

The main changes identified in the areas of the organization, policy, the user, technology and economics are summarized in table 2.11 below.

Table 2.11 Overview of the history of digitization of Dutch museums

Area \ Period	1960-1990	1990-2000	2000-2010	2010-on
The museum				
Concept of digitization	Experimentation, available only to selected few.	Efficiency tool for museum work, broad adoption.	The web as publication form, legal issues.	Linking and opening collection information, new frontiers.
Internal organization	Only selected individuals had access.	Groups of practice formed, new functions emerged, reorganization.	Specialists in house, policy plans, major reorganization.	Adoption and adaptation of best practice for a digital work form.
Policy				
Subsidies	Sporadic, experimental.	National efforts, from multiple ministries.	Research and development, broad scale and scope.	Further privatization limiting structural subsidies.
Rules and regulations	Few rules.	First standardization of form.	Request of policy plan and use of standards.	Support collaboration.
The user				
Relation to user	Limited internal user.	Internal user informed improvements.	External user only receiver.	All users are potential producers and consumers.
Access requirements	Internal: for object identification.	Internal: for object management.	Internal: for information management. External: as information service.	Internal: to support all core activities. External: for all uses, anytime, anywhere, anyhow.
Technology				
Adoption	Limited and dependent on large institutions.	Hardware and software in all areas of work.	The Internet is new communication channel.	New forms of collection management and visualization.
Adaptation	Introduction. Controlled vocabularies.	Adoption. Transfer from paper to digital.	Institutionalization. Digital information management systems throughout.	Regeneration. Breaking boundaries, letting go of content control.
Economics				
Internal budget	No internal budget.	Used from other activities (exhibition, preservation).	First earmarked budgets emerge.	Alternative forms of financing.
Object valuation	Experimentation with small collections.	Selection of objects based on format.	Emergence of long tail.	All information objects are valuable.

Source: own.

This chapter has presented key events in the adoption of computers from the perspective of the museum organization. The next chapter will present the perspective of museum associations targeting specific areas in the shift towards digital work forms.

3. Museums working together

As museums adopted computers, collaborative efforts began to emerge as institutions relied on each other to obtain resources, including financing and know-how, as well as for support and to validate efforts. One example of museums working together was discussed in chapter 2, with the maritime museums and the MARDOC group, who had an influential role in the general adoption of computers in museums. Like MARDOC, other forms of collaboration have shaped the national landscape.

This chapter describes a selection of four such groups. The first group is a thematic cluster, covering the ethnographic collections, aimed at developing a joint registration practice. This is followed by a group formed inside the association of museums in charge of representing the information character of the sector. The third group is an inventory project of museum collections. The last group presented is a national group set up to ensure long-term access to cultural heritage information.

3.1 SVCN and the ethnographic collections

The Dutch ethnographic museums of the *Overleg Volkenkundig Musea* (OVM - Ethnographic Museums Group), which has been organized since the 1980s, formed the *Stichting Volkenkunde Collectie Nederland* (SVCN - Foundation of Ethnographic Collections), in 1995.[171] Together, they reported having a collection of about 500,000 objects.[172]

In 1990, this group of ethnographic museums launched a three-year project, supported by the Ministry of Culture, to register and digitize the information about ethnographic collections.[173] The two goals of the project were: (1) to collaboratively describe (by museums, government and local constituents) the ethnographic collections in a uniform manner; and (2) to input data into several databases that would eventually be linked to form a national network, so that the Dutch ethnographica could be made available to other, international, ethnographic museums and eventually to the public.[174]

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[171] The Foundation included the Afrikamuseum in Berg en Dal, the Museum Gerardus van der Leeuw in Groningen, Museon in The Hague, the Ethnographic Museum in Rotterdam, the Ethnographic Museum in Nijmegen, the Volkenkunde Museum in Leiden, the Tropenmuseum in Amsterdam, and the Ethnographic Museum Nusantara in Delft.
[172] Beumer, 2008:23; Taekema, 1996.
[173] Van de Voort, 1994:31.
[174] Fontijn, 1991.

The project started with a pilot on the Africa collection. The goal was to evaluate the feasibility of a common terminology list with the names of countries and people related to the collections. The automation process involved entering objects in WordPerfect, used by the Natuurmuseum in Rotterdam, in a standard format and then storing the data on floppy disks before being incorporated into the Rotterdam museum's database (at the time using MVV/VOIS, a BRS search software). A print out of the data was sent back to the Tropenmuseum to be checked and changed if needed.[175] The ethnographic museums learned a great deal during the conversion process: the older cards had a more descriptive narrative while the newer cards used keywords and a shorter, more structured text. Decisions had to be made regarding the most useful information for the description and association of objects, establishing qualitative and quantitative use, and considering the space and time required by the chosen information.[176] New information had to be added, like the state of the object (good, reasonable, moderate or poor).[177] The old cards had no standard use of location, sometimes using only a region (not a country) or using the names of colonial regional governments for objects from Indonesia.[178] The *Tropenmuseum* had an extensive literature list to reference each object (up to 18 sources) while Rotterdam used no references for the objects. Agreement on a system to document references came later. It was clear that literature required its own database to better suit the bibliographic format.[179]

Also, the inventory numbering system had to be harmonized. The inventory field included only numbers but the *Tropenmuseum* used an alphanumeric system in which the letters indicated the origin or donor (e.g. objects from the *Artis* collection were identified with an A number and objects from the *Koloniaal Museum* in Haarlem with an H number). A serial number was added to accommodate the *Tropenmuseum* system. Other fields represented the merging of existing data fields. This was particularly important for the thesaurus, as broad terms had to be devised to facilitate data retrieval. Other terms had to be specified, like "Congo" (Kinshasa or Brazzaville), or like names used for a region, a city, a river or a nation.[180]

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[175] Fontijn, 1991:39-40. WordPerfect 4.2 was available in 1986 followed by 5.1 in 1989 as a DOS word processing system (http://en.wikipedia.org/wiki/WordPerfect).
[176] Fontijn, 1991:43,51.
[177] Fontijn, 1991:51.
[178] Fontijn, 1991:64 (part 3).
[179] Fontijn, 1991:54-55.
[180] Beumer, 2008:17; Fontijn, 1991:44-49.

A keyword list was developed to provide a standardized vocabulary for information storage and retrieval. The keyword list was to support the thesaurus, which structured the information hierarchically. When entering data in the computer, the thesaurus information had to be consulted outside of the data entry screen, making it less than practical. The need for an ethnographic thesaurus was evident: the Chenhall categories used in the project were created for man-made objects, not for natural history objects, agrarian products, and countries and nations. The Smithsonian Institution classification, also suggested for use in the project, was generally more extensive than the one used by Dutch ethnographic museums, except in some specific ethnographic areas. Using an existing classification system would therefore lead to an impoverishment of the classification system.[181]

In 1992, the OVM received a stimulus subsidy of €127,000 for automating access to the Dutch ethnographic collections. From 1992 until 1997, institutions received €25,000 and in 1998 and 1999 this was reduced to €9,000 per year. In addition, the museums were responsible for allocating €16,000 per year for a full time staff.[182]

In 1996 the Foundation decided to adopt a single common software system to facilitate the exchange of information and to benefit from collaborative work in the development of thesauri. The ethnographic museum (*Rijksmuseum Volkenkunde)* in Leiden was the first to adopt the chosen The Museum System (TMS) together with *Museon*, thanks to a grant from the Mondriaan Foundation.[183]

The *Nationaal Museum voor Oudheden* (National Museum of Antiquities) followed in the adoption of TMS and reported beginning with only two licenses. All data was transferred from Q&A and dBase (through Microsoft Access) into TMS, and data controls were performed before requesting more licenses for the rest of the staff.[184] The libraries of the ethnographic museum decided to adopt the MinIsis system, which allowed the library catalogue to be displayed online. Not all libraries used the same system, however: Rotterdam used BRS/Search system, Leiden used

[181] Fontijn, 1991:56-57.
[182] S&CZ,1998.
[183] Taekema, 2007; Yearly Report Mondriaan Foundation 1999. TMS was developed by the Getty in 1994. C-it Collections Information Technology remains the only distributor of TMS in the Netherlands. The current co-director of C-it is a former employee of the Volkenkunde Museum in Leiden (Degenhart Drenth, 2010; Volkers, 1998).
[184] Volkers, 1998.

BiBSearch, The Hague used TINreg, Delft used Q&A, Nijmegen and Groningen used CDS-ISIS.[185]

TMS allowed the storage of images, linked to the object file, otherwise stored using Phillips Laser Vision Disks. In 1995, the Wereldmuseum in Rotterdam decided to experiment with a new system called ImageBase, including software and hardware to manage slides, photos, negatives and text. Data was archived in a hard disk but could also be stored in a CD-Rom.[186]

By 1997 a good basis for the thesaurus sections on geographic origin, cultural origin, functional category and object keywords was completed.[187] In 1999, the SVCN devised a digitization plan for the migration of data to a shared platform, for the creation of an ethnological collection with a Dutch ethnographic thesaurus, for the presentation of the national ethnographic collection through a joint website and for the translation of the thesaurus into English and French. Translation has yet to be completed.[188]

In January of 2009, the Dutch Ethnographic Collections, were presented jointly through the SVCN website as the Ethnographic Collection Netherlands (http://www.svcn.nl/).[189] In total, the SVCN has developed three Dutch thesauri: an Ethnographic Thesaurus, a Geographic Thesaurus, and a Key Word Thesaurus. These have served to provide institutions holding ethnographic collections with a strong unifying ground. English versions of the thesauri are being developed to increase accessibility to the collections.[190]

The registrars of the Dutch ethnographic museums meet once every 3 months to discuss issues regarding the thesauri, the information system in general, and the data to be entered in each field. The structure for entering data (who enters what information and where) reflects the organizational structure and is not the same in all museums. Collaboration further increases the use of standards and data entry practice.[191]

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[185] Taekema, 2007.
[186] RKD, 1996b.
[187] Beumer, 1998:26.
[188] Beumer, 1998:24.
[189] Museums contributing to the Dutch Ethnographic Collections include Museon in The Hague, the Tropenmuseum in Amsterdam, the Ethnographic Museum in Leiden, the Afrika Museum in Berg en Dal, the Ethnographic Collections of the University of Groningen, and the Museum Nusantara in Delft (http://www.svcn.nl/).
[190] Beumer, 2007.
[191] Beumer, 2007.

At the end of 2013, the ethnographic collection website displays almost half of its collection, or a total of 233,609 objects. Only objects with an image are made available online.

3.2 SIMIN and the Museum Association Shaping the Registrar's position

Another important community of practice formed in the Netherlands that has served to advocate for digitization in museums is the *Sectie Informatieverzorging Musea in Nederland* (SIMIN - Department of Information Management for Museums in the Netherlands). The department was formed in 1977 as part of the NMV and remains active today.[192] During the founding meeting at the *Openluchtmuseum* in Arnhem, representatives of the Ministry of Culture were present. Boy Wander, one of the leading forces behind the creation of SIMIN, recognized the museum policy document from 1976 entitled *Naar een nieuw museumbeleid* (Towards a New Museum Policy) as having anticipated the formation of the association.[193] The policy document identified object registration, and information about collections, as fundamental in the process of accountability and museum renewal.[194]

A hand-written quarterly publication by the *Reinwardt Academie* reports on a SIMIN meeting held on 15 December 1978 at the *Marinemuseum* in Den Helder, that set the tone for the period: "an extraordinary meeting was held […] People present could see digital numbers and letters on a computer screen […] Unfortunately, it appeared that not everybody knew the (basic) functions and possibilities of the computer, making the presentation hard to follow."[195] The report also communicated the benefits of mechanized collection management, including knowing how many objects in the collection were damaged or how many objects were of a similar format. According to its editors, the overview on collections, the use of controlled vocabulary and the ability for query, made digital collections management systems a desired and urgent tool for moving beyond the amateur work style of museums.[196]

Five years later, during the NMV meeting of 18 May 1983 at the *Teylers Museum* in Haarlem, the *Onderzoek Cultuurhistorische Collecties* Report (Research

[192] Van de Voort, 2002. Other departments of the NMV include Collections, Culture, PR and Marketing, History Museums, Historical Houses, Art Museums, Public and Presentation, Security and Facility Management, and SIMIN. The NMV organizes yearly conferences since 2007.
[193] Van de Voort, 1977:8.
[194] Van Doorn, 1976.
[195] Kersies, 1979:1.
[196] Kersies, 1979.

into Cultural-Historical Collections) was presented. Results showed a worrisome situation in Dutch museums: rapid growth was leading to mismanagement of collections due to the lack of an overview. NMV chair Henk Overduin estimated collections were growing at the rate of 1.5-2% per year yet about 80% of the new acquisitions never saw the light of day again.[197] These estimates were made without knowing the actual number of objects housed in Dutch museums.

The increase in collections was accompanied by an increase in museum institutions. The Dutch central agency for statistics CBS reported that in the period between 1982 and 1986 the number of museums increased from 485 to 572 (representing an 18% growth). See Table 1 in annex for museums reported per year.[198]

During the 1983 meeting, museums were challenged to talk about *too much*, to consider having too many objects under their care, and to develop collection *selection* criteria. Maritime museums and university collections were presented as an example of institutions that had made plans for the future and delineated their collection focus. Rapid collection growth was an international problem. Solutions were sought in the building of new storage facilities, the purchasing of computers or the increase of labour resources. Solutions were also required in the form of a selective policy for deaccessioning.[199]

Results from a survey sent to 400 institutions were presented, of which 248 responded and 20 informative interviews were conducted. Most respondents (87%) reported growth in the collections since the 1970s: in 92 institutions acquisitions grew by less than 25%, in 80 by 25-50%, and in 44 by more than 50% (table 3.1). The main concerns that were reported were collection registration (55%) and preservation (33%). An estimated 7% of objects were digitally registered. Objects were seldom lent. Recommendations included collaboration with heritage institutions from other sectors (libraries and archives), the development of a selection policy, and the development of standards for a registration system for cultural-historical collections.

[197] Maurits, 1988.
[198] Maurits, 1988. From CBS data from 1982, the 485 museums were divided by theme into 6 categories: art (10%), history (55%), natural history (10%), technique (18%), ethnographic (2%), and mixed (4%) (Vaessen, 1986).
[199] Maurits, 1988.

The RBK had developed a system to tag objects believed to have exceptional cultural value, representing the so-called A and B collections.[200]

Table 3.1 Collection growth (1983) (N=248)

Acquisition growth (% of objects)	< 25%	25-50%	> 50%
Number of museums	92	80	44

Source: based on Maurits (1988).

SIMIN played an instrumental role in development of the *registrar* as a specialized profession, starting with a meeting on the subject in 1992. Before the 1990s, Dutch museums generally lacked a registrar. The curator conducted most activities around the object. When an object had to be handled outside the museum, a number of other people participated, including the restorer, secretaries and transport staff.[201] This was not uncommon in Europe, where a "strong framework of oral tradition […] and the collective memory of curators" served as the backbone for the running of museum information systems.[202]

Meetings, publications and collaboration with other institutions (MARDOC, Bureau IMC and the *Reinwardt Academie*) led to the adoption of the position of registrar in Dutch museums. That is not to say that the work was not being done, but that a new profession and division of responsibilities developed in the field.[203] The first registrar position was advertised in 1990 by the *Boerhaave Museum* followed by the *Maritiem Museum* in Rotterdam in 1991.[204]

The position of registrar began to be regarded as specialized work in the care, movement and management of museum objects. Most of all, the registrar was to respond to the need for accountability for the contents in collections and for museum documentation: ensuring objects could be located and information sources were cross-related.[205]

[200] Maurits, 1988. Interestingly, this would later be developed in the Delta Plan categorization of objects, expanded to include collections A, B, C, D and E. The RBK is one of the institutes that merged to become ICN, now RCE.
[201] Hogenboom, 1992.
[202] Sarasan presents the case of American museums two decades earlier (Sarasan, 1995:187).
[203] Museums in the UK and in the USA, in contrast, developed a registrar position in the 1950s. Mary Case, of the USA, verbalized the work of the curator as the intellectual work around objects, while the registrar was to be responsible for the capture of information and for making it accessible (Ouwerkerk, 1992).
[204] Ouwerkerk, 1992; Van de Voort, 2002:7.
[205] Hogenboom, 1992; Sarasan, 1995.

> "The tasks of a registrar in a Dutch museum are primarily those concerning collection information. The contents of the information may or may not be the responsibility of the curator but the registrar should have authority over completeness, format and legal content of the information. This authority means that the tasks of the registrar should never be underestimated (certainly not in salary). For a good registrar is also an advisor: he/she can offer advice and information on the development of collection plans, conservation plans, storage and exhibit pay-out, public information systems and automation procedures. An eye for everything that is happening in the museum is what the good registrar needs. A good registrar will therefore refuse to work in some dark corner of the museum, looking after files."[206]

Registrars and automation entered museums at the same time. The use of computers brought a need for collections management procedures and technical accuracy of descriptions, which led to specialization.[207] Eventually, two roles developed: the documentalist, in charge of researching and linking information about objects, and the registrar, responsible for developing and managing the collection information system. In practice, the documentalist is often also described as registrar.

In collaboration with the LCM and the *Reinwardt Academie*, the NMV started a two-year project called MIRO (*Museum Informatiesysteem en Registratie Opleiding* - Museum Information System and Registration Training).[208] From a series of interviews in the field, it appeared that registrars of small and mid-size institutions were made directly responsible for the automation of the information system. In large institutions, the responsibility for managing the digital information system lay with several people. At management level there was no clear information strategy plan to guide activities, data exchange or efficiency of work. The registrar was generally made responsible for this. MIRO trained a number of museum staff members working with digital information systems. When the project was terminated, it proposed that SIMIN support the formation of a national registrar association, or a network of cultural information specialists.[209] This, unfortunately, was never actually realized.

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[206] J. Hogenboom in "But whose job is it?" On the position of the registrar in Dutch museums, compared to North American colleagues, May 1992, in Hogenboom, 1992:5.
[207] Nieuwenhuis, 1992:69).
[208] Verschuuren, 1994:13.
[209] Kemmerling, 1994: RKD, 1995 (No.13).

In contrast to the registrar - a person who would care for and manage the information aspects of the object - the conservation specialist would be responsible for the physical care of the object. The curator then would develop content and remain ultimately responsible for the object and the related activities, information and research.[210] Management of objects was thus divided into administrative and physical, while content development, or scientific research, was kept as a separate function.

As Parry has mapped in his book *Recoding the Museum* from 2007, communities of practice served to inform but also to give stability and status to the emerging field of museum computing. SIMIN has been such an organization for museums in the Netherlands, and was later complemented by DEN (for the entire heritage sector), starting in 1999. SIMIN not only supported the adoption of computers but also advocated for best practice in the field. Between 1981 and 1999, SIMIN published 18 thematic magazines and 4 publications (table 3.2).

[210] Ouwerkerk, 1992:4-5.

Table 3.2 SIMIN publications 1988-2000

Year	Title
1981	Publication 1: *Museumregistratie en ontsluiting van gegevens* (Museum registration and access of data)
1982	Publication 2: *Handleiding voor de beschrijving van historische voorwerpen* (Manual for the description of historic objects)
1988	Magazine 1: Data exchange
1988	Magazine 2: Automation projects in Dutch museums
1990	Magazine 3: *Handleiding registratie van literatuurcollecties in musea* (Manual for the registration of literature collections in museums)
1990	Publication 4: *Een klein Musee imaginaire: voorbeeldenboek bij het registreren van museumobjecten* (A small imaginary Museum, examples to register objects)
1990	Magazine 4: *Organisatie van de automatisering* (Organization of the automation)
1991	Magazine 5: *WVC en museale automatisering, effecten van het stiumuleringsbeleid* (WVC and museum automation, effects of the stimulus policy)
1992	Magazine 6: *De computer als hulpmiddel bij het collectiebeheer van technische en transportmusea* (The computers as tool for the collection management of technical and transport museums)
1992	Magazine 7: *De registrator, facetten van een functie* (The registrar, changes in function)
1992	Magazine 8: *Autheursrecht en reproducktierechten op museaal beeldmateriaal en data* (Authors rights and reproduction rights of museum images and data)
1994	Magazine 9: *De registratie van fotocollecties* (Registration of photo collections)
1994	Magazine 10: *Terminologie, museale samenwerking bij woordcontrole* (Terminology, museum collaboration in controlled vocabularies)
1995	Magazine 11: *Netwerken in musea, netwerken van musea* (Networks in museums, networks of museums)
1995	Magazine 12: *Museale automatisering en de gebruikersgroepen* (Museum automation and user groups)
1996	Magazine 13: *Omgang met archieven in musea* (Handling archives in museums)
1997	Magazine 14: *Musea en normering* (Museums and norms)
1998	Magazine 15: *SGML en museale gegevensverwerking* (SGML and museum data processing)
1998	Magazine 16: *Kwaliteit en kwalitetsbeheersing bij de registratie* (Quality and quality management during registration)
1998	Magazine 17: *Het informatieplan, nut en noodzaak* (The information plan, use and need)
1999	Magazine 18: *Beelddigitalisering in musea* (Digitizing images)

Source: based on http://www.museumvereniging.nl/Bijeenkomsten/Secties/SectieSIMIN/Publicaties.aspx. Accessed October 2014.

SIMIN headed many national surveys and various research projects (as presented in the previous chapter) and results were presented during the SIMIN meetings. Most of all, SIMIN provided a forum for discussion. The adoption of computers, the dissemination of research results about the use of computers and discussions about the emerging best practice were all regular topics in the SIMIN meetings.

SIMIN supported the extension of information services in museums to include recording and giving access to information about the collections (e.g. books, images and objects) in analogue or digital form.[211] The committee continues to be

[211] Koldeweij and Nauta, 1986; SIMIN, 2005.

instrumental in the organization of museum information systems. It currently supports standards and norms for the registration of objects, the process of adopting information technology including training, and collaborative efforts among heritage institutions.[212]

3.3 MusIP and the first overview of the nation's heritage assets

The province of Utrecht spearheaded what would become a national inventory project and the source of national statistics of museum collections through the *Museum Invetarisatie Project* (MusIP - Museum Inventory Project). MusIP's methodology, that of accounting at collection level, has enabled the estimation of the total number of objects present in the Netherlands, reportedly nearly 30 million objects.[213] The *Stichting Ondersteuning Musea* (SOM - Foundation for the Support of Museums) wanted to obtain a better overview of the collections and so it conceived a museum inventory project as a policy instrument devised to improve collection management for the province.[214] MusIP was a collaborative project between SOM and the provincial government.[215]

In 1993, SOM conducted an investigation on the storage conditions of the collections in Utrecht but there was no overview of the objects in the province. In the cultural policy document of 1995-1998, the heritage office decided to research the *Collectie Utrecht*. This was conceived as the total sum of all cultural heritage collections within the province boundaries including the so-called national and non-national collections. MusIP responded with a qualitative and quantitative inventory of all collections in museums, the types of collections, their state of conservation and their use. The inventory included movable collections in museums, botanical collections, animal collections, heritage foundations, castles, churches and private heritage collections.[216]

The name MusIP was inspired by the *Monumenten Inventarisatie Project* (MIP - Monument Inventory Project), which from 1986 to 1995 was responsible for

[212] http://museumvereniging.nl.
[213] Veeger, 2008.
[214] SOM, 2000; LCM, 2005; De Rijke, 2010. SOM was the organizational component of the Federation of Cultural Heritage Foundations in Utrecht (*Federatie Stichts Cultureel Erfgoed*), now known as the Landscape Heritage Utrecht, or LEU (*Landschap Erfgoed Utrecht*).
[215] SOM, 2000; De Rijke, 2010.
[216] SOM, 2000. A similar inventory effort took place around geologic, geographic, archeological and monumental data using the CWK Cultural Historic Value Card.

the registration of monuments at the municipal level. Monument records included special characteristics, a description and a photograph. MusIP however, was conceived with a description model designed for movable objects.

Early discussions took place between SOM and the Cultural Heritage Inspectorate (*Erfgoed Inspectie*). Reporting at object level was not practical. A faster method was needed to get an overview of the collections and the work that needed to be done. Data collection would take place at collection level, rather than at object level. In this way, results would be visible quickly.[217]

The project started after MusIP received a grant from the Mondriaan Foundation for the design of a database; the province subsidized the implementation of the database and K. F. Hein Fund paid for the acquisition of laptops for MusIP personnel.[218]

The database was developed during the first phase of the project (June through November 1997). The information system was designed at the Utrecht University Computer Science Department, now the Information Science Department of the Mathematics Faculty. During the discussion sessions it became clear that visualizing the end product was challenging for many members of the group. The new working medium, a digital database, was an abstract concept very different from what institutions were used to working with, which was a manual information systems with physical access to the collections. For some, the proposed possibilities were hard to imagine.[219]

The initial database was designed in Access and was based on conversations with curators and collection managers from 5 museums. The final version was tested in seven museums chosen for their varied collections. Once the final design of the database was completed, it received a positive evaluation by the national experts at DEN. The project could start and three employees were hired. The inventory of collections in the province of Utrecht took place between November 1997 and June 1999.[220]

MusIP staff members and the advisory board discussed what type of data was going to be collected and for what purpose.[221] Data gathered about the museums

[217] SOM, 2000; De Rijke, 2010.
[218] Mondriaan, 1996; De Rijke, 2010.
[219] SOM, 2000; De Rijke, 2010.
[220] SOM, 2000; De Rijke, 2010.
[221] De Rijke, 2010.

included museum identification number, contact information, and type of collection. The museum number is given by the NMV; each museum has its own unique number. Originally, in agreement between the NMV, SIMIN and the MARDOC Foundation, the idea was to link the original museum number to the objects (object inventory number), though few museums have done this.[222]

Information about the collections included number of objects in the collection, owner, location, level of registration (complete, partial or absent), condition (good, varied or poor), storage conditions (good, regular or poor), keywords, 13 AAT fields, and the Delta Plan[223] categories assigned (A, B, C, or D cultural and historical value model). These categories were identified based on the province holdings, so an object category A would be of irreplaceable value to the province, irrespective of its national value. No image was linked to objects in the collections at this stage. The use of the AAT for the organization of collections, based on form and function of the object, further facilitated the counting of collections. Thematic keywords (e.g. industry, trade, agriculture) were desired but proved too complex for the project at the initial stage.[224]

MusIP was labor intensive. The three MusIP employees worked with 44 museums in different capacities, depending on the organization of the institutions. Larger institutions had more staff available but many museums had volunteers supporting the inventory project. In general, MusIP staff would visit the depots and define sub-collections together with museum staff. A total of 1,145 sub-collections were identified in the province. MusIP staff members found that 22 of the 44 institutions inventoried lacked a collection registration system.[225]

Results from the MusIP inventory showed that 15.4% of collections (or 133,000 objects) belonged to Provincial category A, 24.8% (214,296 objects) to category B, 31.6% (273,073 objects) to category C, 4.1% to category D, and 24% were not classified. Museums reported 29.7% of collections as being fully registered, 41.3% were partially registered, 27.2% were not registered, and the remaining 1.8% was not reported. 17 museums reported housing 59 not-registered sub-collections with category A.[226]

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[222] SOM, 2000; De Rijke, 2010; RKD, 1998.
[223] See chapter 4.6.
[224] SOM, 2000:17-21.
[225] SOM, 2000; LCM, 2005:18 ; De Rijke, 2010.
[226] SOM, 2000: 41-43.

After completion of data gathering, each museum received a report containing the findings.[227] Ideally, institutions would use MusIP reports to develop a collections plan and to support subsidy applications, though the extent to which this actually took place is unclear. At the time, museums were gaining awareness of the choices made when placing an object within a context of time and place. The use of AAT served to harmonize object placement across institutions. Alternatives provided by the selected information systems were of the essence. MusIP conducted a comparative research study on the various collection registration systems available.[228]

In July of 2000, MusIP continued as MusIP & Co (Co was added as short for computer). The goal was to improve the quality of collection registration in digital information system through a subsidy scheme. Financial support was linked to the acquisition of a digital information system (20% discount for Adlib software) and training was made available. MusIP was made available on the Internet in May of 2005 and museums were encouraged to create their own website and publish their holdings.[229]

The project proved successful and was expanded to the rest of the country in 2002.[230] 50% of the project was financed by the provinces and 50% was paid for by the Ministry of Culture.[231] The concept of the *Collectie Nederland* (Collection Netherlands), launched in 1990, finally became visible. The *Collectie Nederland* came to represent the total of all objects collected by Dutch museums.[232] It was therefore in fact shaped by the data in MusIP, giving form to a national heritage collection that served to inform decision making and support heritage policymaking.

As the model for the inventory of collections was adopted nation-wide, the database was converted from Access into Adlib. Additional data was gathered, including images and descriptions with which to identify the collections. Collections were ranked as MusIP category 1, 2, 3 or 4 following the Delta Plan categories A, B, C and D. The overall core of the report remained the same.

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[227] S. Adam (1999) *Eindrapport: Stand van Zaken van de collectieregistratie in de musea in de provincie Utrecht*. Utrecht: SOM.
[228] L. Heite (1999) *Automatiseren:een hele kunst! Adviesrapport voor de opzet van een pc-project voor de musea in de provincie Utrecht*. Utrecht: SOM.
[229] SOM, 2000; De Rijke, 2010.
[230] http://www.musip.nl/.
[231] De Rijke, 2010.
[232] LCM, 2005: 17.

On average, MusIP staff members spent two days inventorying each museum, though some institutions required 4 to 8 days for data input and for writing the report. Provinces with a large number of museums could allocate shorter data-gathering times per institution. Museums in Amsterdam, Leiden and The Hague joined in 2005. The last ones to join MusIP were the province of Gelderland and the city of Amsterdam, who finished inventorying collections in 2009.[233]

In 2005, a MusIP symposium took place at the KB in The Hague. The first results from the national inventory were presented. The national inventory was a success because it proved the usefulness of working systematically, to raise awareness of the importance of a good collection policy, and to increase professionalism in the specialized area of museum work. MusIP data is used for the national statistics published by Statistics Netherlands. Data were again collected to produce the *Collectiebalans*, a national report on museum collections from 2008.

Table 3.3 Number of museums per size of collection (2008)

Number of museums	359	92	110	54	20	28	19
Size of collections	less than-5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	100,000-250,000	250,000-more

Source: Collectiebalans and MusIP.

The *Collectiebalans* was the first national estimate of the size of collection housed in Dutch museums. The report estimated the Dutch national collection was made up of 45,185,882 objects (table 3.3). One important finding was that more than 90% of the total national collection was managed by less than 10% of institutions (table 3.4). On average, museums managed a collection of about 100,000 objects.[234]

Table 3.4 Overview of types of collections (2008) (in millions)

Type of collection	**Images**	**Natural objects**	**Text**	**Tools and utensils**	**Numismatics**	**Other**
Number of objects (in millions)	18 (41%)	12 (28%)	6.6 (15%)	4.6 (8%)	2.5 (6%)	0.78 (2%)

Source: Collectiebalans and MusIP.

[233] SOM, 2000:31; De Rijke, 2010.
[234] Veeger, 2008.

MusIP provided data on the extent to which collections were registered, showing that there were backlogs in both analog and digital registration. It was expected that the backlog of collection registration would decrease as objects were registered directly into a digital information system. Paper information cards would eventually have to be transferred to a digital format. Less than 30% of objects were estimated to have a digital image for identification and only 3.8 million objects (or 8%) had some form of information available online.[235]

Eventually, having objects registered only in a paper information system came to mean they were part of the non-registered objects because, in practice, the objects were inaccessible. Converting registered objects to digital format was done with increasing speed (i.e. by scanning the information cards, by outsourcing retyping). Through new techniques available (e.g. scanning), more and more paper registrations were being made digital.[236]

MusIP resulted in more than an inventory project. For many museums, working with MusIP meant the setup of a collections registration system, the adoption of a collection organization system based on AAT, and visibility at a national level. MusIP raised awareness of the importance of accessing collection information, first for museum workers, then as museums exchanged information, and finally as the general public gained access via the MusIP web site. Museums in Utrecht received training capacity while data was being collected to further support the province's heritage policy. MusIP represented the first step in the adoption of province-wide standards and an important step in the nationwide professionalization of museum practice.[237]

The proven success of MusIP Utrecht showed that it was possible to create a national inventory of collections. Success was attributed to two key elements: (1) collections were inventoried at sub-collection level and not at object level; and (2) MusIP staff coordinated and gave advice concerning the input of data in all participating museums.[238] MusIP's strength also came from the collaborative effort to collect data into a joint repository.

The success of the national inventory project is unquestionable. However, the project suffered from three main problems: (1) museums never fully interiorized the

[235] Veeger, 2008.
[236] Beumer, 2008.
[237] SOM, 2000; De Rijke, 2010.
[238] SOM, 2000; LCM, 2005.

reporting of MusIP data; (2) collection registration remains a labor-intensive activity; and (3) people keep expecting the system to contain more than what had been entered while failing to profit from the work done. The current data available in the MusIP system (housed at the individual museum institutions) is hardly used due to a general lack of know-how about the database.

MusIP requires regular updates in order for data to stay relevant. In view of such a labor-intensive activity, museums need to be clear on what they get in return for their effort.[239] Each province was to provide an update of the data every two years but hardly any institution actually complied. MusIP has been running nation-wide since 2002. It seems reasonable to expect that reporting collections' data would be adopted into the organizational planning. This, however, was not the case, only 30% of data had been updated. Several provinces have no clear insight into the changes within collections. Provinces are faced with limited resources in terms of time, money and interest. Motivating museums to report data therefore remains a challenge.

In 2011, the management of the MusIP database was transferred to RCE, and the data was absorbed into the DiMCoN database. In 2013, RCE began contacting all museums to update their data. At the time of writing, results remain unknown.[240]

3.4 NCDD, CCDD and the protection of past investment

Sustainability and preservation of digital content has been an issue since the first use of computers, as migration of data was not always successful (if at all possible). As individual institutions began taking measures to safeguard their data for the future, it quickly became clear that a coordinated effort was needed, simply because of the costs. It also became clear that ensuring long term access to digital content was not only a matter of finding the right technical solution but that other issues also played a role: policies, organizations and finances needed to accommodate the long-term care of digital data. For this reason, a group of 11 institutions came together and formed the *Nationale Coalitie Digitale Duurzaamheid* (NCDD - National Coalition for Digital Preservation) in 2007.[241]

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[239] De Rijke, 2010.
[240] http://www.musip.nl/.
[241] In 2007, NCDD members were 3TU.Datacentrum (University Libraries of Delft, Eindhoven and Twente); Data Archiving and Networked Services (DANS); Dutch Institute for Sound and Image (NIBG); National Library (KB); National Academy of Arts and Sciences (KNAW); Ministry of Internal Affairs (BZK); National Archive (NA); Netherlands Organization for Scientific Research

NCDD was set up as a "a cross-sectoral, bottom-up collaborative initiative in which 11 national organizations with responsibilities for safekeeping information joined forces to address the challenge of permanent access… The coalition's mission [was] to facilitate the establishment of both a technical and an organizational national infrastructure for permanent access to digital information in the Netherlands […] reaching results within 5 years." [242]

The Coalition focused on public information because it is mostly the public institutions that are confronted with long-term information decay, particularly archives, libraries, museums and research institutions. The type of information that needed to be preserved was divided into government information (found in archives), scientific information (including publications found at the KB and research data collected by DANS), and culture and media information (e.g. the media collection found at the NIBG, and the cultural heritage collections found across a number of institutions). This led to the identification of four sectors: government (and archives), science, media (radio, film and television) and cultural heritage. A network leader was selected for each sector for being "an organization with enough standing, enough funds, and a large enough network to mobilize the others." The cultural heritage sector was not represented, as no clear network leader was found. All network leaders had a national responsibility regarding the safeguarding of information, analogue or digital. The KB opened an e-Depot in 2003, NIBG launched the Digital Archive in 2006, DANS was established in 2005 as a repository for humanities and exact sciences, and the NA opened a Digital Depot in 2009.[243]

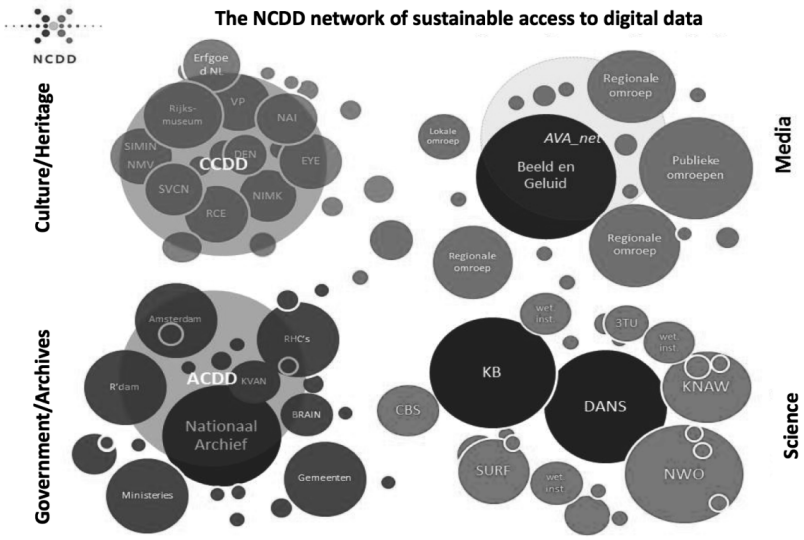
No museum institution had such a role. The reason for this can be found in the fact that museums, and other similar cultural heritage institutions, produced the digital content themselves. This had as consequence that the size of the digital collections was relatively small compared to the large heterogeneous datasets produced, for instance, by the government.[244]

In order to best understand the state of digital data and the preservation practice, NCDD coordinated a national digital preservation survey in 2009, funded by

(NWO); Surf Foundation, Statistics Netherlands (CBS); and the DEN Foundation (Angevaare, 2009:11).
[242] Angevaare, 2009:2.
[243] Angevaare, 2009:36. The digital archive of the NIBG was developed in collaboration with Technicolor and the Public Broadcasting. It had a total cost of €13 million, of which €4.6 million was provided by NIBG and €8.3 million by the Public Broadcasting (Van der Windt, 2011:18).
[244] Angevaare, 2009:42.

the Ministry of Culture's Education and Research Policy Department. The report analyzed Dutch practice in areas such as sustainability, identifying risks and sharing experiences of costs and finances. Institutional experiences were shared, anonymously, to better reflect on the situation. In the words of one participant: "Yes, we have had one crash. We had no back up, so all our data vanished. That is still a trauma in the organization. We would rather not talk about that."[245]

Figure 3.1 NCDD networks



The research involved listing the guidelines developed to ensure long-term access to digital materials and management requirements to limit data loss. For instance, using standard formats was known to increase the chances of long-term use. There were also a number of guidelines for different types of data. For government data, a 2005 report called *Een dementerende overheid?* (A Dementing Government?) found that the government's accountability was limited due to errors in information management, which was only expected to get worse as a number of government departments switched to a digital information management system. In order to ensure a proper transition, the government published a set of 7 standards in *Informatie op Orde* (Information in order) in 2008, to ensure interaction and public access, with an integral approach and legal consistency. The standards are applicable for digital but

[245] Angevaare, 2009:6.

also for analog information and relate to issues of (1) accountability; (2) organization; (3) information policy; (4) information design; (5) information system; (6) creation and use of information; and (7) management of information.[246]

Archival data further followed an international standard (NEN-ISO 15489-1) to ensure adequate information management, including policy, responsibilities, quality and auditing. For scientific data, DANS developed a Data Seal of Approval while, for cultural heritage data, DEN developed *De Basis* (The Basis), as guidelines to ensure long-term access of data.[247]

But how many organizations actually followed the guidelines? It was noted that the *Digitaliseren met beleid* subsidy scheme required institutions to develop an information plan that included a sustainability policy.[248] However, the 2012 report on the state of digitization reported 55% of Dutch museums had an information policy but only 23% had a sustainability plan.[249] Was sustainability too expensive? Cost-benefit analysis was challenging and unpractical as benefits were visible only in the long-term. Alternative forms of valuation were required, perhaps by determining the willingness to pay for access in the long-term, or the willingness to lose access in the long-term.[250]

NCDD found that the most important barriers for following the guidelines of sustainable management were (1) lack of awareness; (2) lack of information and knowledge about sustainable access (and knowledgeable staff); (3) the state of information management (e.g. institutions just switching to digital work processes had not yet thought of long-term access); (4) lack of long-term financing; (5) lack of reliable storage capacity; (6) lack of concrete, practical tools; and (7) lack of an organizational culture that can adapt to the digital era.[251]

NCDD further identified a number of general principles regarding the costs of sustainable accessibility: (1) cost per object decreases as the size of the archive grows (with homogeneous content); (2) the greater cost factor is not storage but labor (at 37.5% compared to 25% for storage); (3) sustainability has to begin from the start when preparing production to avoid *exorbitant* unexpected future costs; and (4) the

[246] Angevaare, 2009:26-27.
[247] Angevaare, 2009:25-30.
[248] Angevaare, 2009:42.
[249] ENUMERATE dataset. See chapter 5, section 4 on the National Digital Inventory.
[250] Angevaare, 2009:52-53.
[251] Angevaare, 2009:9.

highest costs are found during acquisition and ingestion.[252] As a result, NCDD advised that sustainability plans include (1) identification of problems; (2) division of responsibilities; (3) facilities for storage and sustainable management; (4) services and tools to support smaller organizations; (5) structural financing; (6) selection of content; and (7) knowledge and expertise.[253] In 2010, NCDD published a follow up report with a strategic agenda calling institutions that produce or manage digital data to be responsible for its sustainability, and institutions to collaborate coordinated by the network leaders, inside and outside the sector as well as at management level.[254] Still, no museum was part of the Coalition.

The cultural heritage sector worked with a core group (rather than a network leader) including the EYE Film Institute Netherland, NAi, NIMK, SIMIN, RKD, RCE, the *Rijksmuseum* in Amsterdam, DEN, SVCN, and Virtual Platform. Together, they formed the *Culturele Coalitie Digitale Duurzaamheid* (CCDD - Cultural Coalition for Digital Preservation).[255] By 2012, NCDD published a document focusing on the sustainability efforts in the cultural heritage sector based on research performed in 2011. Cultural heritage information services had increased their value thanks to the web and, gradually, to other digital access channels. NCDD identified the value of cultural heritage in its role in the formation (and changing over time) of and in ensuring historical continuity. The document further presented a strategic agenda that included a government lobby to recognize the importance of long-term access and to adopt it as a higher priority on the agenda, to contribute in the development of structural solutions with additional financing and to require the inclusion of information plans (to contain a sustainability strategy and business plan) to all subsidies and as part of the project report. Other strategic actions included maintaining relations between the CCDD, NCDD and other coalitions, increasing awareness about sustainability, developing instruments to facilitate adoption of measures to increase long-term access, imbedding sustainability in all organizations' policies, encouraging collaboration and initiating further research to inform future strategies and policies.[256]

[252] Angevaare, 2009:9,54.
[253] Angevaare, 2009:9-10.
[254] NCDD, 2010.
[255] NCDD, 2012:21.
[256] NCDD, 2012.

NCDD currently staffs a program manager and a researcher, and operates with the support of member institutions. The executive board is made up of representatives from the scientific, governmental, audiovisual (and media) and cultural heritage sectors managing digital data.[257] It is a bit early to report on the effectiveness of CCDD and NCDD in reaching the goal of creating a technical and organizational national infrastructure for permanent access to digital information in the Netherlands.

3.5 Conclusions

This chapter has presented the work of museum professionals trying to advance digitization efforts by developing standards and by pooling resources for a greater outreach.

The collaboration of ethnographic museums in Netherlands was established in the 1980s to coordinate acquisition of collections but served as a meeting point to define a national digitization strategy for ethnographic collections. This is unique in the Netherlands. All ethnographic museums use the same collections management system (TMS) and have together developed thesauri to structure collections. The government has supported their efforts with subsidy for the management of the project, for the acquisition of the software and for the migration of data. The collaborative work has had an important role in the development of standards and in the advancement of digitization in ethnographic museums. At the end of November 2013 there were 437,731 objects in the national online ethnographic collection. The benefits of collaborating were large enough to individual ethnographic institutions that they opted against separately competing for resources. This lowered fragmentation of data, as collections were organized using the same ontology to join the digital collection. Unfortunately, practice lies behind theory and data exchange remains limited and online joint publication requires improvement. Still, the foundation of a joint infrastructure is there.

At the national level, SIMIN, the information department of the *Nederlandse Museumvereniging* NVM, has played a vital role in establishing the registrar position in museums, in coordinating research and disseminating results, and ultimately in raising awareness of the information role of museums as service providers.

[257] In 2012, the executive board of the NCDD was formed by Martin Berendse (secretary, National Archives); Peter Doorn (treasurer, DANS); Sandra den Hamer (EYE); Jan Muller (vice-chair, NIBG); and Bas Savenije (chair, KB) (http://www.ncdd.nl/en/over-organisatie.php).

Supporting the internal and external information service, beyond the mere presentation of objects, has gained an organizational place first through the registrar position and slowly developing into collection information departments in museums. SIMIN also played an important documentation role until the 2000s. Though meetings continued in the last decades, presentations stopped been published as SIMIN reports. Nevertheless, SIMIN remains active and is the longest lasting digital collection association for museums in the Netherlands.

Digitization has been closely related to the inventory of collections and later the inventory of digital activities and resources. The national museum inventory has its origins in the local efforts of the province of Utrecht, where a methodology was devised to account for objects at collection level estimating, for the first time, the size of the total heritage holdings at province level and then at national level). The need to account for the state of collections and the desire to best serve local constituents is what led a group of museums and local policy makers to work together and design a workable system. Government support also played an important role, as seed money during the local inventory project and as source of financing for the national inventory of collections. Being able to report the growth, location and state of objects is important, but being able to have an overview of the national collection is a great achievement. Few countries would be able to report data similar to that reported by the MusIP efforts. Raising awareness of the potential use of such a valuable information asset remains, however, a challenge. Data is not regularly updated and hardly anybody knows how to get it out of the system, making this relevant project an unfortunate example of museum's lack of understanding and recognition of the value of their information assets.

The short life of digital information carriers was noted early in the 1980s when archives started to use digital disks to replace paper for information storage. Changes in standards, in hardware and in software have led to loss of information with expensive consequences. To meet the challenges of digital longevity, a group of cultural heritage institutions have organized a coalition to develop a national strategic agenda for the creation of an infrastructure to ensure permanent access to digital information, in collaboration with a national coalition to include scientific, government and media content. Technology will continue to evolve and data migration issues will remain. A unified digital heritage, scientific and governmental information approach benefits museums as much as other memory institutions.

Considering the magnitude of the task at hand, one may wonder why museums invest so little in preserving past investments.

4. National efforts towards digitization of collections

The use of computers in museum work practice in the Netherlands has been shaped by a whole range of subsidies, grant schemes, and regulations developed by policy makers. Museum representatives have been involved throughout the policy making process, though with a limited decision-making role, particularly regarding the allocation of resources. The government funding of digital activities, earmarked or not, has fluctuated independently of the advances or needs perceived by the field. However, since digital heritage activities were identified as part of an information society and thanks to the formation of a Culture and Media section within the Ministry of Culture, digital activities in museums have received structural support.

Starting with the first subsidy for the digitization of collections in 1969 and the use of the National Computer Center for processing museum collection data since 1979 in Apeldoorn and in 1977 in Hoorn (see chapter 2, sections 2.2 and 2.3), it was not until the 1980s that a more systematic centralized organization to support and coordinate digital activities would appear.

This chapter will map the role of the Dutch government in influencing the adoption of a digital work practice in museums starting in the 1980s and in responding to the institutions in the field (discussed in chapter 2) and influenced by wider international trends (following in chapter 5).

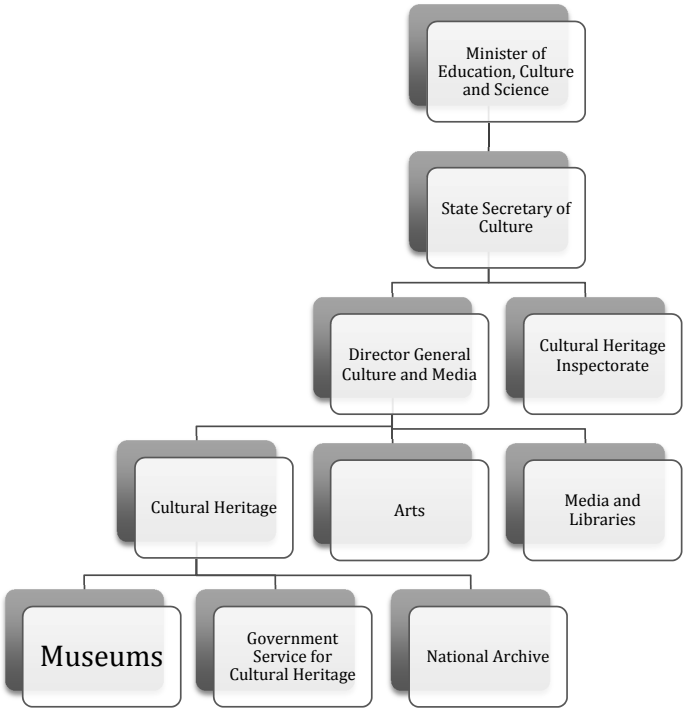
4.1 The Museum Sector

The Ministry of Culture[258] is currently in charge of decision-making in the cultural area. From 1918 until 1965, museums fell under the management of the Ministry of Education, Arts and Science. In 1965, museums became part of the Ministry of Culture, Recreation and Social Work and in 1982 they became part of the Ministry of Welfare, Health and Cultural Affairs. In 1994, a department was created to link museums, heritage, archives and the arts (to be joined by libraries), culminating in the current organization of culture as part of the Ministry of Education, Culture and Science (fig. 4.1).[259] For an overview of the ministries, ministers, secretaries and directors in charge of museums (and digitization), see table 2 in the

[258] For reasons of clarity, Dutch government bodies are given in English, as given in the government's English-language sources.
[259] Elshout, 2013; OCW, 2006.

annex. The changes reflect the public administration view of the role of museums and culture, being primarily linked to education, to leisure or to heritage.

Figure 4.1 Organizational structure of the Ministry of Culture in 2013 (excluding the section related to Education and Science)



Currently, the Ministry of Culture oversees the Cultural Heritage Inspectorate and the Director-General Culture and Media (DG-CM). This Department is in charge of coordinating Cultural Heritage, the Arts, the Media, and Libraries. Museums fall within the Cultural Heritage section, together with the National Archives (NA), and the Government Service for Cultural Heritage (RCE), which is in charge of ensuring the care of archaeology, monuments, historic buildings, natural heritage, and fine and applied arts. The RCE links all constituents that support the care and management of national heritage by providing "knowledge and advice, legislation and policy, technology and funding." NA and RCE staff are civil servants. The Ministry of

Culture works with the NA, the RCE, the KB and the Cultural Heritage Inspectorate to steer its vision in the field.[260]

Some museums have been supported by other Ministries, e.g. the *Legermuseum* (Army Museum) financed by the Ministry of Defense, the *Tropenmuseum* in Amsterdam financed by Foreign Affairs and the Geldmuseum financed by the Ministry of Finance together with the Ministry of Culture. The trend is to move all museum financing under the Ministry of Culture.[261]

There is no museum law, or Museum Act, in the Netherlands. There is, however, a Cultural Heritage Preservation Act (*Wet tot behoud van cultuurbezit*) enacted in 1985 and designed to "prevent objects of importance to Dutch cultural history from being exported."[262] The Cultural Heritage Inspectorate manages and ensures implementation of this Act.

According to the 2009 census, there are 810 museums that fall within the definition of the International Council of Museums (ICOM).[263] Museums can be divided into four categories: national museums, regional museums, city museums and private museums. National, regional and local museums make up 15% of museums while private museums (including foundations and associations) make up 85% of all Dutch museums.[264] All national museums are independent, meaning that they are not a government agency (staff are not civil servants) and thus free to define their institutional policies (including collection and information policies).[265] Their relationships with the government vary. The government may own part of the collection and the building where the museum is housed, it may also provide a structural operations subsidy. Museums may also apply for government grants for

[260] Procee, 2012; http://www.culturalheritageagency.nl/en/about-us/who-we-are; http://www.culturalheritageagency.nl/en/what-we-do; http://www.government.nl/ministries/ocw/organisation.
[261] The Ministry of Culture will finance the Tropenmuseum starting in 2017, contingent to an organizational merging with the Afrikamuseum in Berg en Dal and the Volkenkunde in Leiden (http://tropenmuseum.nl/nl/node/84).
[262] OCW, 2006:78. Legal standing of other heritage sectors includes: the Monuments and Archaeological Sites Act (1961, 1988, followed by the Malta Convention in 1992); the Public Records Act (1995); Public Libraries Act (1975) and the Higher Education and Scientific Research Act (1982) giving the KB responsibility for library and information provision (Ketelaar, Huysmans and Mensch, 2011).
[263] http://www.cbs.nl.
[264] http://www.ne-mo.org/index.php?id=74&STIL=0.
[265] The Law for the Independence of Museum Services (*Wet verzelfstandiging rijksmuseale diensten*) was passed in 1993 and implemented in 3 phases. All 17 national museums became independent non-profit organizations between 1994 and 1995 (Tweede Kamer, vergaderjaar 1994-1995, 23,900 VIII, nr. 2, page 9; Tweede Kamer, vergaderjaar 1995-1996, 24,844, nr. 10).

projects or activities. The Ministry's impact on national museums is greater, and more direct, than on regional museums.

The Ministry influences regional, local and private museums through various subsidy rules. City governments are responsible for funding city museums. Regional and city museums are not all independent, but the trend is towards full autonomy. Some museums that have gained autonomy recently include the *Stedelijk Museum* in Amsterdam (2006), the *Amsterdam Museum* (2009), and the *Centraal Museum* Utrecht (2013).[266]

4.2 Museum policy

The first policy document in the Netherlands concerning museums can be traced back to the first quarter of the 20th century. The *Nederlandse Oudheidkundige Bond* (Netherlands Heritage Society) wrote a policy report entitled *About the reorganization and management of our museums*, bringing museums to the political agenda. The government was to play a guiding role in the constitution of collections: the society argued for the separation of art and history museums, which were to play an educational and an aesthetic enjoyment role respectively, and for a government policy on museums. In this period, a number of documents were written to identify "what is a museum, what is the function of museums, how should collections be formed, preserved and managed, and what should be the relation with [and responsibility to] the public." This policy report coincided with the establishment of a Museum Commission (1919).[267]

The Commission advised museums to differentiate between objects of "artistic qualities and objects of historic value," and to create a national advisory commission for museums.[268] In this period, between 1920 and 1940, hundreds of museums were opened.[269] For the growth of museum numbers in the Netherlands see table 1 in annex.

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[266] IP, 2012.
[267] The Netherlands Heritage Society represented museums as well as archives, libraries and monuments. The Museum Commission was made up of 20 members, including 16 museum directors (Elshout, Forthcoming; OCW, 2006). In the USA, John Cotton Dana was an important player in the discussion concerning the *raison d'être* of museums, always advocating for an educational role and accountability to the local community instead of an elitist (aesthetic) approach. For writings by Dana, see Messias Carbonell (2007) and Peniston (1999).
[268] Elshout, Forthcoming.
[269] OCW, 2006.

Policy documents for culture, the arts or specifically for museums, were published sporadically until the end of the 1980s when the Ministry of Culture began to publish a cultural policy document every four years, one for every new subsidy period. An overview of the policy documents specific to digitization, but including museums and culture and the management of information can be found in table 3 in the annex.

In 1976, the Ministry of culture published *Naar een Nieuw Museumbeleid* (Towards a New Museum Policy).[270] This policy document became fundamental in the discussion of museums. It was based on the key principles of harmonization, of museums being part of society and responding to their public, and of decentralization, to increase broad geographic access. Museums were asked to legitimate their relevance in order to receive financial support.[271] The document argued that the national government should take full responsibility for the national museums holding high quality objects of national significance, while regional and provincial governments should finance their regional and provincial museums respectively. In this way, an account of collections became essential, where objects, their quality and level of national significance were documented. Although no system was in place to implement a nation-wide registry at this time, the policy document became an important driving force for future documentation efforts.[272]

The 1976 policy document identified key problems in the sector in need of an urgent solution, including: insufficient distribution of museums in the country; few coherent collections but many redundant and incomplete collections; poor housing, conservation and security; under-developed registration and documentation of collections; incomplete educational services in many museums due to insufficient labour resources or inadequate facilities; and insufficient collaboration with other institutions in the area of education, culture and health (these areas are partly the responsibility of the Ministry of Culture regulating museums). The Ministry also required museums to place the preservation task on the same level as the public task. During the following decade, the 1980s, museum institutions saw an explosion of educational activities, requiring a new department in museums to be in charge of coordinating the increase in the number of visitors.

[270] Van de Voort, 2002.
[271] Vaessen, 1986.
[272] Vaessen, 1986.

4.3 The crisis of the 1980s

In the period between 1979 and 1981, the museum of history of science and medicine *Museum Boerhaave* in Leiden took part in a pilot project financed by the Ministry of Culture. Staff worked on the automation of collections for a few months at the National Computer Center in Apeldoorn (about 1,300 objects were digitally registered), experimenting with the STAIRS database program. This project was not easy since the museum had to adjust its object registration to the requirements of the computer center, which had limited knowledge of museum documentation.[273] Unfortunately, the final report concluded that the museum did not have enough resources, in terms of knowledge and capacity, to take automation of collections any further. Funding was terminated.[274] This was an important setback with negative effects on the development of digitization projects in museums.

In 1980, the Ministry of Culture proposed, in collaboration with the NMV, to form a committee that would discuss the future use of computers in Dutch museums. This became the *Automatisering Museale Informatieverzorging* committee (AMI - Automation of Museum Information). A preparatory group was formed and planning was started.[275] AMI intended to unify various backgrounds (i.e. curator, registrar) and museum identities (e.g. natural history, art) in the design of a national system for digital museum registration. AMI, as a project, never took place. One year after forming the preparatory committee, the Ministry announced the lack of structural funds for activities related to automation and information services for museums in the coming years and all activities were brought to a halt. Nevertheless, on 24 September 1981, the AMI preparatory group sent a detailed policy plan to the Ministry and to the NVM.[276]

The document voiced the "deep disappointment" of the AMI preparatory group with the Ministry's decision to stop funding after one year of preparatory work and warned of the need for a centralized guidance infrastructure to avoid "wild growth" of digital activities. The proposed solution was the formation of an independent foundation with continuous financing, that would coordinate the sector through a number of activities, would support the specific specialist needed, would

[273] Van de Voort, 2002:4; Van de Voort, 2012.
[274] Koldeweij and Nauta, 1986; AMI, 1981:20.
[275] AMI, 1981.
[276] AMI, 1981; Van de Voort, 1991; Koldeweij and Nauta, 1986.

design the desired information systems, would coordinate local initiatives, and would oversee the information systems.[277] At a time when few museums owned personal computers and automation was planned from a central mainframe computer, the envisioned foundation would be in charge of designing and managing a national central information system. Individual institutions would in turn have a terminal with a keyboard, screen and printer. Printing locally would be limited to small projects, while large projects and catalogues were to be printed centrally. Museums would also request reports of their data (e.g. list of objects on loan) from the central main frame.[278]

Automation was seen as the solution for the improvement of efficiency and quality of work practice, benefitting both museum workers and the public at large. Automation was required to ensure access to and management of the ever-growing collections. Access was desired for the public interested in the social and cultural memory housed in museums (e.g. individual questions, computer assisted education, researchers) as well as for the institution to undertake its core tasks of collection, conservation, research, presentation and education. Quality of data was expected to improve, particularly regarding completeness, timeliness and access to information. Benefits were identified at various levels of the organization: for execution (e.g. creation of catalogues with index), for management (e.g. location control), and for policy making (e.g. development of an exhibition's policy).[279]

The AMI report identified seven requirements to ensure a successful automation project: (1) coordination and standardization, as computerized programs were identified to benefit from high standardization of terminology, data input, thesauri and object description; (2) collaboration and synchronization of decision making and project planning between institutions, including the various museums, related ministries and private institutions, and among collection themes and institutional departments to access each other's collections; (3) participation of all stakeholders, to create a unified system with content from scientists (curators), cataloguers and system specialists, which with to reach a more efficient and less expensive way of working; (4) research of all stakeholders' information needs, in order to satisfy the needs of all museum workers and in order to keep costs as low as

[277] AMI, 1981. DEN is an organization currently supporting digital related activities for the heritage sector very much as envisioned by the AMI group.
[278] AMI, 1981:15.
[279] AMI, 1981:7-8.

possible; (5) development of the institution's own initiatives to assure motivation, so that the museum can define its own level of involvement and the timeline of the project implementation; (6) define stages to advance in clearly delimitated parts that would build a whole, because digitization takes so much time, so that results become visible supporting motivation; and (7) visibility of financial resources, in order to plan accordingly in terms of amount and of time as automation requires an upfront investment in hardware, software, training and the reorganization of the workflow.[280] All seven requirements would prove to be challenging to achieve.

In order to present a concise policy plan, the AMI preparatory group focused on the digital registration and documentation of museum collections. The chosen approach considered the exchange of data as well as the management of resources. Registration of objects was to include the minimum suggested by CIDOC: name of the museum, registration number, form of acquisition, acquisitions date, origin, name of the object, description and history. The AMI group envisioned all objects to be inputted at this basic level by the museum, though, if required due to lack of resources input could be outsourced. This meant that quality control of the data was the responsibility of the individual museum.[281]

It had been planned to present the report at a special Museum Day. However, the lack of funds to finance automation nationwide prevented this from happening.[282] The Ministry of Culture received the plan and "closed its eyes."[283] The work of AMI was not continued as it represented an infrastructural investment that the Ministry of Culture was not able to carry out. Instead, government funding focused on small projects and limited efforts in response to the emerging need in the field. The Ministry did finance the acquisition of one microcomputer by the MARDOC group, and made them responsible for giving advice, coordinating research and leading adoption of computers in the museums sector (see chapter 2, section 2.2 The MARDOC years). As van Tol and Buis would later write, "aware or not aware, it would seem that people have a tendency to save when building the infrastructure."[284]

One fundamental contribution from the AMI preparatory group was the idea of designing an information system by curators, registrars and IT specialists together.

[280] AMI, 1981:9-10, 21.
[281] AMI, 1981:14-15.
[282] Rijksmuseum Annual Report 1981:33.
[283] AMI, 1981. As stated by Koldeweij and Nauta (1986).
[284] Van Tol and Buis, 1992:20.

The committee identified the risk of designing an information system that would only satisfy the requirements of the administration and registration of objects and ignoring the role and contribution of scientists (curators).

Automation in the 1980s took place in what Van Tol and Buis called a process-oriented approach, where systems were developed as "customized solutions for a specific problem," making them costly as information was not integrated into a central system e.g. data changes in one address system will not be reflected in other membership systems). Instead, they proposed an integrated data oriented approach, linking content that followed the rules of understandability, correctness, authorization, privacy and security. They identified the need for controlled vocabularies as well as data owners, or people responsible for the information. Large institutions further required owners of data (people responsible for the data dictionaries).[285] This would be given much attention in the decade to follow, during the 1990s, when Dutch museums would build a national digital heritage collection.

The budget cuts of the 1980s were devastating for many institutions and in fact created a crisis in the museum field. The AHM wrote a letter to the NMV calling attention to the impact of the restrained budget. The main concerns stated were the neglect of restoration activities, the postponing of temporary exhibits or educational programs, the closing of departments and the closing of the museum to the public during specific days all as result of insufficient funds. The NMV in turn sent a telegram about the letter to the Ministry of Culture advocating a budget revision. The NMV organized a demonstration in May of 1982 at the *Tropenmuseum* where museums complained about the austerity measures of the government, with many small museums were being threatened with closure.[286]

Larger museums also felt the impact. The *Rijksmuseum* reported in 1982 that budget cuts would affect the public function of the museum; it would close one day a week while raising the entry fee by *f*1 (€0.45). In addition, the structural lack of security staff would lead to certain areas of the museum bring closed to the public. Other activities were further hindered, having a broader negative impact, including the limitation of international exhibition projects and the increasing absence of the *Rijksmuseum* in the international market.[287]

[285] AMI, 1981; van Tol and Buis, 1992:18.
[286] Maurits, 1980; Rijksmuseum Annual Report 1982:7.
[287] Rijksmuseum Annual Report 1982.

The main consequence of the economic stagnation of the 1980s was the decentralization of many cultural institutions (the national government would only care for the national collections) and the transformation of national museums into independent non-profit, self-governing institutions. The process of fully becoming autonomous would take 15 years (for the national museums, while the other museums would take even longer). A number of cultural funds were created for the direct channeling of government support, ideally also for a "faster, more flexible decision-making." This was a period of deregulation, privatization, and reorganization throughout the government, resulting in an arm's length implementation approach to policy: the ministries were to create the policies yet other institutions were to implement them.[288]

4.4 SMA, supporting national coordination

In October 1985, Ministry of Culture published a draft policy document entitled *Aanzet tot een beleid ten aanzien van automatisering van museale collecties* (Towards a Policy for the Automation of Museum Collections). This document made plans for the integral automation of all national museum collections in the short term (over a period of 7 years). National museums would automate with support of the national government, while non-national museums would automate with support of the NMV. Automation was seen as "the documentation of art and culture objects with cultural and natural historic value, to be found at the (national) museums in order to guide good management, increase access to objects, improve the information provision (internal, with other museums and within the department), and to lay a base for future information systems."[289]

Standardization was seen as essential and MARDOC was recognized to have the experience to support the choice of hardware and software. The policy document was further seen as a request for museums to function as businesses, as preference was given to small projects that would produce fast and visible results.[290]

In the period between 1981 and 1986 some museums began automation projects. Somehow, in spite of the recession, funds were organized at an institutional level and, in 1987, funds were made available with the support of the new

[288] OCW, 2006:41.
[289] Tweede Kamer, vergaderjaar 1985-1986, 19,066, nr. 5 (page 5, paragraph 48).
[290] Van de Voort, 1991:6; Koldeweij and Nauta, 1986.

government. In 1987, 4% or 21 museums had a computer. By 1988 that increased to 7% or 37 museums, by 1989 to 13% or 69 museum and by the end of 1990 to 25% or 174 (table 4.1).[291] The MARDOC group, working from the RKD, was active and visible supporting institutions with knowledge and advice, even at the international level; clients included the *Koninklijk Instituut voor het Kunstpatrimonium* (Royal Institute of Art Heritage) in Brussels.[292]

Table 4.1 Adoption of computers in museums 1987-1990

Year	1987	1988	1989	1990
Total number of museums	538	538	538	697
Museums with a computer	21	37	69	174
Percentage	4%	7%	13%	25%

Source: adapted from Van de Voort, 1991a.

By 1987, the Ministry allocated €3.6 million for cultural management and care. The funds would be allocated to fight the backlog found in registration and documentation of the national collections ideally establishing a systematic data entry system to increase access to collections and therefore support management. For this reason, €2.8 million was reserved for automation.[293]

In 1987, the Ministry asked the NMV board to advise on the creation of an advisory body for the automation of collections. The *Stuurgroep Museale Automatisering* (SMA - Museum Automation Advisory Board), was formed.[294] This government body started from scratch and did not build directly on the AMI work, which was unknown to the team. SMA was in charge of advising the policy of the Department of Museums, Monuments and Archives (MMA) regarding museum automation, specifically for object registration, and for coordinating the automation of museum content from 1987 to 1991. It was financed by the income brought in by museum entry fees. The Ministry wanted to fund activities that responded to the distribution of knowledge, education, research and the development of software,

[291] Van de Voort, 1991a.
[292] Koldeweij and Nauta, 1986.
[293] Maurits, 1987.
[294] SMA's work was part of a national initiative to adopt computers at work. Museums were supported and managed as decentralized systems (Westerveld email correspondence 29 June 2012).

exchange of data and new work methods. Museums were required to present a digitization plan with their proposal.[295]

This initiative was part of a greater government plan to automate. Automation was seen as a key component in the management of the public sector's information services (including processing, storage and dissemination of information), which required political guidance to ensure the greatest possible benefit during its application. By 1986, the *Bestuurlijke Overlegcommissie Overheidsinformatievoorziening* (BOCO - Administrative Commission for Government Information Services) was joined by the *Centrale Commissie Overheidsinformatievoorziening* (CCOI - Central Commission for Government Information Services) to advise the government. One early advice involved the creation of an independent *Expertise Center* for the application of information technology in the government. This project received a budget of €910,000 a year for two years. The Ministry of Internal Affairs coordinated all information services but each ministry was made responsible for an area: the Ministry of Culture was to coordinate the digitization of cultural objects. Information Services, and therefore automation of processing, storage and distribution of information, were seen as fundamental for the management of the public sector. The government realized that central coordination would increase benefits and the overall quality of information.[296] SMA was part of the national automation process but functioned as a decentralized group.[297]

[295] Other such decentralized information systems included the ARCHEION Archive Management System, the MIP Monument Inventory Project, and the library system. In contrast, central information systems included the financial system, personnel system, and a documentation system (Tweede Kamer, vergaderjaar 1989-1990, 21 300, H XVI, nr. 3). In 1986, museums, monuments and archives had an income of 7,8 million guilders (€3,5 million) from entry fees. Museums were required to take measures to improve administration of income (also from the sale of catalogues and posters) to raise more income. Automation was expected to improve administration (Tweede Kamer, vergaderjaar 1986-1987, 19 700, H XVI, nr. 189).

[296] The BOCO was formed in 1975 with representatives from national, local and regional governments to coordinate and integrate the policy, management and execution of information services. The CCOI was formed in 1986 as successor of the Information Services Commission of the National Advice Commission, to provide policy proposals, in particular for the data communication plan for the government and for standards for data exchange, integrated by external experts and representatives from various departments, according to the project at hand (Tweede Kamer, vergaderjaar 1987-1988, 20 644 No. 1-2, *Informatievoorziening Openbare Sector*).

[297] Van de Voort, 1991:6; Koldeweij and Nauta, 1986.

Table 4.2 Information services budget: general, museums, archives and financial services 1987-1994 (in million Guilders/Euros)

	1987	1988	1989	1990	1991	1992	1993	1994
Museum automation								
Operations	0.2 (€0.09)	0.2 (€0.09)	0.3 (€0.14)	0.3 (€0.14)	0.8 (€0.36)	0.8 (€0.36)	0.8 (€0.36)	0.8 (€0.36)
Development	1.6 (€0.73)	1.7 (€0.77)	1.9 (€0.86)	1.6 (€0.73)	0.7 (€0.32)	0.7 (€0.32)	0.7 (€0.32)	0.7 (€0.32)
Archives automation (Archeion)								
Operations	-	0.1 (€0.05)	0.2 (€0.09)	0.2 (€0.09)	0.3 (€0.14)	0.3 (€0.14)	0.3 (€0.14)	0.3 (€0.14)
Development	0.2 (€0.09)	0.7 (€0.32)	0.7 (€0.32)	0.7 (€0.32)	0.6 (€0.27)	0.6 (€0.27)	0.6 (€0.27)	0.6 (€0.27)
Monument Inventory Project (MIP)								
Operations	-	-	0.0	0.0	0.1 (€0.05)	0.1 (€0.05)	0.1 (€0.05)	0.1 (€0.05)
Development	0.3 (€0.14)	0.2 (€0.09)	0.3 (€0.14)	0.1 (€0.05)	0.1 (€0.05)	0.1 (€0.05)	0.1 (€0.05)	0.1 (€0.05)
Financial information system								
Operations	1.6 (€0.73)	1.6 (€0.73)	1.8 (€0.82)	1.6 (€0.73)	1.8 (€0.82)	4.8 (€2.18)	4.8 (€2.18)	4.8 (€2.18)
Development	5.8 (€2.63)	7.3 (€3.31)	5.0 (€2.27)	12.2 (€5.54)	7.8 (€3.54)	1.2 (€0.54)	-	-
Total General	**22.8 (€10.35)**	**30.8 (€13.98)**	**27.2 (€12.34)**	**32.8 (€14.88)**	**26.2 (€11.89)**	**22.5 (€10.21)**	**21.4 (€9.71)**	**21.3 (€9.67)**

Source: Tweede Kamer, 1988-1989, 20800, XVI, nr.3:26-27; Tweede Kamer, 1989-1990, 21300, XVI, nr.3:26-27.

From the start, SMA was to work as a facilitator providing partial financing for digitization projects. A brochure was designed detailing the conditions for subsidy: subsidies were meant for work carried out at the museum but not for the purchasing of computers or for outsourcing the project. This structure was devised so that museums would do the work themselves, provide part of the financing, and involve their own staff. Financing was not given to acquire computers. By 1986, all national museums had personal computers – even if these were not used for the automation of collections but instead for general administration. There was no financing given to cover operational costs, for equipment maintenance or to update and migrate the existing systems. There was no financing given for extra personnel, even if it was known that a number of activities could not be executed without additional staff, particularly regarding the new labour-intensive activities (e.g. input

of data). The subsidy was meant to encourage experimental applications of computers in the support of museum information services.[298]

For the SMA, it was clear that standards for the automation of collections were important and needed to be implemented. It was also clear, and perhaps more important, that museums needed to experiment, to try new things, even if that meant starting small and making it in a "quick and dirty" way. That is, it was thought important to enter data into the systems even if the data was not perfect.[299] The extent to which the general museum field understood this is unclear.

SMA started work by mid 1987 and in the first year nearly 50 subsidy requests were received, mostly from national museums. Most of the rejections involved small museums that requested acquisition of computers. More than half of the total amount given in grants went to non-national museums.[300] Later that year, the so-called *PC-Museum Project* was established to support the acquisition of hardware, software and training, covering the needs of small museums whose basic digital infrastructure needed improvement. The two subsidy programs worked together (see section 4.5).

During the first year of work, SMA identified two main problems: first, museums were in very different stages of digitization. Subsidy applications reflected this in the array of projects submitted; some museums were beginning with digitization of text while others were developing information systems for the documentation of collections. Second, there was no attention for the structural follow up of the projects. All attention was given to the development of new systems while maintenance and long-term vision was lacking, future return on investment was not taken into consideration.[301]

For these two reasons, the steering committee decided to end the project. The policy of stimulating digitization was too broad and would only widen the digital divide. Furthermore, the committee believed that museums should incorporate the

[298] Van de Voort, 1991.
[299] Koldeweij and Nauta, 1986. In 2010, data quality was used as the main reason for not making digital collections widely accessible to the general public. During a meeting at ICN, now RCE, participants agreed that "dirty data" was not acceptable and could not be made accessible to the public (3 February 2010. Summary available at http://blog.collectiewijzer.nl/2010/02/04/presentatie-collectiebalans-moderne-kunst/).
[300] Van de Voort, 1991.
[301] Van de Voort, 1991. It would not be until the decade of the 2000s when government grants would require a sustainability plan.

investment in digitization, identified as becoming part of the museum's structural activities, into their regular budget.[302]

However, the group changed their mind and decided not to end in 1988 as planned but to continue until 1992, following an altered course in the subsidy program. This would give extra time to the museums that were behind to catch up a bit and to set funds aside in their organizational budget specifically for digital activities. The SMA committee favored submissions with a positive effect towards other institutions and projects that supported collaboration. Projects that would expand an existing information system and large digitization projects were not first choice. SMA also began supporting policy development and other preparatory digitization activities.[303]

The SMA subsidy supported all processes in the adoption of computers in museums, including text processing, administration (address lists and book keeping), automation of libraries, automation of collection, and digital presentation of collections. Subsidies were granted for the obtaining of advice on automation projects, for hardware and software, for system development, for training and education of staff, and for other diverse related activities.[304] Table 4.3 shows the breakdown of funds granted for each of the activities.

Table 4.3 SMA grants in percentage per digital activity 1988-1990

	1988	**1989**	**1990**
Advice	20	10	10
Hardware	38	65	35
Software	15	20	5
Design	6	1	30
Training	12	4	10
Miscellaneous	10	0	10
Total number of grants	**45**	**25**	**15**

Source: adapted from Van de Voort, 1991:7-9.

Before automation, the budget required for museum information services comprised a knowledgeable staff and a modest infrastructure made up of a pen and a few paper cards. The costs structure changed when the same service required a

[302] Van de Voort, 1991:10.
[303] Van de Voort, 1991. A later subsidy called Policy-based Digitization was also designed to develop an information plan or a collections plan, in addition to implementing the plan, and would run for 2 years.
[304] Van de Voort, 1991.

computer and staff training, which asked for a significantly larger budget. Most museums adopting computers in this period were in the process of remodeling or moving. The costs for digitization had to be taken from other activities, meaning museums would have to choose between setting up a good information system or an exhibition.[305]

Collections, being at the heart of museum work, depend on an effective registration system. The board of SIMIN was convinced that the basic registration costs of a museum object should be made visible and should appear as a budget line in the total budget. But knowing how to calculate the cost of registration, in either a manual or a digital system, was challenging for museums. Research was conducted and a model was proposed. Registration costs included all transactions and activities related to the registration of the object (e.g. transportation from storage, data entry). The proposed formula estimated registration costs (R) of object x, based on the time that it took to enter basic registration data in hours (T), multiplied by salary per hour (S) plus material costs (M) and photography costs (F).[306]

$$R = (T * S) + M + F$$

Overhead costs were not included (e.g. desk, chairs, light, office costs, management). Time involved would differ by type of collection and with relation to the experience of the staff. Salary costs were dependent on the position and seniority of staff involved. Material costs for a hand registration system (e.g. paper cards, hand book) would differ from a computer registration system (software, hardware, training, supplies, and maintenance). The cost of photography would depend on the quality of output (a hired professional photographer would be much more expensive than using an existing image).[307]

The model was tested at the *Frans Hals Museum* in Haarlem by a group of students. Results estimated a registration cost per object ranging from €8 to €11. The research project concluded that further research was needed; there was not enough data available, and the situation per museum was too different to be able to give a cost model that would work in all cases.[308]

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[305] Koldeweij and Nauta, 1986.
[306] Fontijn, 1987.
[307] Fontijn, 1987.
[308] Fontijn, 1987. The same exercise of providing a model to calculate costs related to digital activities per project was conducted by DEN in 2010. A spreadsheet was published with variables of type of activity (digital reproduction format determined storage size), cost of labour (per salary scale), duration of project, cost of storage (storage size being a variable of digital production format), and cost of

4.5 The PC-Museum Project, a jump-start

In 1987, the Ministry of Culture made *f*400,000 available (equivalent to €181,500) for the *PC-museum project*.[309] The subsidy program hoped to support the automation process in Dutch museums by funding the acquisition of hardware (PC and printer), software (Q&A or TINreg) and training, as automation was seen to support the increasing information needs from inside and outside the museum organization.[310]

The *PC-Museum Project* was the first nation-wide government incentive for the adoption of computers in the Netherlands, covering 124 heritage institutions and with at least one institution participating per province. The project lasted until 1991 and provided over 100 computers, 144 software licences (110 Q&A, 6 TINreg, and 28 Word Perfect), and training for 487 staff. Expenditure resulted in 39% directed towards hardware, 24% directed towards software, 33% directed towards courses, and over 4% was spent to lease equipment (table 4.4). Some institutions bought only hardware, some only software, and some only followed training courses. There was no follow up to assess the effectiveness of the project.

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electricity (relevant when scanning is done in house) (Gillesse, Jochens, Maris, 2010). Still, all cost models are but an indication of potential costs that depend on the variables found per institution, including resources (collection type, knowledge, technology), experience and goals of the project. For a description on cost and production statistical projects see chapter 5, section 5.4 National digital inventory.

[309] NMV, 1999a,b,c,e.

[310] NMV, 1999a,b,c,e.

Table 4.4 Total SMA and PC-Museum Project grants and percentage by digital activity

	1988	1989	1990	Total
Number of museums with a computer	56	104	200	200
SMA grants	**45**	**25**	**15**	**85**
Advice	20%	10%	10%	
Hardware	38%	65%	35%	
Software	15%	20%	5%	
Design	5%	1%	30%	
Training	12%	4%	10%	
Miscellaneous	10%	0%	10%	
PC-Museum Project				**124**
Hardware				39%
Software				24%
Courses				33%
Leased equipment				4%

Source: own. Based on Van de Voort, 1991 and NMV, 1999.

The *PC-Museum Project* noted that even though museums did automate certain office activities (e.g. writing texts, using address databases), the level of automation of collection information was surprisingly low in Dutch museums. This, explains the project's final report, was due to the challenging considerations that museums faced to digitize collection registration. Adoption of computers as text editors required a different institutional effort than switching from a paper collections information system to a digital one. Adopting new hardware and software required planning for training, system providers, support for hardware and software, costs and expected results. During the second year of the project in particular, more training courses were provided, a help-desk was introduced where museum could call with questions and a user group for trouble shooting was formed.[311]

Ever since the first automation projects, museums have been confronted with a reflection process to better adapt their internal organization to the new work style. Collection registration is a core activity and changing a core work process significantly affects the entire organization. The *PC-Museum Project* encountered a certain amount of resistance, as institutions did not participate as widely as expected. The project was extended in order to use all funds that had initially been made available and the subsidy amount was increased per museum applicant.[312]

[311] NMV, 1999a,b,c.
[312] NMV, 1999a,b,c.

In its brochures, the project was presented as a ready-made choice for museums: research into various hardware and software had been conducted and the most suitable for museum work had been chosen; the software had been developed specifically for museum object registration; the programs were installed and the computers were delivered; training was designed for museum workers; there was a hot-line for problem solving and a help-desk was available to answer questions.[313] The project's coordinator recalls explaining to enthusiastic museum workers, after convincing them of the benefits of using an automated system, that data still needed to be entered into the system.[314] Ever since the first digitization projects, costs have been undervalued, particularly in relation to data entry, to the time it takes to learn a new system - and to develop a new work practice. The misconception that the computer would have all answers *with the push of a button* misrepresented the task at hand.

User access to collection information was possible as Q&A allowed for digital publishing. This required first making a copy of the original catalogue in order to hide sensitive information.[315] Publication of collections would take a more prominent role as the World Wide Web entered the museum scene. Many museums still waited until the late 1990s to create a website, and until the 2000s to publish the collection catalogue (with images).

As was envisaged, the *PC-Museum Project* resulted in a number of museums adopting the same software and registration system. This led to a first nation-wide standardization of museum object registration, though much smaller in size in comparison to the Delta Plan for the Preservation of Collections inventory project that would take place in the 1990s.

4.6 The Delta Plan for the Preservation of Cultural Heritage national inventory

In 1990, the Ministry of Culture launched the *Deltaplan voor het Cultuurbehoud* (Delta Plan for the Preservation of Cultural Heritage). The Plan was named after the hydraulic engineering project designed to prevent flood disasters, such as the one suffered in 1953. The Delta Plan for the preservation of cultural

[313] PC-museumproject, 1990c.
[314] Personal conversation on 7 December 2009.
[315] PC-museumproject 2009a.

heritage would represent the dikes and flood barriers to protect the Dutch heritage assets.[316]

The Delta Plan, as it would be called in the heritage field, was a response to a report uncovering the poor state of the heritage collections. The report, made by the General Audit Office, found that the care of collections housed at the 17 national museums was threatened by insufficient registration, a backlog in restoration and a series of shortcomings to assuring optimal conservation.[317] "The record system was set up in such a way that only one or two people knew how to use it."[318]

The preservation of collections was found to be "distressing." Expert staff to preserve and manage the ever-growing collections in a responsible way was lacking. Collections were being seriously threatened by polluted air, excessive light, temperature fluctuations, mildew and insects. Over the years, resources had been channeled to the expansion and presentation of collections as well as to the popularization of museums. This policy resulted in an increase of museum visitors from 13 million in 1978 to more than 20 million in 1988 but it also resulted in neglect of the less visible parts of the museum.[319]

The Delta Plan was organized as an emergency response to the deterioration of museum objects. It had two main objectives: (1) to clear (or reduce) the management and conservation backlog so that institutions could handle it with their conventional resources, and (2) to train institutions in the areas of conservation and management. Funds were made available from the Ministry of Culture and complemented by the Ministry of Housing, Physical Planning and the Environment. The effort was to cover museums and archives as well as monuments and archaeological resources.[320]

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[316] WVC, 1991:12-14; WVC, 1993:67).

[317] In the UK, the National Audit Office published a similar report on the *Management of Collections of the English National Museum* in 1988 expressing "direct concern about standards of inventory control and storage" similar to those in the non-national sector (Fahy,1995:2). The late 1980s saw national efforts to adopt standards to improve registration of collections efficiency.

[318] WVC, 1991:4; Tweede Kamer, vergaderjaar 1987-1988, 20679 rapport Algemene Rekenkamer 'Rijksmusea', nrs. 1-2,12-14.

[319] WVC, 1991:4.

[320] Van Dijken, 2000:1; WVC, 1991. The Department for the Protection of Monuments and Historic Buildings (*Rijksdienst Monumentenzorg*) supports preservation by setting regulations and by providing grants for maintenance and restoration. The State Service for Archeological Investigation (*Rijksdienst Oudheidkundig Bodemonderzoek*) keeps a record of sites where finds are made and is responsible for investigating the excavations carried out, for instance resulting from road construction. The Ministry of Culture is responsible for the audio-visual archives and for the National Archives under the terms of the Dutch Archive Act. Local authorities and district water boards are responsible for their own archives (WVC, 1991:20).

40% of this plan was financed by the national government contingent on 60% support by provincial and municipal governments. Museums worked on the registration, preservation, and conservation of the national movable collection (including objects and excluding buildings or sites). Funding was also contingent on the development of a collection plan that described a museum's collection, its composition, meaning and significance for the museum itself as well as for the nation.[321] The Delta Plan project represented the first national effort to inventory museum objects, influenced the professionalization of registration practice and served as an incentive to develop collection policies. Indirectly, it signified a major national impulse for the adoption of computers and for the implementation of an object valuation system that would (among other activities) guide digitization for many years to come.

The Delta Plan consisted of three phases, or interventions in the management and preservation of collections: (1) inventory of the backlog; (2) development of a plan to eradicate backlog; and (3) implementation of the plan. Collections were ranked according to their historical-cultural importance into categories A, B, C and D. Category A represented the irreplaceable and invaluable heritage assets of the nation, generally meaning the exhibited collection. These objects have a standardizing function for a period or style (standardizing value), are used to establish a link (have a link value), or have significance derived from their role in relation to an outstanding historical event (symbolic value). Category B contained objects that possess a high attraction and exhibition value, generally found in temporary exhibits, have a special origin in the collection (genealogical value), form part of a valuable whole (collection value), or have a documentary value (e.g. a topographic atlas). Category C contained all that was left and could not be included in A or B, but that formed part of the museum's collection, generally found in storage rooms. Finally, category D represented all the objects that did not belong to the museum's collection but served to support the exhibits (props).[322]

The distribution of objects in national museums over the categories was as follows: A=22%, B=44%, C=32% and D=1%. Objects in non-national museums were ranked differently. Institutions were asked to identify the objects of national

[321] Kuyvenhoven, 2001.
[322] WVC, 1991:44-46. There was initially a category E to identify the objects that did not form part of the collection and were considered for deacessioning. This category was dropped early in the project.

importance or of exceptional cultural value, representing roughly categories A and B (adding up to more than half of the total collection of objects). The Delta Plan would only provide funding to cover the preservation of A and B objects both from national and non-national collections.[323]

The Delta Plan initially envisioned allocating *f* 20 million towards registration of collections, raised to *f* 22 million in 1993, compared to *f* 109 million allocated to conservation of collections, raised to *f* 131 million in 1993. Museums reported being in three different stages of registration: a first group required to (re)register the entire collection, renewing and improving the process, represented by the museums with the greatest backlog. A second group required to fill-in gaps in their registration systems while the third group first required a general assessment of the collection (based on object valuation) before being able to start the registration process.[324]

The plan was started in 1991 and was expected to run until 1993 but was extended until 1995, with a budget of *f* 193 million guilders. According to the inventory of the backlog, however, the costs were estimated to reach *f* 210 million guilders.[325] This represented three times the annual budget of all museum institutions.[326] By mid 2000, €150 million of additional public funding had been allocated to the conservation of collections, but also towards "supporting activities such as research, development of materials and educational work."[327]

From the start, the costs of conservation of objects was identified to be much higher than that of preventive preservation. It became clear that "conservation begins when an object is acquired." Preservation would have to be adopted in the core activities, as a budget line item, in order to prevent future backlog from reaching such magnitude.[328] The similarities with digitization are striking. Digitization projects end up costing more than initially estimated and digitization is cheaper when done right from the start. Cleaning up poorly inputted data has proved to be prohibitively expensive for some institutions.

Due to the longer than estimated duration of the Delta Plan, the initial underestimation of the extent of the backlog, the technological developments, the

[323] WVC, 1991:46-52. Identifying objects as A and B categories to represent high cultural value have been used by the RKD since the mid 1980s.
[324] Tweede Kamer vergaderjaar 1990-1991, 21965, Nr. 3:6.
[325] Intromart, 1993; Kuyvenhoven, 2001; PMZ, 1993.
[326] WVC, 1991.
[327] Van Dijken, et al, 2000:1.
[328] WVC, 1991:61.

adjusted priorities and the many institutional changes, the Delta Plan resulted in much more than a project. It was a national process to change museum work practice. This project continued the trend established with the policy document of 1985 *Aanzet tot een beleid ten aanzien van automatisering van museale collecties* (Towards a Policy for the Automation of Collections), which specified financial responsibility for the different types of museums. The national government was to subsidize only the national museums; the regional and local governments were to be responsible of regional and local museums respectively. Before this, the national government subsidized all museums running at a loss.[329] The selection of objects to be preserved with financing through the Delta Plan contributed to this division.

In the policy paper entitled *Kiezen voor Kwaliteit, beleidsnota over de toegankelijkheid en het behoud van het museale erfgoed* (Choosing for Quality), written in 1990, the Ministry called for the registration of collections at the basic level. This required all objects to be identified and the location and ownership to be recorded. Basic registration needed to answer the questions to *what*, *where* and *who owns it*. That is, registration was to include: (1) description of the object (identification); (2) location of the object; and (3) legal status of the object (e.g. ownership, loan).[330]

Immediately following this policy paper, Minister of Culture d'Ancona steered museums towards maximum autonomy, requesting that a number of institutions become independent boards, agencies, foundations or ventures.[331] Autonomy of museums was realized gradually starting in 1993.[332] In 1993, the Ministry established the *Erfgoedinspectie* (Cultural Heritage Inspectorate) in charge of supervising the management of the national collections, covering also archaeology, archives and monuments in 2005. The inspectorate "ensures compliance with the law and promotes improvements to the management and care of cultural heritage […] it also advises the minister on the quality and effectiveness of the legislation."[333] In this way, the government remained responsible and accountable for the national collections managed and cared for by the autonomous national museums. The Collections

[329] OCW, 2006:74.
[330] Intromart, 1993; WVC, 1990:22.
[331] Van Woerkom, 1991.
[332] RKD, 1995:1.
[333] The Cultural Heritage Inspectorate also implements the Monument Law of 1988, the Archive Law of 1995, and the Law of Independent National Museum Services of 1993, among others (http://www.erfgoedinspectie.nl).

division of the inspectorate implemented the Cultural Heritage Preservation Act (*Wet tot behoud van cultuurbezit*) of 1984.

In 1991, the Ministry of Culture published a document entitled *Vechten tegen Verval* (Fighting against decay). This was the implementation plan for the Delta Plan, emphasizing care for extraordinary cultural collections (i.e. categories A and B)[334]

In this policy document, the Ministry acknowledged the problematic state of conservation of collections and called for an evaluation of the Delta Plan to take place in 1993. With the allocated funds of about €4.45 million, it was expected that the backlog of conservation would be eradicated in all national collections by 1998, with the exception of the *Rijksmuseum* in Amsterdam, the *Volkenkunde Museum* in Leiden and the RBK. That is, 14 of the 17 national institutions were expected to complete registration of their collections by 1995.[335]

The 1993 evaluation of the Delta Plan entitled *Cultuurbehoud* (Preservation of Culture) reported that the Ministry had insufficiently stimulated the inventory of backlog particularly in non-national collections. Institutions lacked clear priorities and measurable goals and implementation plans were not being formulated.[336] The document also stated that less than half of the museums, particularly the small museums, were not able to participate in the subsidy program because they were unable to provide the 60% of the costs required in order to receive the 40% subsidy. Furthermore, smaller museums noted the lack of specialized staff and requested additional assistance in the form of consultancy.[337]

It was reported however, that the number of museums with an in-house conservator increased by 40% in the period from 1990 to 1993, even while the conservation budget remained constant. The historic museums reported a lower percentage of in-house conservators.[338] The largest part of the Delta Plan budget was directed towards salaries (for the registration, conservation and research of collections) and in support of training (for the preservation of collections)[339]

The evaluation also reported on comments from museum staff. Respondents noted that the subsidy was meant for conservation only and not for registration even

[334] WVC, 1991:1.
[335] Intromart, 1993.
[336] Tweede Kamer, 1993-1994, 23 475, nrs.1-2:5-7 (report Algemene Rekenkamer *Cultuurbehoud*).
[337] Intromart, 1993.
[338] Intromart, 1993.
[339] WVC, 1991.

though registration was an inherent part of the conservation process.[340] The Delta Plan subsidy covered active or passive conservation projects only. The subsidy did not cover registration in general, but did end up funding the registration of the objects to be conserved.[341] The extent to which institutions understood this and took advantage of the funds available for registration is not known. What is clear is that the policy guidelines had a limited scope and did not include registration in the preservation process. A unified approach to the support of activities related to museum objects was required for the formation of a national infrastructure. Instead, however, conservation and registration departments competed for the limited funds available.

In 1993, the management of the Delta Plan was transferred to the *Projectbureau voor verzelfstandinging van rijksmuseale instellingen* (PMZ - Office for Independent National Museums). PMZ conducted a second evaluation and found that the registration backlog was reduced by 38% and the conservation backlog by 12%.[342]

Expected costs for the Delta Plan were estimated based on man-years. The calculations failed to include the differences found in the work processes of the various museums and the variety of staff involved (thus pay rate). Temporary staff were hired to support the work process but permanent staff were required from museums participating in the project in order to retain some of the acquired knowledge within the institutions.[343]

Larger museums required an automated system to assure the efficiency of the work process. *Paleis Het Loo* is one example thereof, adopting a digital system in 1993 to increase efficiency of the registration of its collections. Automation required advice on data entry. Adoption of a new information system represented an interpretation of data and, to a certain extent a translation into a new language, to guarantee the correct registration of specialized vocabulary.[344]

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[340] Intromart, 1993.
[341] Mondriaan, 1994.
[342] 18 museums took part in the PMZ evaluation: the Rijksmuseum Twente, Vincent van Gogh in Amsterdam, Boerhaave Museum in Leiden, Rijksmuseum van Oudheden in Leiden, Beeldende Kunst, Nederlands Scheepvaartmuseum in Amsterdam, Zuiderzeemuseum in Enkhuizen, Koninklijk Penningkabinet in Utrecht, Mauritshuis in The Hague, Kröller-Müller in Otterlo, Paleis Het Loo in Apeldoorn, Kunshistorische Documentatie in The Hague, Meermanno-Westreenianum in The Hague, Catharijneconvent in Utrecht, Rijksmuseum in Amsterdam, Rijksdienst Kastelenbeheer in The Hague, National Natuurhistorisch Museum in Leiden and the Volkenkunde Museum in Leiden (PMZ, 1993).
[343] PMZ, 1993.
[344] PMZ, 1993.

Average costs of the registration of collections were made up of 80% personnel costs (regular museum staff and temporary staff hired for the Delta Plan) and 20% material costs. Conservation of collections reported a slightly different ratio of 68% personnel costs and 32% material costs. Several museums reported suffering from a lot of extra stress within the organization due to the increase of staff, with the temporary staff hired for the Delta Plan. Delay in the registration of collections was reported in a number of institutions. The *Volkenkunde Museum* in Leiden was in the process of moving and remodeling its storage facilities, which meant postponing registration activities. The *Rijksmuseum Twente* took longer than expected because the registration included photographs of the objects. The *Scheepvaartmuseum* in Amsterdam encountered difficulties because the photograph collection was registered at collection level rather than object level. *Paleis het Loo* had numerous objects on long-term loan and the responsibility for the conservation costs (including the registration of the objects) was not clearly assigned. The *Rijksmuseum* reported encountering a challenge due to the variety of the collection types.[345]

The PMZ evaluation stated museums experienced a revolution in their mentality towards collection care. The institutions added a conservation budget line and conservation activities were adopted into the core museum work practice. That was not the case for registration, which continued to lack a budget line. It was further stated that institutions had shifted their focus from presentation to conservation of collections.[346]

The 1994 Delta Plan evaluation by the Ministry of Culture entitled *Werken in de Delta* (Working in the Delta) differentiated between the management and the care of collections as two distinct responsibilities, sometimes falling in two different organizations. In the case of the national museums, the government's management of collections responsibility was delegated to the caring institutions (the museum) and therefore the Ministry focused its financial support on these institutions (national museums). Collection administration and passive conservation fell under the

[345] PMZ, 1993.
[346] The Kröller-Müller Museum reported using one of their exhibit halls to organize the objects and solve the storage problem (PMZ, 1993). Such clear institutional support is still desired for digital activities.

management responsibilities while object preservation fell under the care of collections.[347]

The Ministry further developed a policy to support all sector organizations through institutions that were nationally financed. A number of these institutions merged to form the *Instituut Collectie Nederland* (ICN - Netherlands Collections Institute) in 1994. ICN was formed to advise, research and train in preservation and management of collections. Another institution was *Erfgoed Nederland* (Dutch Heritage Foundation), formed in 2007 as an umbrella organization linking three heritage sectors (archives, archeology and monuments) and educational institutions. It provided information and documentation, supported expertise and coordinated international affairs.[348] The Foundation was only active for about 2 years before being merged with ICN to form the *Rijksdienst voor het Cultureel Erfgoed* (RCE - Cultural Heritage Agency), an agency housing all expertise in the field of movable and immovable cultural heritage. It functions as an independent knowledge institute for the preservation and management of movable cultural heritage.[349]

The 1995 policy report *Pantser of Ruggegraat, uitgangspunten voor cultuurbeleid* (Harness or Backbone, principles of a cultural policy) named the *Collectie Nederland* (Collection of the Netherlands) as the sum total of all objects in Dutch museums and public buildings. Ownership and management was divided

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[347] Van Dijken, et al, 2000. The difference made between the managing and care activities, artificially divided into various responsible entities, remains a hindrance for a holistic approach to collection management. Digital activities fall under management (as does registration of collections) yet digitization is a form of preservation, thus care activities. In the 2010s, efforts to harmonize management and preservation were headed by NCDD and DEN (http://www.ncdd.nl; http://www.den.nl/pagina/217/de-basis-voor-digitale-duurzaamheid/).

[348] By 2010, the Ministry consisted of four cross-sectoral departments (Secretary General, Primary and Secondary Education, Higher-Vocational Education and Science, and Culture and Media Departments), three state services (National Service for Cultural Heritage, ICN Netherlands Institute for Cultural Heritage), two agencies (State Archives Department, and DUO Service for the Implementation of Education), two inspectorates (for Education and for Cultural Heritage) and three associated advisory councils (for Education, for Cultural Heritage and for Science and Technology). In addition, the Knowledge Chamber was founded in June 2006. From the Ministry of Education, Culture and Science the Secretary General and the Directors General are member of the Knowledge Chamber. The Knowledge Chamber consists of: The Education Council of the Netherlands (*Onderwijsraad*), The Advisory Council for Science and Technology Policy (AWT) (*Adviesraad voor het Wetenschaps- en Technologiebeleid*), The Council for Culture (*de Raad voor Cultuur*), The Scientific Council for Government Policy (WRR) (*Wetenschappelijke Raad voor het Regeringsbeleid*), The Netherlands Bureau for Economic Policy Analysis (CPB) (*Centraal Planbureau*), The Social and Cultural Planning Office of the Netherlands (SCP) (*Sociaal en Culturel Planbureau*), The Netherlands Organisation for Scientific Research (NWO) (*Nederlandse Organisatie voor Wetenschappelijk Onderzoek*), SenterNovem (agency of the Ministry of Economic Affairs), Consultative Committee of Sector Councils for research and development (COS) (*Centrum voor Onderzoek en Statistiek*) and The Inspectorate of Education in the Netherlands (http://www.government.nl/ministries/ocw#ref-minocw).

[349] http://nl.wikipedia.org/wiki/Instituut_Collectie_Nederland.

amongst various ministries and private foundations. However, the actual nature and size of the collection was unclear. For that, a research of collections was conducted in 1996 identifying collections, their value and the responsible ministry.[350]

Subsidy was extended to organizations managing non-national collections.[351] The Delta Plan actually extended until 2000 through financing distributed by the Mondriaan Foundation to support registration and conservation projects (see the following section 4.9.1 on the Mondriaan Foundation).

The *Raad voor Cultuur* (Netherlands Council for Culture) was established in 1995 to give independent, non-binding advice, requested or not, to the Ministry of Culture. The Council included sectors and committees that work on museums, heritage and e-culture.[352]

In 1999 the *Landelijke Contact Museumconsulenten* (LCM - Netherlands Museum Advisory Foundation), developed a *Museum Register* in response to the increased awareness of registration and policy plans as the key for improvement of museum practice. The register aimed to improve the quality of museums in the Netherlands. Museums could voluntarily request an audit of performance in nine basic requirements (renewable every five years). These requirements were: museums must have (1) an institutional basis; (2) a policy; (3) a collection; (4) a collections

[350] National collections (that satisfy criteria A, B and C) include: the Ministry of Internal Affairs was responsible for the National Fire Department museum in Hellevoetsluis, and together with Justice were responsible for the Police Museum in Apeldoorn. The Ministry of Finances was responsible for the Coin Museum (then Money Museum in Utrecht), the Tax Museum and the Gambling Museum (managed by the National Lottery). The Ministry of Defense was responsible for all the Military Museums, the Marine museums in Den Helder, the Marines Museum, the Military Aviation Museum in Soesterberg, the Bronbeek Museum in Arnhem and the Gendarmerie Museum in Arnhem. The Ministry of Agriculture, Nature and Fishing was responsible for the Groenveld Castel in Baarn. The Ministry of Transport was responsible for the Post, Telegraph and Telephone Museum in The Hague. The Ministry of Economic Affairs was responsible for the Meteorology Museum in Delft. The Ministry of Foreign Affairs was responsible for the Tropenmuseum Ethnographic Museum in Amsterdam and the International Soil Reference Museum in Wageningen. The Ministry of Health and Sport was responsible for the Moluks Historic Museum in Utrecht, the Resistance Museum in Amsterdam and the National War and Resistance Museum in Overloon. The Ministry of Housing, Spatial Planning and the Environment was partially responsible for the Dutch Architecture Institute NAi in Rotterdam. The Ministry of Education, Culture and Science General Cultural Affairs was responsible for the Dutch Railway Museum, the Department of Cultural Heritage was responsible for the Huis Doorn, the Department of Arts was responsible for the Dutch Architecture Institute NAi in Rotterdam, the Theater Institute in Amsterdam, the Puppet play Museum in The Hague, and the Dutch Filmmuseum in Amsterdam, the Department of Media, Letters and Libraries was responsible for the Dutch Literature Museum and Documentation Center in The Hague, the Dutch Newspaper Museum in Amsterdam, and the Dutch Broadcasting Museum in Hilversum. Museums that received almost 100% subsidy from OCW but lacked national collections include the Museum Het Princessehof in Leeuwarden, the Teylers Museum in Haarlem, the Jewish Historic Museum in Amsterdam and the Afrikamuseum in Berg en Dal (OCW, 1997:6-12).

[351] Van Dijken, 2000.

[352] http://www.cultuur.nl.

registration plan; (5) a collection preservation plan; (6) access to research into the collections; (7) basic provisions for the public; (8) qualified workers; and (9) a stable financial basis. The results helped museums to develop project plans to improve the deficiencies found.[353] An evaluation in 2008 led to a new *Museum Register* that includes a short version of a self-assessment test to be performed every year (starting in 2012), an audit to be performed every five years by staff of the Register and updated test criteria to allow new museum forms. Since 1997, over 563 museums have requested an audit of which 415 have become officially registered museums.[354]

State Secretary of Culture Van der Ploeg presented the policy report *Cultuur als Confrontatie* (Culture as Confrontation) in 1999, where entrepreneurship of heritage institutions became a priority and a means to further other goals (including cultural diversity), at the national and institutional levels.[355]

Museums were called on to increase the visibility of their collections. On average, it was estimated that museums received about €11 in subsidies per visitor, and even though museum visitor numbers had increased, much needed to be done to reap profit from such an investment. The value system for collections (A, B, C and D implemented during the Delta Plan) was not considered useful for increasing the movement of collections, itself a measure to increase access. The Minister of Culture consulted with the *Raad voor Cultuur* about concrete possibilities.[356] Digitization was accepted as a crucial concrete solution, with DEN leading the way.

By 2000, the government had given the autonomous national museums €40 million for the registration and conservation backlog through the Delta Plan program. Museums received an additional €58 million for the improvement of building and climate control facilities for the collections. The goal of the plan changed over time from "eradicating backlog" to achieving "workable inventories," the last however never having been clearly defined.[357]

Government funding has had a direct impact on the process (quality and quantity of output) of the national efforts for digitization of heritage. This is reflected in the Ministry of Culture's publication *Alles uit de Kast* (Pulling out all the Stops) published in 1998, in which three possible financing scenarios and potential outcomes

[353] SNM, 2013; http://www.museumconsulenten.nl.
[354] SNM, 2008; https://www.museumregisternederland.nl/.
[355] Van der Ploeg, 1999.
[356] Van der Ploeg, 1999:54-55, 77.
[357] Tweede Kamer, vergaderjaar 2000-2001, 27 470, nrs. 1-2:14 (*Report Museale collecties van het rijk*).

were sketched: (1) a government subsidy of *f*50 million (€22.5 million) would reach a minimum digitization level; (2) a government subsidy of *f*100 million (€45 million) would reach a limited level of digitization but would support the unification of a national infrastructure; (3) a government subsidy of *f*150 million (€68 million) would allow the development of a comprehensive infrastructure of digitized material, with the limited creation of educative products yet sufficient establishment of necessary support institutions.[358] The report was clearly written and projections were carefully estimated yet little was done with it.

4.7 Policies for the new millennium

In 1994, the Netherlands started an e-government program with a National Action Program Electronic Superhighway (*Nationaal Actieplan Elektronische Snelwegen*), one of the first in Europe. The influence of ICT on the job market was clear: in 1994 more than 60% of the work force was involved with information. The information workers assisted in the "drastic lowering of costs" related to information management in many industries.[359]

In 1998, this was followed by the *Actieplan Elektronische Overheid* (Action Program Electronic Government) and, in 1999, the policy report *De Digitale Delta – Nederland oNLine*.[360] The policy document was a collaboration of six ministries: Economic Affairs; Large Cities and Integration Policy; Justice; Transit and Water Management; Education, Culture and Science; and Finance.[361]

Five areas, called *columns*, were identified for government support: the telecommunications infrastructure; knowledge and innovation; access and skills; regulations; and the adoption of ICT in the public sector. The government made available €32 million for the development of the electronic superhighway and in addition invested in various R&D programs. The government no longer considered it necessary to subsidize the adoption of computers or the setup of ICT in the organizations. For one identified area, access and skills, the cabinet made available

[358] Alles Uit de Kast (1998) (pp.63-64).
[359] Jorritsma-Lebbink, 1999:6; via the Internet Archive, snapshot on 14 April 2013 at http://e-overheid.nl/onderwerpen/e-overheid/geschiedenis.
[360] Jorritsma-Lebbink, 1999:6; http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2005/12/22/de-digitale-delta-nederland-online.html .
[361] Jorritsma-Lebbink, 1999. The Minister of Large Cities and Integration Policy was a minister without portfolio, meaning it was a voting minister not heading any Ministry. The Ministry of Transit and Water Management is now part of the Ministry of Infrastructure and the Environment.

€1.82 million exclusively for pilot projects in the area of cultural and scientific heritage, to be coordinated by the newly formed DEN Foundation (see section 9.4.2 below). This became the start of a policy that would prioritize digital access to cultural heritage. This was in line with the fact that all over Europe, national digital infrastructures were being formed in the first decade of the 2000s.

The Digital Delta policy document fundamentally changed the financing scheme for the digitization of collections. It was no longer only a matter of preservation of culture headed by the Ministry of Culture but a national effort to shape a Dutch information society.[362]

A 2002 letter from the Secretary of Culture Van de Ploeg about a new strategy to support digitization of heritage, known as the *Digitaliseringsbrief* (Digitization Letter) described in detail the digitization policy sketched in the policy document *eCultuur in Beeld* (e-Culture in View).[363] An argument was made for effective digitization: "constantly introducing new sources to the electronic domain and, even more importantly, creating flexible systems to ensure that they can be used – unrestricted by space, time or context – for research, for developing interactive teaching applications, for decision making, for developing creative activities and transferring knowledge on every cognitive level." The government was to create the conditions to support effective digitization.[364] The letter used the findings from the 1998 report *Alles uit de Kast* to build its case: institutions lacked the capacity and knowledge to digitize properly, the user often could not find the searched items, and digitization was used only for administration rather than for the advancement of culture.

Van de Ploeg further argued that effective digitization "allows public knowledge and capacity to be harnessed and used to the full. The added value of electronically accessible heritage information lies in the scope it creates to link new information." He criticized institutions for building *monolithic systems* and *independent projects* and called for using digitization beyond a means of cataloguing and managing collections. Solutions focused on sustainability, integration of digitization into information management, appropriate use of procedures and standards (to achieve transparency, sustainability and relevance) and a supportive

[362]Jorritsma-Lebbink, 1999.
[363]The eCulture Policy Document was sent on 22 April 2002 (Reference MLB/M/2002/14.192) while the Digitization Letter was sent on 27 May 2002 (Reference DCE/02/18765).
[364] Van de Ploeg, 2002:2.

policy.[365] In short, *good* digitization meant making accessible heritage materials for use and reuse (added value was to be gained by linking content) in turn reflected by an increase in use.

The letter further proposed six policy changes: (1) establishment of a coordinating center for the digitization of heritage, dramatically changing the role of DEN into an independent coordinating center "responsible for collecting, establishing, disseminating and applying instruments, reference models, procedures and national and international standards with the aim of improving the quality, compatibility and interoperability of heritage digitization projects [by] conducting research, evaluating processes and guiding experiments and projects": (2) Establishment of clear government frameworks via grant criteria; (3) Improvement of management of digitization projects, including structural funding to achieve higher quality; (4) Revision of copyright, central to knowledge exchange through new forms of use and frequent reuse of content; (5) Working together with international initiatives, including the MINERVA European group responsible for comparing heritage digitization policies and programs as well as for sharing good practice principles; and (6) investment in research and technology, particularly in multidisciplinary research into the integration of new technology to improve access to cultural heritage.[366] This last policy direction would lead to the ICES-KIS and CATCH projects (see section 4.7 on public private initiatives below).

This was a unique policy document because it proposed a change without allocating funds. Funding for digital heritage activities was later approved with €1 million in 2004, raised to €2 million in 2005, raised again to €4 million in 2006 and ultimately raised to €8 million in 2007 and 2008.[367] Financing digital activities with such amounts, backed up with a decisive strategy was unprecedented. After 2008, funds were reallocated to other activities.

Following the *Digitaliseringsbrief*, the Ministries of Finance and Culture commissioned an inventory of the state of ICT in museums in 2002 and the Dutch

[365] Van de Ploeg, 2002:2-5.
[366] Van de Ploeg, 2002:5-9. The Ministry of Culture, supported by DEN, KB and NA, launched a website to present the digitization of cultural heritage in the Netherlands at http://www.cultuurtechnologie.net. Over 56 initiatives were identified with 27 benchmarked initiatives. All text was in English. ARIA, the web-based project of the Rijksmuseum, was presented as an example of successful production. The extent to which the published best practice and benchmarking was used by Dutch institutions is unclear. The site is currently only accessible via the web.archive.org.
[367] OCW internal document entitled *Expenditure for digitization 2004-2008*, 14 October 2004.

position in the international field from PWC Consulting.[368] Results from 160 museums (of the 399 surveys received) resulted in a baseline for ICT use in museums. There were three main results. First, Dutch museums were good but unstable: Netherlands ranked third in ICT innovation, after Sweden and the UK, but subsidies lacked a policy framework (at national and institutional level) resulting in ad hoc subsidies and technology implementation. Second, the ICT infrastructure was existent but lacking in vision: if well-coordinated, all the digital elements could serve to build and add on to a digital information foundation. Noticeable was the role of volunteers, highlighting the missing structural staff required to build a (national) knowledge infrastructure. Third, there was a clear digital divide: larger museums had a digital policy, had concern for sustainability (i.e. ensured migration of data), profited from national grants and subsidies, had ICT support from other institutions, and used standards more often than smaller museums.[369]

Museums reported allocating less than 9% of their annual budgets to ICT (including hardware, software, staff, schooling and outsourcing), mostly from ongoing budgets. Regarding the source of income, tickets sales were the most reported form of income yet subsidies represented the largest amount of income (47% of total budget). More than half of the respondents managed a collection smaller than 10,000 objects and most museums (90%) had the collections registered, though only 65% used digital registration. Furthermore, the report concluded that the Ministry could support a nationally coordinated policy, providing structural earmarked subsidies towards ICT (with strict conditions), with the support of institutions to give out funds, to set clear guidelines, and to coordinate the field to contribute to the building of a knowledge infrastructure.[370] These ideas would be found in the later subsidy scheme *Digitaliseren met beleid* (see section below).

A study that would have much impact was the 2002 report published by the Wetenschappelijk en Technische Raad (WTR - Technical and Scientific Council) entitled *Inventarisatie Infrastructuur Digitaal Erfgoed, een onderzoek naar visies,*

[368] In 2000, the same inventory on the use of ICT at international comparison was performed in other sectors, including the tax services, the health system, the bank sector and the distribution and transport services. The 2002 inventory involved the agro chain, the construction sector, education and museums (EZ, 2003:3).
[369] The advisory commission for this research project was made up of members of the two ministries, the Dutch Museum Association (NMV) and its information management section (SIMIN), the Netherlands Advisory Foundation (LCM), the DEN Foundation and representatives of the two larger software distributors (Adlib Information System and C-it) (PWC, 2002:4-10).
[370] PWC, 2002:64-65,80-104.

belemmeringen en oplossingen (Inventory of the Digital Heritage Infrastructure, a study of the visions, barriers and solutions). The main findings were that the heritage field lacked a long-term vision regarding ICT ("people were solving past problems with new technologies"), that digitization was thought of as *getting everything online* (the push model, ignoring participation from users), that government funding lacked a coherent plan (project subsidies did not build on existing knowledge), that criteria for grants needed to include innovation but also the construction of a solid base (digital infrastructure requires continuity), that digitization, contextualization and management of digital materials required clear separation (the activities were generally paired while financing was not), that digitization was focused on administration (instead of building a knowledge infrastructure) and that a mentality change was required to fully embrace and profit from the potentials that the digital medium had to offer.[371]

The report identified the digital infrastructure as a key element: the public expected access to, and interoperability, validity, high quality and transparency of information sources; heritage collections had to be digitized and be made available through the necessary applications to ensure their access, use and reuse. The realization of these two factors, the expectations of the public and the need to digitize, were deemed necessary to enable the construction of a knowledge infrastructure supported by cultural heritage. Failing to properly digitize (ensuring findability of digitized materials), warned the report, would later result in a substantial economic loss.[372]

The report argued that documenting and giving sustainable access to knowledge was not only the responsibility of the heritage institutions but that it needed to take place in a seamless aggregation made by experts from heritage institutions and from the academic world.[373]

The document made reference to a cost estimation for digitization of collections made by the KB: the actual digitization took up 30% of costs; the remaining 70% involved creating metadata (25%); giving access to the materials (30%); and data management (15%). For projects involving more than 2,000 objects,

[371]Velthuis and Bruinsma, 2002:v-vi.
[372]Findability in this case is fundamentally different in a library, where knowledge transfer takes place after the user reads the borrowed book, than in the museum, where the public accesses only the information about the object. Museums require a more comprehensive collections information system to support actual knowledge transfer (Velthuis and Bruinsma, 2002:11,16).
[373]Velthuis and Bruinsma, 2002:21.

labour costs would be substantial to organize all the handling of the objects. Certainly, the costs were more specifically dependent on the number of objects, type of material, physical state, measurements, desired format, resolution, quality, completeness, finishing, equipment, and so on.[374] Estimating digitization costs of museum objects would fundamentally differ from library objects in that museum objects required manual documentation and contextualization.

Also in 2002, the *Wetenschappelijke Raad voor het Regeringsbeleid* (WRR - Scientific Advisory Council for Government Policy), published a report entitled *Internet en cultuurbeleid* (Internet and Cultural Policy) on the consequences of ICT for cultural policy. The report identified three key changes in the market: first, the Internet would enable new forms of production, distribution and consumption, forming a *prosumer* (a producer who is also consumer and vice versa); second, the costs of storage, reproduction and distribution would decrease while quality of product would increase, parallel to the development of a culture of sharing; and third, digitization and the internet would serve to increase values such as freedom, development and pluralism, but also allow the forming of monopolies and an economic perspective (cultural commercialization).[375] The impact of this report is not documented.

By the end of 2002, it was clear that the Netherlands was at a turning point. This was particularly clear in the international context when the EU Dutch representative group reported that, as agreed to by the EU Member States, all activities conducted after one year of adopting the so-called Lund principles had been reached, "with special emphasis on cultural and scientific resources and on the contribution of public cultural institutions" (see section 5.3). Policies, programs and projects were published online (www.cultuurtechnologies.net).[376] Benchmarking was supported by a web-tool that collected and published project information (all in English, for an international audience). Projects inventoried included the *Cultuurwijzer* (Web Guide to Culture), coordinated by DEN and fully funded by the government. Lacking formal criteria for evaluating competence centers for the

[374] Velthuis and Bruinsma, 2002:48.
[375] WRR, 2002:21,47-50.
[376] The website is unfortunately no longer available.

digitization of museums, advisory centers were listed, including DEN, the RKD and ICN.[377]

For the period 2001-2004, the Ministry of Culture made €90 million available over a 4-year period to develop a Digital Delta Plan (*Digitaal Deltaplan*). The Ministry also provided €13.6 million for eCulture, in response to the council's policy report.[378]

The eCulture policy report published by the Council for Culture in 2003 defined digitization as "the ongoing integration of information and communication technology into society," which in turn allowed heritage institutions to reassess their work methods and roles. Applied to heritage, digitization (or eCulture) integrated "ICT into the primary processes of production, distribution, presentation, preservation and (re)utilization of cultural expression." Three aspects of eCulture were identified for government support and stimulation: digitization of information, cultural innovation (for new products and services) and organizational change (for new roles and functions, resulting from organizational convergence and including heritage institutions fulfilling an intermediary role in a larger digital network). Expertise and cooperation were key. This report responded to the national ICT agenda, which was the responsibility of the Ministry of Culture, the Ministry of Internal Affairs and the Ministry of Economic Affairs.[379]

In 2005, the *Cultuurwijzer* was transferred to ICN, and continued to be a showcase project to give online access to digital heritage with a budget of €200,000 per year for the period 2004 to 2008.[380] *Geheugen van Nederland* (Memory of the Netherlands) was a similar project, providing access to collections across heritage sectors and supporting digitization of materials. The project received €6.8 million in the first phase (prior to 2004) and in the second phase it had a budget of €0.5 million in 2005 to €2 million in 2007.[381,382] Both projects supported digitization with continuity, started in the 2001-2004 Cultural Policy plan and the National Action Program Electronic Highway, and together supported the formation of the national knowledge infrastructure.

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[377] Snyders, 2002:1,3-5.
[378] OCW, 2004b:55.
[379] OCW, 2004b:9,12.
[380] See chapter 2, section 2.5
[381] See section 4.9.3
[382] OCW internal document Expenditure for digitization 2004-2008, 14 October 2004.

Giving continuity to projects, through continuous funding, did not always yield immediate results. In 2005, the Ministry of Culture commissioned a study on the use of the Art and Architecture Thesaurus (AAT) to explore the best approach to finance the development and maintenance of the translation (AAT-Ned). The RKD was financed by the Ministry of Culture to carry out the project and results suggested long term benefits from continuing the efforts; however, institutions voiced an interest in adopting the thesaurus yet there was no desire to share the costs. Benefits were not immediate since gain was expected over time as more institutions adopted the national standard and made their collections available online improving exchange of objects (and data) among institutions. In 2005, only 32% of respondents used AAT, 68% used their own classification system.[383]

In 2006, the Ministry of Culture launched a subsidy for digitization designed for heritage institutions to increase access and use of content by professionalizing the digital work process. The subsidy was meant to support integration of digitization in the work processes, in policy and in the institutions. Grantees were required to connect to the national infrastructure (the "Digital Collection Netherlands") by linking content to the *Geheugen vam Nederland* (cost were partially covered by the subsidy), and to use the standards and procedures found at DEN's ICT Register. The plan was called *Digitaliseren met Beleid* (Policy-based Digitization). Institutions were able to request financing to write an information plan, for the implementation of a digitization project and for digitizing collections to catch up with the digital backlog of collections registration that was required to implement the subsidized project. From 2006 to 2008, a total of €8,750,000 was made available for the plan (€3,750,000 for developing information plans and €5,000,000 for digitization projects). In general, the Mondriaan Foundation managed the funds made available by the Ministry of Culture but this time Senternovem was the institution to manage the *Digitaliseren met Beleid* grant distribution. Senternovem was part of the Ministry of Economic Affairs and was responsible for financing innovation, the environment and energy related projects.[384]

[383] Van der Graaf, 2005:26-27.
[384] Regulation from 9 March 2006, nr. DCE/06/9313 (*Staatscourant*, Jr. 2006, No. 60); Regulation from May 1st, 2007, nr. DCE/07/18332 (*Staatscourant*, Jr. 2007, Nr. 92); Regulation from 17 January 2008, nr. DCE/08/1089 (*Staatscourant*, Jr. 2008, Nr. 25).

Table 4.5 List of digital funding sources on DEN's website

National programs supported by the Ministry of Culture	Innovation Cultural Expression Mondriaan Foundation (from 1994 to 2012, for 40% of project costs) Metamorfoze (1997-present) NWO (Science4arts and investing subsidy) PRIMA (€20 million per year for projects) Stimulation Fund for Architecture (from 1993 with a budget of €4.7 million in 2011) Game fund (from 2008 to 2011 with a €300,000 budget in 2011 for the development of artistic games)
Provincial and local subsidy programs	Fund for Cultural Participation Dutch Bank Cultural Foundation Fund 1818 Promotion of Empowerment Foundation Foundation Elise Mathilde Other provincial programs
Private funds	Bank Giro Lottery Prince Bernhard Fund VSB Fund SNS Reaal Fund Foundation ANWB Fund Small private funds
European subsidy programs	CIP-ICT PS Program Culture Program 2007-2013 Media Program 2007-2013 Regio / EFRO / INTERREG 7th framework for research 2007-2013 Common Heritage International Visitors Program

Source: http://www.den.nl/docs/20070530143455/ (version 20 April 2012).

Digitaliseren met Beleid was a successful policy instrument because it financed digital production with a set of requirements to ensure the use of standards in production, ensuring each funded project contributed to the national digital infrastructure. The instrument also changed work practice as institutions reporting having an information policy rose from 6% in 2007 to 55% in 2012.[385] DEN was instrumental in the process as adviser on the use of best practice, including the creation of information policy documents and pointers to subsidy programs (table 4.5). This grant scheme was unprecedented. No other grant program had the comparable funds available to support digital production or reached the structural impact across institutions.

In 2009, a new grant program was available for the "innovation of cultural expression" (*Subsidieregeling Innovatie Cultuuruitingen*). Museums were eligible for a grant to implement collaborative activities that would increase the value of cultural

[385] In 2007, 24% of museums reported having a policy document including a section on information while only 6% of museums reported having specifically an information policy plan (NMV and DEN, 2007:13). In 2012, 55% of museums reported having a digitization strategy (ENUMERATE data set).

expression (for as much as 90% of total costs for up to €100,000). A total of €3 million were made available each year. This fund would not cover basic digitization costs (or digital registration and photographing of collections). The first year, 6 projects (from 96 applications) received a grant.[386]

A one-off subsidy was given to the project *Beelden voor de Toekomst* (Images for the Future), a project to preserve a large national audiovisual collection (film, video, photography and audio) housed in three heritage institutes: *Nederlands Instituut voor Beeld en Geluid* (NIBG - Netherlands Institute for Sound and Vision) in Hilversum, the *Filmmuseum* in Amsterdam, and the *National Archives* in The Hague. The project was started on 1 July 2007, with a budget of €154 million for seven years. The goal of the project was to preserve more than 700,000 hours of heritage materials through digitization, comprised of 137,200 hours of video, 22,510 hours of film, and 123,900 hours of audio, in addition to 2.9 million photos. Images for the Future responded to the obvious emergency of material decay being identified in these collections. An indirect and broader goal of the project was to contribute to the realization of the Lisbon goals (see chapter 5, section 5.3 Initiatives of the European Commission for digitization) as well as to strengthen the creative industries in the Netherlands and to stimulate new broadband services, multimedia literacy and awareness of historic cultural heritage.[387]

It received a large subsidy directly from the natural gas rebate channeled through the *Fonds Economische Structuurversterking* (FES - Fund for Economic Structure). The application process required a plan on how the resulting product would strengthen the Dutch economic structure.[388] A cost benefit analysis conducted by SEO (*Stichting Economisch Onderzoek*) reported a benefit of €176 million (which represented between a €20-€60 million cost-benefit balance), in addition to social benefits for the restoration, conservation and digitization of the collections that were not quantifiable. In other words, there was an expected €20-€60 million gain to be *paid back* to the Ministry of Finance (or discounted to the budget of the Ministry of Culture). Benefits were to be gained by an expected increase in demand due to improved access, and were expected to represent about €7 million cash flow to the

[386] Regulation starting 29 May 2009, Nr. WJZ/126668(8246) (*Staatscourant*, Jr. 2009, Nr. 110); Regulation starting 14 December 2009, Nr. WJZ/177107 (8271) (*Staatscourant*, Jr. 2009, Nr. 126); (http://wetten.overheid.nl/BWBR0025967/geldigheidsdatum_05-01-2010).
[387] TNO, 2010:6; http://www.beeldenvoordetoekomst.nl/en/project.html.
[388] Verheul, 2007.

participating partners (by customers paying to access materials) to be used for furthering preservation and access of collections.[389]

Direct effects were identified to include access to the audio-visual materials that may otherwise be lost without preservation measures, as well as consumer surplus brought by the value to access the materials (higher than expressed by price value). That is, the increased value brought to consumers was partially represented in the price paid to access materials but part of the gain was unaccountable in numbers, personal value was gained by being able to access the information. Indirect effects that were identified included a contribution to the labour market (€1.6 million), product diversity and an international competitiveness due to advancement of know-how. External effects were estimated from the conservation of culture and heritage for future generations, increase merit good by reinforcing cultural-historical awareness, increase multimedia literacy and a contribution to the Lisbon goal to support the knowledge economy (knowledge spill-over).[390]

It was the first time digital activities related to the conservation of collections were identified to contribute to the labor market and to generate additional income (by sales of digital materials). The report had an important impact on the future valuation of digital collections and digital activities. However, due to the economic downturn of the 2010s, no other large subsidy would be given to digitize collections. In fact, the funding of the project was eventually reduced to €115 million when it became clear that the expected pay-back would not be realized.[391]

Beelden voor de toekomst was not only a large digitization project but it also required the administration of author rights, the development of an infrastructure for the distribution of content, the development of standard search, the contextualization of the material to assist use (also in English), and the development of new services to optimize access and use.[392] One of those services used crowdsourcing to involve user participation for the identification of copyright free video material in a game called *Waisda?* (Dutch slang for *What is that?*). This serious game was funded by the EU Presto Prime project, based on game theory and launched in 2009. The video

[389] SEO, 2006.
[390] SEO, 2006:4-8,39.
[391] Brief aan de Tweede Kamer over de tussentijdse evaluatie van het project Beelden voor de Toekomst, Kamerstuk 30-11-2010 http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/kamerstukken/2010/11/30/brief-aan-de-tweede-kamer-over-de-tussentijdse-evaluatie-van-het-project-beelden-voor-de-toekomst/brieftk-tussentijdse-evaluatie-beelden-voor-de-toekomst.pdf.
[392] TNO, 2010:6.

annotation game served to identify fragments in a video to complement the professional annotations.[393]

Giving access to materials required publishing content with metadata. Besides crowdsourcing (or community tagging), automatic metadata using speech and image recognition, and web crawling were explored in collaboration with the University of Amsterdam, the University of Twente, the Utrecht University and the Amsterdam University VU.

By 2010, the project appeared to produce less income than expected and required more funds than planned (i.e. due to higher labor cost and an increase of international standards for storage). TNO performed an evaluation, commissioned by the government, to establish the *lessons learned*. Among the unexpected situations was the quality of metadata (which was worse than expected), and the difference in cataloguing used by the three institutions that resulted in a slower start.[394]

One important unexpected change in the market required a change in plan for the Images for the Future project. When started, little video material was available online and few consumers had broadband Internet at home. As access and content increased (e.g. in YouTube), the public got accustomed to free access. Charging for content was only possible for *extras*, including access to high-resolution video or in combination with other services (i.e. materials packaged for schools).[395] The question then became: should access to content be offered at a fee (i.e. for educational material) if it would be accessed much more often if made available for free?

In preparation for the 2013-2017 budget period, the Ministry of Culture further contemplated the issue of open data. Museum collections were (largely) owned by the government, their preservation and care was funded by taxes. Digitization was also often funded by taxes. Digital heritage was thus government information and as such should be part of the open data government policy.[396]

4.8 Public private initiatives

In the early 1990s, an interdepartmental commission of ministries launched an R&D grant scheme known as the *Interdepartementale Commissie Economische Structuurverstreking – werkgroep Kennisinfrastructuur* (ICES-KIS -

[393] Gligorov, 2012:141; Belice, Brinkerink and Oomen, 2010.
[394] TNO, 2010:25.
[395] TNO, 2010:55.
[396] Procee, 2012.

Interdepartmental Commission Economic Structure Improvement – group Knowledge Infrastructure).[397]

Projects were financed from the FES fund. "It was argued that an investment impulse was needed to create multidisciplinary networks of knowledge in order to address some of the complex future bottlenecks and challenges in Dutch society. To implement this strategy, a separate inter-ministerial task force (ICES/KIS) was formed with the mission to prepare the strategy for investment in creation, development, diffusion and implementation of knowledge in the Dutch economy." ICES/KIS was a tool for initiating and managing large multidisciplinary R&D projects, while "strengthening the knowledge infrastructure and improving the economy through public-private participation."[398]

The two first rounds of the grant scheme did not include any heritage institutions. A third round of ICES/KIS was initiated in 2000 with a budget of €805 million. 37 projects took place between 2004 and 2012. NWO acted as organizing and coordinating partner of the program. All projects were evaluated as being from sufficient to excellent.[399] This program was also known as the Digital Production Line (DPL). Projects were to involve collaboration between a heritage institution, an ICT research institution (a university) and a private firm. Together, they would integrate knowledge and collections, give access to heritage and ensure sustainable preservation of digital material.[400] One such project involved the collaboration between a heritage institution (Naturalis), two universities (Tilburg and Maastricht) and a private business (Trezorix B.V.). Together they explored automation of knowledge enrichment by classifying, analyzing and linking objects of the heritage collection.

Another consortium supported by ICES-KIS was MultimediaN, a program for the development of cutting edge projects with multimedia application with a budget of €32 million (of which €16 million were provided by the FES fund). One of their projects involved eCulture, aimed at improving the interaction with Dutch cultural heritage by interconnecting different kinds of information from different sources (using semantic web technology) to improve presentation and searching facilities.

[397] OECD, 2003:69.
[398] OECD, 2003:69.
[399] Verhagen, 2011b:1-3.
[400] DPL brochure, 2003.

Participants included DEN, ICN, the University of Amsterdam, the Amsterdam University VU, and the Center for Mathematics and Computer Science (CWI).[401]

Following up on the work of ICES/KIS, the Ministry of Culture funded a project to research and develop strategies for ICT and heritage content in 2004. The project was funded through NWO and was called CATCH, an abbreviation of Continuous Access to Cultural Heritage Program. The program ran from 2004 through 2010 and was made up of a series of projects, initially six and later extended to ten. The program made €6 million available for the collaboration between computer researchers and collection managers. CATCHPlus (2009-2011) took as a starting point the output from CATCH to create prototypes for broader application and had a total funding of €3.1 million.[402] From the NWO website, table 4.6 below presents an overview of projects.

The Dutch government established five measures to support ICT and research. First, the Digital Entrepreneur Court, to assist government administration for private business, and the Cloud Computing, to facilitate online services, were launched. Apps for Netherland received €12,000 to stimulate market applications of datasets (a project of the Ministry of Internal Affairs, the Ministry of Education, Culture and Science, and the Ministry of Economic Affairs, Agriculture and Innovation in collaboration with de Waag Society). *Digitale Vaardigheden Beroepsbevolking* (Second, Digital Skills for Work) was established to increase e-skills, and the ICT research infrastructure was supported with a budget of €7 million in 2012 to upgrade the Huygens super computer and to set up a High Performance Datacenter (both available for the public sector). Third, positioning the Netherlands as Digital Gateway to Europe. Fourth, TNO was to reserve €6.2 million for applied ICT research, for projects supporting the Digital Agenda. Last, the research program COMMIT was launched.[403]

[401] ICES/KIS, 2008.
[402] NWO, 2013:8.
[403] Verhagen, 2011.

Table 4.6 CATCH and CATCH Plus project overview (2004-2012)

CATCH projects		CATCH Plus projects
Acronym and goal	**Participating institutions**	**Acronym and goal**
CHIP Cultural Heritage Information Personalization.	Rijksmuseum, the Technische Universiteit Eindhoven and the Telematica Instituut. www.nwo.nl/catch/chip The follow up had the Amsterdam University VU and the Amsterdam Museum as participating institutions.	CHIP Plus User Profile Repository and Art Recommender.
CHOICE Charting the Information Landscape Employing Context Information.	Netherlands Institute for Sound and Vision, the Telematica Institute, Max Planck Institute and the Amsterdam University VU. www.nwo.nl/catch/choice	MULTIPLY to develop a search and browse support system for professionals.
CHORAL Access to Oral History.	University of Twente, the Municipal Archives Rotterdam, the Erasmus University Rotterdam and Radio Rijnmond. www.nwo.nl/catch/choral	Speech recognition to develop a tool to index spoken text.
MITCH Mining for Information in Text from the Cultural Heritage.	National Museum of Natural History and Tilburg University. www.nwo.nl/catch/mitch	CHECKERS made possible to store relevant information from unstructured text.
MuNCH MultimediaN and CATCH.	University of Amsterdam, the Amsterdam University VU, the Netherlands Institute for Sound and Vision and the association Digitaal Erfgoed. Nederland www.nwo.nl/catch/munch	NA
MuSEUM Multiple Collection Searching Using Metadata is a project	University of Amsterdam, the Gemeentemuseum Den Haag, the Rijksbureau voor Kunsthistorische Documentatie and the Municipal Archives Rotterdam. www.nwo.nl/catch/museum	MuSeUMPlus launched the search engine MuS and Gemeen.
RICH Reading Images in the Cultural Heritage	Rijksdienst voor het Oudheidkundig Bodemonderzoek and the Universiteit Maastricht. www.nwo.nl/catch/rich	NA
SCRATCH Script Analysis Tools for Cultural Heritage	Nationaal Archief and the University of Groningen. www.nwo.nl/catch/scratch	SCHRATCH4all developed a search engine for hand written texts.
STITCH Semantic Interoperability to Access Cultural Heritage	National Library of the Netherlands, the Vrije Universiteit Amsterdam and the Max Planck Institute. www.nwo.nl/catch/stitch	STITCHPlus linked thesauri and semantic classification systems.
WITCHCRAFT What is Topical in Cultural Heritage: Content-based Retrieval Among Folkloric Tunes	Utrecht University, the Meertens Instituut and the Theater Instituut Nederland. www.nwo.nl/catch/witchcraft	WITCHCraftPlus develops a web search engine for melodies.

COMMIT, a project funded by the Ministry of Economic Affairs, Agriculture and Innovation with a budget of €50 million, was a collaborative cross-sector ICT research program. Participating knowledge institutes, companies and non-profit organizations contributed €60 million to the project. The goal of the initiative was to strengthen "the Dutch open ICT innovation system by establishing best-practice in public-private, high-technology and high-science research projects aiming for Dutch leadership in selected markets and societal applications." COMMIT was part of a national effort to stimulate research and development of new products, services and processes using ICT to fuel economic growth. 15 research projects were funded by

COMMIT, three of which involved a heritage institution (table 4.7).[404] Expected deliverables include several journal and conference papers, products, user studies, dissertations, and other results.

Table 4.7 COMMIT project overview (2013)

Project	Participating institutions
Socially-enriched access to linked cultural media	Rijksmuseum Amsterdam, Erfgoed Delft, Europeana Auxilium, Collections Information Technology (C-it), KB, Delft University, University of Amsterdam, Amsterdam University VU, CWI, NIBG, GridLine, Video Dock, Eurovision Technologies.
From data to semantics for scientific data publishers	DANS, Elsevier, Phillips Research.
Information retrieval for information services	NIBG, University of Amsterdam, Tilburg University, Erasmus University Rotterdam, CWI, University of Twente, Nationale Politie, Tralking Trends, Teezir, Textkernel, TrendLight, WCC Smart Search & Match, Gelderland South Policy, General Dutch Press (ANP), Eurovision Technologies.

Source: http://commit-nl.nl/projects.

In addition to the action agenda established for ICT, the Dutch government identified nine top sectors of innovation in 2012, including the Creative Industries. Funded projects are required to perform research and to ensure valorization of the output (i.e. by proving social benefit or by positioning products in the marketplace).[405]

4.9 Instruments of the Ministry of Culture

The Ministry of Culture has adopted an arm's length strategy to coordinate digital heritage and museum activities. Various instruments have been established since the mid 1990s to institutionalize digitization of heritage materials. Examples of these instruments are the Mondriaan Foundation, established in 1994, the DEN Foundation, formed in 1997, and the *Koninklijke Bibliotheek* (KB), with a paper preservation program started in 1999.

4.9.1 The Mondriaan Foundation

The Mondriaan Foundation was formed in 1994 to advance the quality of museum activities through incidental subsidies and consultancy. Though the Delta Plan was projected to end by 1996, Minister of Culture Nuis allocated extra funds to

[404] http://www.commit-nl.nl/. The Dutch economy grew by 60% between 1985 and 2005 as result of the growth of ICT (Verhagen, 2011).
[405] http://www.rijksoverheid.nl/onderwerpen/ondernemersklimaat-en-innovatie/investeren-in-topsectoren.

serve as a bridge budget, totaling somewhat less than €1 million. These funds were channeled via the Mondriaan Foundation. The Mondriaan Foundation was to continue supporting the Delta Plan until 2000 with a budget of €2.63 million per year, and gradually diminishing funds in the period between 1997 and until 1999. The Mondriaan Foundation further funded an evaluation of the Delta Plan in 1996.[406]

Table 4.8 Mondriaan Foundation grants towards digital activities

Year	% of total grant amount allocated to digitization	# grants allocated	Name of digitization related grant scheme	% of amount allocated to digitization under special digitization grant
1994	10	3		
1995	1	7		
1996	0.5	2		
1997	0.5	3		
1998	13	9		
1999	2.3	23	(part of access to collections using ICT initiative)	1.7
2000	7.3	24	Digitization and Cultural Access	3
2001	40	22	eCulture	33
2002	26.4	4 12	(not part of digital initiative) New media Temporary investment New Media Digitization	- 3.4 8.7 4.2
2003	19.6	9 12	Projects Art New Media Temporary New Media Digitization Public Access	5 2 0 3
2004	13.3	 15 2	(General grants) Digitization Institutional grants	 4
2005	2.4	 9	(General grants) Digitization	 2.4
2006	15.2	7	(e-Culture)	
2007	2.5		Digital public activities Interdisciplinary e-Culture	- 2.1
2008	12			

Source: Mondriaan yearly reports 1994 through 2008.

Digitization subsidies from the Mondriaan Foundation can serve to map developments in the national policy towards digitization. Table 4.8 shows the Mondriaan Foundation's funding programs that directly or indirectly have supported digital activities.

Initially, only a limited proportion of the Mondrian Foundation's funding went to digitization projects. Towards 1999, Short-term projects with an *experimental*

[406] Mondriaan, 1994; Mondriaan, 1995; Mondriaan, 1996.

character were favored for funding, covering a larger number of smaller projects. These were evaluated and results influenced funding in future years.[407]

In 2000, a new grant was formulated for digitization and cultural access, allocating almost €455,000 mostly towards website related projects. Funds were allocated for projects related to the digitization of collections that were not part of the main digitization and cultural access subsidies, covering selection, photographing, registration, inventory, migration, and publication. Among the honored projects were the management of the photo collection of the Leiden University, the digital presentation of the top 250 objects at the *Nationale Museum van Oudheden* in Leiden, and the digital publication of the *Atlas of Mutual Heritage*.[408]

In 2001, over 33% of grants were part of the eCulture program, with funding for hardware and software, research and development, for the *Centrum voor Beeldcultuur* (Center for Image Culture) and for digitization of (mostly) online projects (e.g. virtual exhibit, online archive, website development). The amount allocated towards digital activities represented almost half of the total grants given. [409] This was the highest percentage of total grants ever allocated to digital activities by the Mondriaan Foundation.

After 2001, however, the funding for digital activities declined again. In 2002, the Ministry changed its policy. The Mondriaan Foundation allocated a total of €15,186,251 in project grants, of which €5,760,000 were earmarked specifically for eCulture. Digital activities represented 26.45% of total grants given. In 2005, funding was dramatically reduced, with digital activities receiving only 2.4% of total grants allocated.

The grants given by the Mondriaan Foundation made it possible to join in the digitization of collections as well as to explore and experiment with new technologies, sometimes leading to projects with a national impact. The Mondriaan granting scheme had a very low threshold for digitization, as it did not require the use of best practices or the consideration of sustainability measures when allocating resources. The impact or longevity of funded projects has, however, not yet been evaluated.

The Mondriaan Foundation's funding policy had three main outcomes. Firstly, supporting small research and development projects provided innovative solutions to

[407] Yearly report Mondriaan Foundation 1999; NMV, 1999.
[408] Yearly report Mondriaan Foundation 2000.
[409] Yearly report Mondriaan Foundation 2001.

an evolving field, such as the use of computers for the various areas of museum work (e.g. registration, presentation). Secondly, funding digital activities resulted in small products that slowly got incorporated into all areas of the museum work, including infrastructural changes (e.g. adoption of a new information system, digitization of a collection segment). The process to fully adopt a digital working method is a long process compared to funding schemes that tend to be short project-based. Lastly, funds rarely covered infrastructure costs. Most subsidy projects were directed towards visible products, or publications (e.g. catalogues, websites).

4.9.2 The DEN Foundation

The early 1990s were characterized by isolated digitization initiatives driven by an internal process for collection management, without considering a national approach or integrated vision.[410] The NMV reviewed and compared 35 files from 26 museums, totaling about 70,000 records. Results showed an average quality of 6.5 (out of 10) based on data entered, density of information and ability of data to be converted to other systems.[411] The report concluded that quality of registration was not homogenous and that a unified database would offer searching benefits.[412] *Digitaal Erfgoed Nederland* (DEN - Digital Heritage Netherlands) was formed in response to a SIMIN research project from 1998 on the *De puntjes op de i: onderzoek naar de kwaliteit van collectieregistratie in musea* (Quality of Collection Registration in Museums).

A number of institutions with a role in the management and preservation of heritage came together in 1996 to form a consortium called *Nederlands Erfgoed: Digitaal!*. The Consortium established the makeup and the strategy of DEN, founded in 1999 as the national organization in charge of collecting and distributing knowledge about ICT standards and other quality instruments for the cultural heritage sector.[413] DEN has become the knowledge organization in charge of advocating for digitization best practice in the Netherlands.

DEN came to function as a catalyst for the repositioning of cultural heritage in the information society. In its first policy paper, DEN identified the value of digital

[410] Lever, et al., 1999.
[411] Stolk, 1998.
[412] van de Voort, 2002.
[413] www.den.nl.

cultural heritage and heritage information in general (housed in objects and locations as information carriers) in a knowledge economy. Public funds used to collect, preserve and manage cultural heritage were believed to require a sustainable approach to ensure optimal benefits for economic and social wellbeing. DEN was to function as an independent entity negotiating and bridging the gap between the ICT business and academia on the one side and the cultural heritage sector on the other. The development gap between the ICT industry and the heritage sector had to be accepted, it was part of the sector's life cycle due to the inherent differences in speed and goals, giving DEN a long-term challenge. The role of coordinator for specific projects was left to supporting institutions such as ICN or to private consultants. Instead, DEN wanted to focus on making a contribution to the development of a new role for the cultural heritage sector in the knowledge economy.[414]

With the vision of making a *Human Heritage Project* possible, as a cultural heritage version of the Human Genome Project,[415] DEN focused on supporting digital access to all human heritage, starting in the Netherlands. Giving access to cultural heritage information was seen as essential in the entire process. Access was not to be limited by political borders so DEN collaborated with international partners (e.g. ICOM, ICOMOS, EAA, IFLA, ICA) and sister organizations (i.e. CHIN, SCRAN, Culture Trust, Kulturnet).[416] Determining access, levels of findability, measuring accessibility, definitions of heritage, and development of measuring tools would be DEN's important contribution to the Dutch heritage field.

DEN thus took on the role of knowledge center for the heritage sector and became a supra umbrella organization. By 2001, the Netherlands heritage landscape had an umbrella organization per sector including the NMV (with 431 members) for museums. In the policy period from 2001 to 2004, all umbrella institutions had shared goals: to support advocacy, expertise and professionalization of the sector, and to increase access to heritage using digital information services.[417] Their collaborative tools included communication among members, exchange of reports, and organization of joint meetings.

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[414] Lever, et al., 1999.
[415] The Human Genome Project was an initiative of the US government to map the ca. 20,000 human genes and to determine the sequence of the DNA, started in 1990 and completed in 2003 (http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml).
[416] Lever, et al., 1999.
[417] Boswijk, 2002.

Umbrella organizations were meant to support the work of the sectors. The heritage sector did already work digitally, yet quality of digital access and collaboration required coordination to increase effectiveness of access. For example, the National Archives had all objects digitally registered at inventory level (about 2.5 million records), made up of baptism, marriage and burial certificates from the period 1811 until 1920. The catalogue was accessible via the website launched in 2002. However, this was not representative of the rest of the archive sector. Only the large archives had digital registration of collections with norms developed internally while small archives required practical support. True collaboration in archives was an illusion.[418]

Libraries, on the other hand, were early adopters of digital technologies and had automated catalogues accessible to the public. However, they had little interest in digitizing their collections to provide remote access to their holdings. Only the KB and university libraries with special collections were digitizing special objects (with an image and not only the catalogue entry).[419]

In archeology, the *Rijksdienst voor Oudheidkundig Bodemonderzoek* (National Service for Archeological Research) was responsible for managing a digital database of places and terrains called ARCHIS (*Archeologisch Informatiesysteem*). This was only accessible internally. The catalogue of their library was automated and accessible online. Furthermore, the public activity was limited to participation in the *Geheugen van Nederland* Project. Similarly, the *Monumentenzorg* (the national institute for the care of monuments) had a database with all national monuments digitally registered. They participate in the Memory of the Netherlands project with 10,000 digital photographs.[420]

Museums, in contrast, were the sector with the greatest disparity. Most museums automated collection registration but had limited digitization of collections (images of the objects). Museums generally kept their digitized catalogues for internal use.[421]

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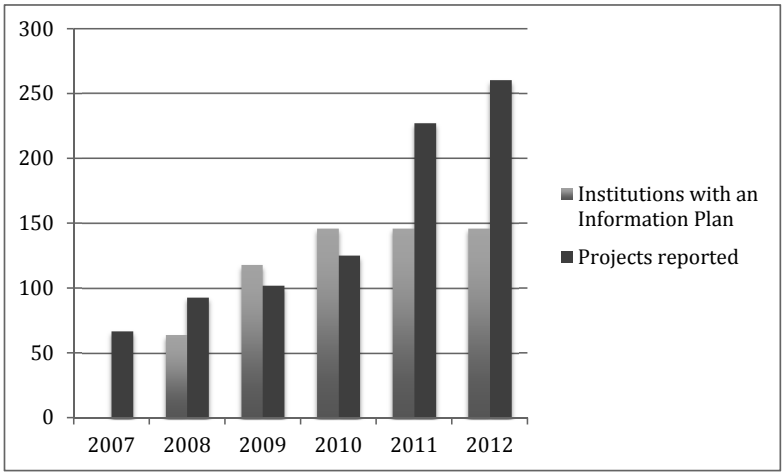
[418] Feliz and Hilhorst, 2003:4.
[419] Feliz and Hilhorst, 2003:4.
[420] Feliz and Hilhorst, 2003:4. The ROB (the National Service for Archeological Heritage Management) merged in 2006 to become the National Service for Archeology, Cultural landscape and Monuments, merged again in 2009 to include all movable and unmovable heritage of the Netherlands in the RCE.
[421] Feliz and Hilhorst, 2003:4.

According to the DEN website in 2009, the "main aim of DEN is to involve all heritage institutions, large and small, in a national infrastructure for digital heritage." Three main activities formed part of DEN's quality assessment of digitization of cultural heritage program: (1) the management of an ICT registry to provide information about ICT standards, which used a wiki as platform for discussion; (2) the management of a Cultural Heritage Projects bank, where institutions report their related ICT projects; and (3) the maintenance of a list of ICT-profiles of Cultural Heritage Institutions, including activities, vocabularies and policy plans.[422]

Figure 4.1 Heritage metric 2007-2012



DEN has put much effort in creating an inventory of digital activities in the heritage sector. A quarterly heritage meter is published on the DEN website with projects started and best practice used based on institutions reporting information, rather than surveys. Though projects have increasingly been reported (see figure 4.1 and table 4.9 for a summary), with a peak increase in 2011 and average growth of 33%, the number of information plans has not increased since 2010. The number of information plans reported may be linked to the requirements of the *Digitaliseren met Beleid* subsidy scheme. Between 2007 and 2012, nearly 800 institutions (of which 25% were museums) have reported being involved mostly with digital production and publication projects.[423]

[422] http://www.den.nl.
[423] http://www.den.nl/pagina/346/de-meter-2007-2012/.

Table 4.9 Heritage metric based on type of project reported (2007-2012)

	Number	100%
Total projects reported	**260**	**100%**
Image banks	51	20
Back office projects	23	9
Digitization projects	78	30
Educational projects	15	6
Research projects	32	12
Heritage portals	51	20
Renewing services	14	5
Newspaper digitization projects	42	16

Source: http://www.den.nl/pagina/346/de-meter-2007-2012/.

In addition, DEN developed *THE BASICS* (The Heritage Essentials: Building A Successful ICT Strategy) "to define a set of minimal requirements for digitization activities within the context of the national infrastructure for digital heritage. Application of THE BASICS guarantees quality, interoperability and efficiency during the entire digitization life cycle." This project was established gradually with input from the field. Findability was developed in 2007, minimal requirements for digital preservation and creation of digital data were established in 2008 and metadata and presentation best practice were published in 2009.

The main role of DEN has been the setting up of best practice projects and standards for the digitization of cultural heritage. Their major contribution has been serving as a broker between the government and the field, advising the Ministry of Culture while coordinating and communicating the growing knowledge within the field. DEN has conducted many research projects, some commissioned to research agencies, to provide the data required to inform policy-makers (see the chapter 5, section 5.4 National digital inventory).

In 2004, DEN began organizing an annual Digital Heritage Conference, (*Digitaal Erfgoedconferentie*), where institutions could share and learn best practice from the field. Since 2008 the conference alternated with an international version called DISH, for Digital Strategies for Heritage (table 4.10).[424]

[424] http://www.den.nl/pagina/314/DE-conferentie-en-DISH/.

Table 4.10 Conferences organized by DEN

Conference	Theme	Notes
DE conference 2004	Heritage in the eCultural period	
DE conference 2005	ICT and culture	
DE conference 2006	Interactive heritage	
DE conference 2007	Find it yourself !	
DE conference 2008	Going out !	
DISH2009	Digital Strategies for Heritage	Organized in collaboration with ErfgoedNederland. Keynote slides available online.
DE conference 2010	Long Live Learning !	Keynote slides and video available online.
DISH2011	Digital Strategies for Heritage	Organized in collaboration with ErfgoedNederland. Keynote slides available online.
DE conference 2012	Interaction heritage and science	Organized in collaboration with CATCH. Blog, keynote slides and video available online.
DISH2013	Business for Creative Industries Creators New Competencies Cultural Commons	Organized in collaboration with Europeana and the New Institute. 4 main themes were selected.

Source: http://www.den.nl/pagina/314/DE-conferentie-en-DISH/.

The yearly conferences have become an important place for the exchange of information and for the dissemination of research results. The role of DEN has been instrumental in the communication between the heritage field on the one hand, and government policy making on the other. Policy implementation has further been informed by the recent surveys on the state of digitization (production, cost and distribution), which DEN has coordinated as part of international statistical efforts. The participation of DEN in international data gathering efforts is discussed in the following section. DEN has been instrumental in the documentation of the digitization process, in coordinating the acquired experience to build on from past learning, and in advocating for an increased awareness of sustainable *proper* digitization of heritage.

4.9.3 The Koninklijke Bibliotheek

The *Koninklijke Bibliotheek* (KB) is the national library of the Netherlands, opened in 1798 and an independent body since 1993, even though it remains fully financed by the Ministry of Culture. Although not a museum, it has been of significance for the Dutch museum world through its many and wide-ranging digital activities. With an annual budget of €50 million and a collection of 6 million objects (or over 110 kilometers), the KB is charged with the tasks of (1) holding a copy of all Dutch printed material; (2) caring, giving access and documenting the national

cultural heritage; (3) advancing the collaboration among libraries; (4) serving as expertise center for digitization, digital archiving, and digital conservation; (5) researching and developing information services, and (6) serving as international contact.[425]

The task of forming a national storage of Dutch printed materials, given voluntarily by publishers, was expanded to include electronic material in the 1990s. The digital collection further contains the mass digitization projects of selected collections including newspapers, parliamentary papers and the Special Books Collection.[426]

The KB was an important trendsetter in digitization of heritage collections. During the June media congress in Eindhoven in 1987, the first copy of the Dutch National Library Disk was presented. The disk contained 7,000 images from books including the 90 prettiest miniatures (from a collection of 400) in color resulting in 4,000 images, as well as 2,800 black and white images from the woodcuts collection. This project was started in 1985 as collaboration between the KB and PICA with initiative from the *Stichting Film en Wetenschap* (SFW - Film and Science Foundation). This collaborative project brought the specialized knowledge on collection registration and findability (KB), together with the knowledge required to make and link a photo through a software program (PICA).[427] The combination of expertise was still to be found in one single institution.[428]

An important preservation initiative that would later play a key role in the digitization of Dutch collections was *Metamorfoze*, a national program for the preservation of paper heritage, which started in 1997. The KB and the NA work collaboratively "to engage in the struggle against paper acidification and other forms of autonomous decay" (including ink corrosion and copper corrosion). The content of the threatened material is transferred to another storage medium by means of microfilming and since 2007 also digitization. The digitized material is made available on the website of the *Geheugen van Nederland* project. *Metamorfoze* covered 70% of the digitization costs and the institution had to finance the remaining

[425] http://kb.nl/en/organization-and-policy/kb-in-a-nutshell.
[426] Verheul, 2007. The KB is a medium size national library, which has 275 full-time equivalent staff, a collection of 3 million paper volumes and over 6 million electronic items in deposit (Ras and Sierman, 2006).
[427] For a description on PICA see chapter 3, section RKD and the art libraries inventory.
[428] Degenhart Drenth, 1987.

30% of costs.[429] The project has been an additional source of funding for museums wanting to digitize and to make available their paper collections, particularly after 2007. Metamorfoze is the one long-lasting project funded directly by the KB that continues to support the long term access of paper collections.

Geheugen van Nederland (Memory of the Netherlands) is the KB's national digitization program. It was started with a grant from the Ministry of Culture to build a central database for images relating to Dutch history, culture and society, and modeled after the Library of Congress' American Memory project. During the first phase of the project, which took place between 2000 and 2004, a matrix was established to support the selection of collections to be digitized based on time, material and subject area. Selection took into consideration the diversity of the individual objects in relation to the national memory being collected, the appeal for a greater public and the potential re-use of the materials in the school curriculum.[430]

Since 2001, grantees agreed to carry out a digitization project (70% of which was to be funded by the *Geheugen van Nederland* and 30% by the institute itself), under very strict norms of best practice. The institutions provided the project with images (as TIFF (Tagged Image File Format) in FTP (File Transfer Protocol) or a CD), metadata (who, where, what, when), a short text describing the collection and the institution, and a brief description of the object for the general public. The participating institutions received a copy of the images and descriptions made for the Memory project, so the information was also available on the institutional website. The Memory project was meant to stimulate use and reuse of digital material on the web, and was not meant to support bibliographic description and cataloguing.[431]

The Memory project contained material representing mostly 2D objects. 3D objects mean a higher cost because they require further organization (of staff, equipment), as well as considerations of special lighting and multiple views. The Memory project also contains some audiovisual material (film, video), but this is costly to store and maintain. Due to the costs of storing TIFFs, the KB conducted research into alternative master file formats for digital collections.[432]

During the following phase, in the period 2005 and until 2008, fast development took place. The KB also became responsible for the digital preservation

[429] http://www.metamorfoze.nl.
[430] LCM, 2005; Verheul, 2007.
[431] Verheul, 2007.
[432] Verheul, 2007.

of the images by storing the master-file in the *eDepot*, the digital repository system for digital preservation (see below). This service also contained re-delivery if the institution wanted to re-use the Master-file for future publications or exhibitions. Providing funding for digitization became less important and instead, the main objective became developing services to promote (re)use of digitized objects. However, copyright was limiting. The KB decided to freely use the digitized materials within the context of *Geheugen van Nederland*, as well as for personal and/or educational use.[433]

In 1994, the KB started to include digital publications in its collections. From 1998 until 2000, the KB was project leader of the European NEDLIB project (Networked European Deposit Library). This led to a series of research and development trials and by 2002, the *eDepot* was formed as the first long-term digital archiving system for academic publications. The KB developed a workflow for archiving electronic publications involving the generation and resolution of identifiers, the search and retrieval of publications, and the identification, authentication and authorization of users. According to their website, which contains information from 2007, 20 full-time equivalents worked in the *eDepot*, with a budget of €1.1 million in structural funds for staff and system maintenance, and €1.2 million structural funds for research.[434]

One project of the *eDepot* involved web archiving, started in 2005 and responding to the UNESCO Charter on the Preservation of the Digital Heritage, which names the web as a form of digital heritage. The web archive includes the .nl domain that was created in 1986.[435] The goals found on the project's website read: "Initially, the goal was to create a process and infrastructure for archiving a selection of Dutch websites and making them permanently accessible. This project has now been completed. Archiving the Dutch web now is part of the day to day activities at the KB."

The KB, as single national institution with a large research and development budget, has a fundamental role in setting best practice for the entire heritage field, including standards for preservation and for benchmarking. It further serves a key role

[433] Verheul, 2007.
[434] Ras and Sierman, 2006. Sweden began web archiving in 1996 even when publication of digital collections was not legal. Collections were made available on-site.
[435] The first .nl top level domain was registered by the Center for Mathematics and Computer Science, or CWI (Centrum voor Wiskune en Informatica) in Amsterdam (cwi.nl). Ras and Sierman, 2006.

as participant in national and international digital activities, and is often the Dutch representative in European projects (see table 4 in annex).

4.10 Conclusions

The Dutch government has supported experimentation in the use of computers for the management of museum objects since the late 1960s, both through subsidies and by making mainframe computers available for museum data processing. The first subsidy specifically for digitization of museum collections was granted in 1969 and it was part of a national government effort to explore automation. No major investment was done in the next ten years because museums were not considered to be ready for the task. By 1980, financing was made available for the organization of the *Automatisering Museale Informatieverzorging* committee (AMI), which identified the elements needed for a centralized coordination plan of action yet funding was stopped. Again a decade was to pass before the government allocated funds for computers in museums.

It was in the 1990s that the government decided to support museums in the acquisition of computers and in the establishment of the first standards. It started with the formation of the advisory board *Stuurgroep Museale Automatisering* (SMA), funds were made available for experimentation, hardware, software and training, and efforts culminated in a national program for the inventory of collections. The Delta Plan resulted in the first long-term government program for the nation-wide registration of objects and indirectly for the digitization of collections. Funds were made available during the next seven years coinciding with the privatization of national museums: it was important to identify what objects were going to be cared for by each autonomous museum. National support and regulation led to the formation of standards, but also accentuated the digital divide as grant schemes favored those with sufficient resources to take up the funding. In this period, computers were widely adopted and used for administration of collections, certainly at national museums while many smaller and local institutions would have to wait until the next decade to adopt digital registration.

A second major investment in the second half of the 1990s was driven by the development of an “electronic” government. Digitizing heritage was part of a national effort to shape a Dutch information society; computers were used to improve

government information services, and collection information was seen as a national asset in the new economy. Driven by the Ministry of Internal Affairs, digital access to cultural heritage became a key goal of the future information society. This notion allowed the allocation of resources for the development of a digital heritage infrastructure to include more than a property and location inventory of objects.

In the period between 2000 and 2010, the Internet took central stage and collections were published online. The Ministry of Culture supported successful digitization that considered future use and reuse of materials while increasing their value through linking: content needed to be part of a national network of heritage information. A granting base was established for what has been a highly successful digitization scheme that lasted only three years, but that fundamentally changed the professionalization of digitization projects. It required institutions to develop an information plan, to follow a set of standards, to publish the digitized content, to perform an evaluation and to self-inventory the project (ideally including financial information which, unfortunately, hardly ever happened). No other grant scheme has had such a wide impact and been so successful in achieving tangible results.

Smaller grants were also given through the Mondriaan Foundation with no apparent coordinated strategy, so that institutions were free to explore their own interest. This functioned as key seed money for what would later develop into important projects such as MusIP and the development of a crowdsourcing workflow. It also resulted in several short-lived projects and innumerable short-term presentation products. Investing in the invisible infrastructure has never been popular, particularly not when compared to projects showcasing world-renowned collections.

Building on to the national digital agenda, a series of major R&D projects were funded for the development of innovative applications of IT for the heritage sector. The R&D projects served as a basis for the emerging policy interest in using digitized content commercially in public-private initiatives where heritage content was repositioned for the market. The creative industries have played an important role in the stimulation of the economy and museums were expected to become part of the trend. The scheme favored institutions that were able to undertake innovative projects, which included universities and the major museum institutions (including the KB and NA). The idea was to distribute knowledge and tools to the rest of the institutions, yet no structure was set in place to facilitate this. The project results remain highly advanced, in fact too advanced for the field even though a popularization component

was to be included. In the last round of projects that were accepted only a couple of large museums were included. The challenge therefore remains: funding innovation can advance the field but only when sufficient funding is allocated to the slow infrastructural work that can support new applications. Museums are a heterogeneous group with no national identified representative. The RCE is part of the government, DEN is an advisory body and museums are yet to organize a proper sectoral collaboration. This environment greatly challenges knowledge transfer in a coordinated way, which only aggravates the digital divide.

Funding digital innovations in the 2010s was directed towards large projects headed by large institutions with the occasional heritage institution collaborating in the development of new digital applications. The KB represents the library sector (though serves as national R&D heritage lab), the NA represents archives, NIBG represents audiovisual content, and the *Rijksmuseum* in Amsterdam has been selected to participate in several projects, yet no clarity exists as to their role as representatives of the museum sector. Funding the same five institutions and expecting and at the same time expecting results to benefit the museum sector as a whole would require a well-developed dissemination strategy. Supporting the positioning of heritage content as part of the information economy, together with health, environment, transportation and education projects, benefits from a strong and clear value proposition. For this, the Ministry of Culture is rethinking its approach to designing funding and evaluation mechanisms to increase efficiency in output in a wider spectrum. The Knowledge department at the Ministry of Culture is coordinating a digital heritage infrastructure together with heritage content constituents (libraries, archives, museums, content centers and scientific repositories). Results are expected shortly after the time of writing.

So far, efforts directed towards digitization for digitization sake generally have a short life and limited impact. In contrast, efforts that take advantage of digital tools to advance other goals (e.g. market stimulants, increase efficiency) constitute a structured policy that can position projects results for greater reuse. Goal-driven efforts often have a larger budget and benefit from a network of experts with a common goal. Large and small, short-term and long-term, focused and overarching projects have all been necessary to allow the field to grow towards a digital work form. A challenge remains balancing policies and funding schemes to allow organic

growth while maintaining a long-term vision able to reposition results to strengthen the infrastructure.

The overview of this period shows the challenges encountered in consolidating the digitization process in the museum sector. This section has illustrated the role of government in financing the digitization of collections, its production, preservation and presentation and has described the digitization of museums in the Netherlands at the national level. The activities taking place at the *European* level also greatly influenced the work done in the Netherlands. Experimental projects and fundamental changes in policy approach at the European level have had a great impact on the digital infrastructure being built in the Netherlands, increasingly via museum collaboration projects. These issues are described in the next chapter of this study.

5. International initiatives

In the 1960s, computers were very expensive and only available to universities and large institutions. For this reason, adoption of computers by museums, and the digitization of museum collections had a collaborative nature, with important implications for developments on the national level. The Netherlands was also influenced by international developments as communicated in the form of conference papers, the opinions of visiting experts and other publications, as well as by participation in committees and international projects. International organizations also served as a source of inspiration for the formation of Dutch associations.

Dutch museums have participated in *European* international collaboration projects for digitization since the late 1980s. A number of initiatives emerged to assist the exchange of information and accessibility of content across member states. For a non-exhaustive list of projects in which Dutch institutions, particularly museums, were involved see table 4 in the annex.

This chapter will present the main international organizations and projects at an international level that have influenced Dutch museum practice, and in which the Netherlands, in turn, has shared many ideas and solutions throughout the years.

5.1 Early organizations and first influences

The Netherlands was strongly influenced by five organizations abroad: the Museum Computer Network (MCN) and the Computer Interchange of Museum Information (CIMI) in the United States, the Museum Documentation Association (MDA) in the UK, and by the International Council of Museums (ICOM), with its Documentation Committee (CIDOC). Other organizations and institutions, including the Network of European Museum Organisations (NEMO) and the International Cultural Heritage Information Meeting (ICHIM), have also had some influence on Dutch museums in the early adoption of computers.

The MCN was formed in 1967 as a consortium of 25 museums in the USA and had the goal of "designing and implementing a comprehensive computer-based information system embracing the textual and visual records of all museum collections in the nation." It envisioned a central system of information about collections complemented by a bibliography, for use by museums and for education

and research.[436] MCN developed a Project Registry, as a joint initiative with the Museum Software Foundation. Members were able to add new projects, mostly from the USA and Canada, but there were also a few international participants, including the Louvre, Museé d'Orsay, the British Museum, and the Glasgow Museum. One of the projects registered is the Dioscuri project, a hardware emulator written in Java developed by the KB in collaboration with the NA.

Standards for the digital documentation of objects and exchange of information emerged from the work of the MCN in a report by David Bearman and John Perkins from 1992.[437] The report provided an overview of the standards used for the electronic interchange of museum information, as well as suggesting standard protocols that would be appropriate for museums.[438] This report led to the formation of the Computer Interchange of Museum Information initiative, or CIMI, which produced the CIMI Standard Framework in 1993.[439] CIMI began with a 2-year funding from the National Endowment for Humanities and the Pew Charitable Trusts with members from the USA, UK, Canada, Australia, and Adlib as representative from the Netherlands.

CIMI was formed to support the development and dissemination of common standards for the preservation of museum information in digital form. In the 1990s CIMI advised museums on information interchange, published the CIMI Standards Framework, endorsed SGML for structuring information and Z39.50 for search and retrieval, and developed a standard for finding aids. CIMI's CHIO Project (Cultural Heritage Information Online) provided a way to test SGML and Z39.50 as standards. A further case study tested CIMI's standards-based information strategies in the "real world" at eight museums. Projects from 2000 through 2003 had three main areas of operation: (1) to explore the nature of museum information and ways to involve information resources in the museum visitors' experiences; (2) to contribute to the development of the SPECTRUM Document Type Description; and (3) to investigate ways to incorporate handheld, wireless, mobile computing into the museum visitors' experience in the Handscape project (Handheld Access to the Museum Landscape).

[436] Ellin, 1968:79. Other groups formed abroad included the Online Computer Library Center, or OCLC, formed in 1967 in the USA, and the Canadian Heritage Information Network, or CHIN, formed in 1981 in Canada.
[437] Jones-Gamil, 1995:9.
[438] Jones-Gamil, 1995:9.
[439] Misunas and Urban, 2007; Jones-Gamil, 1995.

The Dutch company Adlib Information Systems participated in the CIMI Z39.50 Interoperability Testbed (1995-1997).[440]

CIMI's founder and executive director was John Perkins. James Michalko, the president of the Research Libraries Group (or RLG) chaired CIMI's executive committee and RLG provided business support for CIMI's operations. These operations ceased at the end of 2003, but RLG continued to oversee the three-year Handscape project until June 2004.[441] When financing stopped in 2003, CIMI stopped meeting quarterly. CIMI members paid a yearly fee based on a sliding scale, with the Getty paying a larger amount than other organizations, but a sustainable financing model (such as a membership model) was never established.[442] CIMI was a unique international effort for experimentation with information solutions for the heritage sector. There is currently no similar umbrella organization that has replaced the production of R&D solutions in the international heritage sector.

The Museum Documentation Association (MDA) was formed in the UK in 1977 and was responsible for the Information Retrieval Group of the Museum Association. The MDA developed a Computer Bureau in 1979 to provide data processing services for museums. The Netherlands used their services in the 1980s, though not without language issues. In 1983, the MDA published the Social History and Industrial Classification, or SHIC, which would lead to the MDA Historic Artifacts Card adopted by the Netherlands in 1987. 1987 also saw the launch of the Museum Object Data Entry System, or MODES, by the MDALCM. In 2011, RCE became the managing license holder of SPECTRUM. MDA was transformed into the Collections Trust in 2008. There is a strong relation between the Collections Trust and DEN, both having a similar role in their respective countries for the coordination of collaborative projects, international comparison and the exchange of best practice.[443]

ICOM-Nederland was established as the national committee of the International Council of Museums in 1980.[444] ICOM-Nederland has a double role as the national representative in the global ICOM-organization and as the communicator of international developments back to the national field. The global ICOM formed its

[440] http://www.oclc.org/research/activities/past/rlg/cimi.htm.
[441] http://www.oclc.org/research/activities/past/rlg/cimi.htm.
[442] Degenhart Drenth, 2010.
[443] http://www.collectionstrust.org.uk/about-us/history/; http://www.museumconsulenten.nl/index.php?6; http://www.den.nl/artikel/bericht/3165/.
[444] Museumvisie Jr. 4, Nr. 3, September 1980:95.

Documentation Committee, or CIDOC, in 1950. The committee provided a space for information exchange and collaboration in the areas of documentation, registration, collections management and computerization. It has also produced several international standards for museum documentation.[445] CIDOC started with a small group of 20 members and by 1990 it had 400 members. This growth in membership reflected the "development of documentation as a museum function and priority."[446] The Netherlands had a direct communication line with CIDOC, with a chair of the Terminology workgroup in 1990, a chair of CIDOC from July 1996 to 1998 and with a post from the Reinwardt Academy (2010-2013).[447]

The 1978 CIDOC meeting in Stockholm focused on automation projects and the information categories used. The international group had already identified the need for a homogenized minimum standard of information to allow international data exchange. Continental differences were found in the definitions of museum data standards. The most important result of the discussion was the establishment of a minimum of eight information categories: museum name, object name, classification, physical description, origin, acquisition date, source, and inventory number. These categories applied to all objects regardless of discipline. The selection of information had to follow set criteria: the information had to identify the object, localize the object, establish the origin of the object, and establish the history of the object as a collected item. All member states were asked to send 100-200 object descriptions from diverse objects to be processed in the National Museum computer. A test was conducted using the Outline of Cultural Material classification and the Nomenclature for Museum Cataloguing classification devised by Robert G. Chenhall. This represented the first international museum data exchange experiment.[448]

CIDOC meetings, as all other international conferences, were important for the exchange of innovative work in the field, for the access and exchange of ideas, and for strengthening the growing field of museum documentation. This international network of specialists benefited from a culture of sharing, reinforcing efforts in individual countries.[449]

[445] http://network.icom.museum/cidoc/.
[446] CIDOC, 1990:1.
[447] CIDOC, 1990:4; RKD, 1996:3; http://network.icom.museum/cidoc/.
[448] Van de Voort, 1978.
[449] Hogenboom, 2013.

CIDOC has been instrumental in the international creation and adoption of standards and has published a series of documents that would provide an international base for documentation standards and best practice. Documents included the *Terminology control bibliography* (1990), a *Directory of Thesauri for Object Names* (1994), *Data modeling bibliography* (1994) and the *Conceptual Reference Model*, or CRM (1998) that would become *A Reference Ontology for the Interchange of Cultural Heritage Information*, or "ISO 21127" (2005).[450]

The Network of European Museum Organisations (NEMO) held its first meeting entitled EC Conference of Museums in 1992. NEMO served as an advisory body to the European Commission (EC) and a cooperating body for museums in Europe. Twice directors of the Dutch Museum Association have chaired NEMO, Manus Brinkman from 1995 to 1997 and currently Siebe Weide, who started as chairman in 2010. NEMO provides information about a number of subjects relevant to museums including laws and regulations, innovation and digitization.[451]

The International Cultural Heritage Information Meeting, or ICHIM was an influential non-profit annual international conference for museums, organized from 1991 to 2007. ICHIM explored "policy, legal, social, economic, technological, organizational and design concerns of digital culture and heritage, from the perspective of cultural policy makers, institutions and cultural participants." The organizers also started a similar yearly meeting called Museums and the Web, held first in 1997.[452] Museums and the Web has become an important forum for the presentation and exchange of trends in the field. The conference website is an important source of information. From the papers published and demonstrations registered, Dutch participation can be mapped starting in 2000 with demonstrations by the *Rijksmuseum* and the *Van Gogh Museum*. Since 2000, the Netherlands has made a total of 21 presentations and submitted 21 papers.

ObjectID was initiated in 1993 by the J. Paul Getty Trust Art History Information Program as an international standard for the description of cultural objects, and was launched in 1997 during a presentation in Amsterdam. The standard was promoted for the protection of objects by "major law enforcement agencies,

[450] CIDOC's website has been updated and no longer presents the publication overview. Instead, they have a list of standards and guidelines at http://network.icom.museum/cidoc/resources/cidoc-standards-guidelines/. CIDOC's previous website can be accessed via the Internet Archive at http://cidoc.ics.forth.gr/.
[451] http://www.ne-mo.org.
[452] http://www.archimuse.com/.

including the FBI, Scotland Yard and Interpol, UNESCO, museums, cultural heritage organizations, art trade and art appraisal organizations, and insurance companies." Ideally, the correct documentation of objects would facilitate their location in case of theft. ObjectID includes nine fields of basic information and an image. The *Tropenmuseum*, the *Rijksmuseum Volkenkunde* and the J. Paul Getty Trust began a pilot to automate an ObjectID checklist with a grant from the Dutch Ministry of Foreign Affairs. A software program was developed and introduced at the National Museum of Mali and the Cham Museum in Vietnam. The *Tropenmuseum* further improved the ObjectID software and was responsible for delivering the software, hardware (computers, scanners and cameras) and training to 14 museums in developing countries. The *Tropenmuseum* encountered difficulties in the implementation of ObjectID because institutions needed a collections management system and because the adoption of a computerized networked system demanded major organizational changes. For this, a second phase took place in which the software accommodated 11 fields for acquisition and location information.[453]

Although the Netherlands has been present and active globally, it is within the *European* context where the most important advancements towards creating digital access to heritage collections have taken place. The following sections discuss the digital heritage European network.

5.2 The Framework Programs of the European Commission

The European Commission (EC) has four-year research periods, or Framework Programs (FPs). Table 5.1 below shows an overview of the Framework Programs and their total budget for research.

Many projects have been funded by the EC through the various FPs, several of which have influenced digitization in Dutch museums. The following is a description of projects in which the Netherlands has played a role. All information has been taken from the CORDIS website (http://cordis.europa.eu/), developed as the Community Research and Development Information Service for European member states in 1993. Additional sources are otherwise stated.

[453] Beumer, 2008:52-55.

Table 5.1 Framework Programs duration and budget execution

Framework Program	Years	Total in € million
FP 1	1984-1987	€3,270.6
FP 2	1987-1991	€5,357
FP 3	1990-1994	€6,552
FP 4	1994-1998	€13,121
FP 5	1998-2002	€14,871
FP 6	2002-2006	€19,256
FP 7	2007-2013	€55,806
Horizon 2020	2014-2020	€79,271

Source: http://ec.europa.eu/research/fp7/index_en.cfm?pg=budget as of February 2012.

The First Framework Program (FP1) for community research, development and demonstration activities took place between 1984 and 1987. The goal of the program was to define a common strategy in the field of science and technology, setting scientific, technical and financial priorities. Almost from the beginning, digital technologies became an important issue. One program funded was RACE (1985-1986), meant to contribute towards technical cooperation in telecommunications technologies. This was followed by RACE 1 (1987-1992), part of FP2, meant to prepare the ground and provide the technological basis for the introduction of Integrated Broadband Communication Networks. The Second Framework Program (FP2) was responsible for financing the first European collaboration in the area of digital museums called the European Museum Network, or EMN. It started in 1989 and ran as a pilot project until 1992. Participating museums included *Museon* in The Hague, the Hamburg *Kunsthalle*, the National Archeological Museum in Spain, and the Brenen Uberzee Museum, highlighting international cooperation as a major requirement for funding. At this early stage, developers and institutions had no knowledge of multimedia. When museum staff members were asked about their format preference for digital images, nobody knew what to say. Formats were important because of long-term implications. The Louvre and the Museé d'Orsay started digitization using a format devised by IBM, but much of the work had to be redone because it was not exchangeable with other institutions.[454] Image digitization was generally done with a scanner, slides were first printed and then scanned. Later on, a video camera was used as *frame grabber* and then transferred to a digital format. The high resolution Vasari camera was used by the National Gallery in the UK and by the Uffizi Gallery in Italy.[455]

[454] Visser, 2012.
[455] Visser, 2012.

"The aim of the EMN project was to provide and develop the exchange of multimedia information through advanced telecommunication technologies. Information on museum objects was made available primarily for the museum's lay public. The museum visitor accessed the EMN through interactive multimedia terminals in one of the eight participating museums. The information to be retrieved consisted of images, texts, full motion video, sound, computer animations, graphics etc."[456]

The work was continued in the RACE 2 Program, part of FP3. The aim of FP3 was to make a major contribution to the introduction of Integrated Broadband Communications, using the Integrated Services Digital Network (ISDN), by integrating the broadband network, by using open standards, and by making new services flexible and cheaper. RACE 2 had a budget of €554 million and was responsible for funding the Remote Access to Museum Archives project, or RAMA.[457]

RAMA was an important early project because it involved the installation of a network for the exchange and access of museum data (images, texts, video clips and sound), including teleshopping of catalogues, reproductions, and so on. It meant to use *distributed* multimedia databases so that any European museum could join to exchange data, regardless of the database content infrastructure. The project soon faced the problem of interconnecting heterogeneous environments, such as museums of a different nature (e.g. using different object registration formats), and different hardware and software systems.[458]

A mix of heritage institutions and IT partners was selected to facilitate development of software that would give online access to collections from the UK, Spain, Greece, Germany and *Museon* representing the Netherlands. Participating institutions could access the digital collections by using a fast telephone line with ISDN.[459] The project evaluation took place in 1993 and was generally positive, identifying the benefit of access to many collections from across the sectors.

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[456] http://www.chart.ac.uk/tocs/abs/visser.html.
[457] http://cordis.europa.eu. The information portal CORDIS was launched in 1994 for the implementation of an RTD Research and Technological Development information service (http://en.wikipedia.org/wiki/CORDIS).
[458] Cisneros, Bescos and Martinez, 1996.
[459] Integrated Services Digital Network, or ISND, uses the telephone line to exchange not only sound but also data (RKD, 1992b:1; NBBI, 1994:8).

RAMA was followed by MENHIR, Multimedia European Network of High-quality Image Registration (1997-1998) with no Dutch partners, as part of the FP4 ESPIRIT Program. It resulted in an online catalogue of 120,000 images. The project was followed by OpenHeritage, enabling the European Culture Economy (2001-2003), part of the FP5-IST Program on access to digital collections of cultural and scientific content. It networked collections from 30 museums with a multimedia management system, and was to be published online at openheritage.org. It is not clear if the website was ever launched. The project was coordinated in Italy, with *Museon* as Dutch representative. The idea of exchanging European heritage collections would later take form in Europeana.

In 1993, the European Commission called for the establishment of an "information society" in its white paper *Growth, Competitiveness and Employment*, as a solution to the expected employment challenges. In 1994, the so-called Bangemann Report entitled *Europe and the Global Information Society* identified mobile communication as a pillar of the information society and made recommendations for the building of an information infrastructure based on public-private partnerships. The report identified the market, private investment and an entrepreneurial mentality as key to the formation of an information society (unlike transport which was dependent on public funds): "the creation of the information society in Europe should be entrusted to the private sector and to market forces." Private investment was to define rules for interoperability, for reciprocal access, for tariffs and for a general regulatory framework, supported by the Member States. The report further advocated EU regulation against monopolies.[460] Relying so heavily on the market stimulated particular attention to users and their information needs.

The fourth Framework Program was launched in 1994. Its objectives were "to implement research and technological development (RTD) programs and demonstration programs by promoting cooperation with and between enterprises, research centers and universities; to promote cooperation in the field of community RTD and demonstration activities; and to stimulate the training and mobility of researchers in the field."

1995 brought the Information Society to the international agenda. The Commission sought to develop information content and an information industry to

[460] EC, 1994; EC, 1997.

support economic growth, competitiveness and employment as well as individual, social and cultural development. This was done through the dissemination and exploitation of the results of FP4 projects, including development projects supported by the INFO2000 Program, running from 1996 to 1999 with a budget of €65 million. It succeeded IMPACT 2 (part of FP3) and preceded eContent (part of FP5). 80 projects were granted (out of 477 submissions received), contributing to the economic exploitation of Europe's cultural heritage, business services, geographic information, as well as scientific, technical and medical information.[461]

One such project was CHAMPOLL, also called Project Champollion, a cultural heritage and multilingual program of long-standing legacy in open networks. Ten institutions participated, including the University of Amsterdam's *Allard Pierson Museum* and the *Museum van Oudheden* in Leiden. The project's goal was to create a network of multimedia electronic databases of Egyptian collections. It was funded by the INFO2000 Program and NWO. The results were published as the *Egyptian Treasures in Europe*, a CD-ROM with a collection of 1,000 objects from participating institutions from Brussels, Dublin, Liverpool, Vienna, Lille, Madrid, Florence, Hildesheim, Lisbon, and Amsterdam including 250 objects from the Allard Pierson Museum. It is not clear if objects from the *Museum van Oudheden* were ever included in the CD-ROM as the museums joined the project later on.[462]

This project led to the Global Egyptian Museum (GEM) website, created, owned and maintained by the Center for Computer-Aided Egyptological Research, or CCER, of the Universities in Utrecht and Leiden. The website presented "a unified and integrated searchable system to give online access to the data" from the CHAMPOLL project, including a virtual gallery with 6,600 objects. Content was made available in English, Dutch, German, Italian, Spanish, Portuguese and French via a Multilingual Egyptological Thesaurus. The website was accessible to subscribers, being private individuals (with an annual fee of €50) or institutions (annual fee of €100, €250 or €1,000 depending on the institution's size). A free 24-hour access was also possible, to test the web-site before purchasing a membership. In

[461] Via the Internet Archive, snapshot 14 February 1998 at http://www2.echo.lu/info2000/en/history.html and http://www2.echo.lu/info2000/en/docs.html.
[462] APM, 1997:12; APM, 1999:5; http://www.oocities.org/timessquare/alley/4482/GEM.html; http://ccrr.org viewed using the Internet Archive.

that sense, the CD-ROM was much less expensive and far less time consuming, considering the slow Internet connection at the time.[463]

The website provided guides, thematic sections, museum views, an illustrated hyper-linked glossary, a kids section, and allowed free text searching of specific words inside the description of the objects.[464] Searching was assisted by eight criteria: museum, inventory number, type of object, material, technique, divine names, dating, and provenance. Descriptions also included color images that could be enlarged and some of them rotated (using QTVR). By 2002, the website presented 21,500 objects from 13 institutions, with a desired growth of 6,000 new objects per year.[465] The CCER website was closed down in 2010.

FP4 included the Advanced Communications Technologies and Services, or ACTS, ESPIRIT Information Technologies, and the Telematics Applications programs. ACTS was responsible for funding AURORA in 1996, a pilot for an automated video restoration system for film and video archive material. Technical University Delft was the Dutch partner.[466] The Telematics Program would have a great impact, in particular due to the Telematics for Knowledge subdivision, which included Telematics for Libraries. The Libraries program was launched in 1990, and marked the start of a first series of programs focused on computerized bibliographies, library networking and interconnection systems, innovative library services, and technology-based library products and tools. A second program from 1994 to 1998, served to consolidate and integrate the results of FP3. Three action lines were set: network-oriented internal library systems, telematic systems for library cooperation and networking, and library services for access to networked information resources.[467] Funded projects included the Van Eyck 1 and 2 projects, and the Networked European Deposit Library project, or NEDLIB, funded in 1998 and coordinated by the KB.

The Van Eyck projects, or Visual Art Network for the Exchange of Cultural Knowledge, were early digitization projects within the Libraries Action Program that focused on images. Van Eyck 1 (feasibility study 1993-1994) and Van Eyck 2 (1994-

[463] http://www.oocities.org/timessquare/alley/4482/GEM.html.
[464] http://www.oocities.org/timessquare/alley/4482/GEM.html.
[465] Van de Plas, 2002. QTVR or QuickTime Virtual Reality allows capturing panoramas and multiple viewing angles to create a 3D effect, or by using 3D renderings (http://en.wikipedia.org/wiki/QuickTime_VR).
[466] http://cordis.europa.eu/infowin/acts/rus/projects/ac072.htm.
[467] http://cordis.europa.eu/libraries/en/intro.html.

1997) involved the collaboration of the Witt Library of London, Trinity College in Dublin, Bremeur (Project management in London), and the Computer Department of the Utrecht University. The project included researching market needs, cataloguing and a feasibility study concluded in 1994, followed by the development of the pilot linking three libraries (including those of the RKD) using 2,500 scanned photographs (as representative records sample).[468] The project intended to develop an art history workstation for researchers, including access to text and images databases accessible from anywhere, requiring standardization of data organization. The aim of the system design was to allow the storage, selection and transmission of high quality images held in various libraries. The project compared systems for artist identification (format, editorial rules, and standards), developed a core record structure (name, date, characteristics, episodes, documentation and local comments) and developed prototype software. A concordance of the core record structure was made to match the Iconclass system. The prototype was delivered in 1996.[469] A second phase of the project took place from 1999 to 2001, as part of the eTen Market Validation projects. The RKD coordinated the project to develop a web system for art historians, museums and the educational field, to simultaneously access multiple art historical databases.[470]

A program complementary to FP4 was MLIS, the Multilingual Information Society Program (1996-1998) for the promotion of the linguistic diversity of Europe in the information society.[471] It aimed to stimulate the use of technologies, tools and methods to reduce the cost of transferring information between languages. MLIS was the predecessor of the eContent Program during FP5.

Another complementary program was RAPHAEL, a community action program in the field of cultural heritage, which ran from 1996 to 2000. Its aim was to contribute to the development and promotion of cultural heritage, encourage cooperation at the European level, support research and common practice, improve access to heritage and the supply of information, and foster cooperation with non-members. The program covered five areas: (1) development and promotion of cultural heritage; (2) networks and partnerships; (3) access to heritage; (4) innovation, further training and professional mobility; and (5) cooperation with international

[468] http://cordis.europa.eu/libraries/en/projects/vaneyck.html.
[469] Van de Starre, 1993; RKD, 1992b:1; RKD, 1995b:4.
[470] RKD, 1992b:1; RKD, 1995b:4.
[471] http://cordis.europa.eu/ist/98vienna/xmlis.htm

organizations. This program was responsible for funding the multilingual European project 300 Pearls, which presented the highlights of three natural history museums from Belgium, Hungary and the Netherlands (*Naturalis*), including documents and illustrated essays.[472]

RAPHAEL also funded the formation of EMII, the European Museum Information Institute in 1998, with offices in MDA in Cambridge, with a grant of €250,000 starting in 1999. EMII was a network of organizations with 10 active and 6 supporting partners interested in giving access to heritage collections. The IMC office participated in the formation of EMII and was an active partner representing the Netherlands abroad (see chapter 2, section 2.2).[473] EMII was again supported by the European Commission in 2002, to devise a working model for the distribution of heritage content (film, video, text and image) from multiple sources (including museums, broadcasters, libraries and archives). Issues hindering availability of heritage materials online included: (1) the understanding of requirements was not shared by technical and content partners; (2) content was used for single projects and the potential for re-use was not exploited; (3) future preservation was not ensured; (4) content holders were not convinced of the benefits of giving access; and (5) projects worked in isolation, without building upon previous work, but rather reinventing the wheel. To this, EMII was to identify best practice for content creation, allowing use and reuse of standards, legal requirements and overall framework to guide future European projects. The EMII's Distributed Content Framework had a budget of €446,779, provided by the FP5-IST (see below). It was coordinated by the MDA in the UK and ADLIB Information Systems was the Dutch partner. The Netherlands is now no longer an active partner.

The FP4 was followed by FP5, which ran from 1998 to 2002. Its aim was to increase industrial competitiveness and the quality of life for European citizens. Its objectives were to create a user-friendly information society (IST), promote innovation and encourage participation of SMEs (Innovation/Small and Medium Enterprises).

Within FP5, the Information Society Technologies Program (IST) was established as one of seven priorities. IST was further divided into four *actions* including interaction of information and knowledge. IST was continued during FP6,

[472] http://300pearls.naturalis.nl/, http://www.petermaas.nl/extinct/links.htm.
[473] Beijers and Hogenboom, 2000:48; EMII, 2001:2,8.

set up to improve the integration and co-ordination of the European Research Area.[474] The program built on the work of the ESPIRIT, ACTS and Telematics Applications Programs. It intended to enhance the added value of information, increase competitiveness, and support the realization of socio-economic needs. One project funded by the FP5 IST was MINERVA, the Ministerial Network for Valorizing Activities in digitization, which ran from 2002 until 2005. Its objective was to facilitate the adoption of the Lund Action of 2001 by coordinating and harmonizing digitization programs and policies for the digitization of cultural and scientific content. The project was coordinated in Italy and had no Dutch partners.[475] The follow-up project, MINERVA Plus also had no Dutch partners.[476] The Netherlands did have an extensive participation but only through competence centers.[477]

The MINERVA IST Project funded the Dutch conference on Strategies for a European Area of Digital Cultural Resources. The conference took place on 15 and 16 September 2004 in the context of the Dutch EU presidency of 2004. The conclusions of the conference were used as input for the 2005-2008 work plan developed by the *Raad voor Cultuur*, which included digitization of heritage as one of its priorities. Citizens were to have unrestricted, sustainable and reliable digital access to Europe's cultural and scientific knowledge; sharing this knowledge would contribute to establishing the knowledge economy.[478]

Other projects funded by the FP5 IST program included OpenHeritage (2001-2003), which aimed at linking heritage collections from 30 museums and publishing them via a portal. It had *Museon* as the Dutch participant. Another project funded was TEL, The European Library (2001 to 2003), aiming at developing a multilingual distributed digital library and leading to the launch of a portal (www.theeuropeanlibrary.org) in 2005. TEL was followed by TEL-ME-MORE (2005 to 2007), part of FP6 IST, aimed at increasing the potential of National Libraries as actors in the knowledge society. The KB was the Dutch partner in both projects.[479] The Maastricht University coordinated eCulture Net from 2002 to 2003. This project

[474] Loebbecke and Thaller, 2011:364.
[475] http://cordis.europa.eu/projects/rcn/61819_en.html.
[476] http://cordis.europa.eu/fp5/.
[477] Dutch advisory and competence centers include: ICN, RKD, NIBG, KB, NBLC (Netherlands Association of Public Libraries), RdMz (Netherlands Department for Conservation), ROB, DEN and NA (http://www.minervaeurope.org/interoperability/competencenters.htm).
[478] OCW, 2004.
[479] http://cordis.europa.eu/fp5/.

had as goal to develop a network of excellence for digital culture research and education.

Between 2001 and 2005, a complementary program for the Information Society was formed called the Multi-annual Community Program. Its aim was to stimulate the development and use of European digital content on the global networks and to promote linguistic diversity in the Information Society, or eContent. The program aimed at promoting digital content through existing and new delivery channels by stimulating exploitation of public sector information, by enhancing linguistic and cultural customization, by supporting market enablers, and by supporting action to disseminate results. It had a budget of €100 million and granted a total of 136 projects. It succeeded the work of MLIS and INFO2000.

Other projects funded by the FP5 Program included the Fauna Europaea project (2000-2004), coordinated by the *Zoologisch Museum* in Amsterdam. Participating institutions included *Naturalis*. The project aimed at producing a taxonomic framework and a software tool to support data transfer, and to collate and validate expert data files.[480]

In 2002, FP6 was launched (2002-2006) to contribute to the creation of research, fostering of scientific excellence, competitiveness and innovation through cooperation between universities, research centers and industry in EU countries and beyond. One research area was Research and Innovation, which involved the IST Information Society Technologies, with a specific theme on technology-enhanced learning and access to cultural heritage. FP6 IST funded the PRESTOSPACE project (2002-2008), aimed at preservation of storage and access, and a standardized practice for audiovisual contents archiving in Europe. It was coordinated in France with Dutch participants NIBG, the Filmmuseum and the NOB Cross Media Facilities. PRESTOSPACE aimed at building "preservation factories providing affordable services to all kinds of collections owners to manage and distribute their assets." It succeeded the PRESTO project of FP5 IST.[481]

Other projects funded by FP6 IST included EPOCH, Excellence in Processing Open Cultural Heritage project (2004-2006) with the Ministry of Culture, University of Groningen, HeritageSolutions, *Hogeschool van Utrecht* and the *Stichting Bedrijfsregio Kop van Noord-Holland*. The project focused on applications (e.g.

[480] http://cordis.europa.eu, Naturalis annual report 2002:50-51, http://www.faunaeur.org.
[481] http://cordis.europa.eu.

AR/VR, 3D) for the tangible cultural heritage of monuments, sites and museums. One of the products involved the Arc3D tool, which enabled users to upload images and subsequently download a 3D reconstruction.[482]

Dutch heritage institutions also received funding from FP6 Sustainable Development (FP6-SUSTDEV), part of FP6-INTEGRATING, which ran from 2002 to 2006. Such was the case with MARBEF (2004-2009), Marine Biodiversity and Ecosystem Functioning coordinated by the Netherlands Institute of Ecology. Its goal was to create a network of excellence aimed at integrating research efforts to coordinate research and better understand marine ecosystems. *Naturalis* was one of the participants. *Naturalis* also participated in the EDIT project, Toward the European Distributed Institute of Taxonomy (2006-2011) aimed at integrating taxonomic efforts across Europe by providing a suitable IT environment and by developing new tools.[483]

A project funded as part of the FP6 Structuring, itself part of FP6 Infrastructure research area, was SYNTHESIS, for Synthesis of Systematic Resources (2004-2009). It was managed in the UK and had as Dutch partners the University of Amsterdam, the Fungal Biodiversity Center, *Naturalis*, and the National Herbarium. The project aimed at developing a network to present the collections jointly for scientific use.

The eContent Plus Program, or Multi-annual Community Program to make digital content in Europe more accessible, usable and exploitable, took place from 2005 to 2008. Its aim was to facilitate access, use and exploitation of digital content, improve quality and best practice, and reinforce cooperation between digital content stakeholders. The program addressed areas slow to develop including geographic, educational, cultural, scientific and scholarly content. The eContent Plus Program was responsible for funding MINERVA EC with €950,000 in 2005.

Projects funded during the eContent Plus in 2006 included the TEL Plus Project (2007-2008) making content OAI compliant for OCR. It was coordinated in Estonia and the KB participated in the Netherlands. GAMA Gateway to Archives of Media Art (2007-2009) established a central platform to digitized media art archives. It was coordinated in Germany and had NIMk and the *Hogeschool voor de Kunsten* Utrecht as Dutch partner.[484]

[482] http://cordis.europa.eu/ist/digicult/epoch.htm.
[483] http://cordis.europa.eu/projects/rcn/74271_en.html; Naturalis Jaarrekening 2006:20.
[484] http://cordis.europa.eu.

Projects funded during the eContent Plus in 2007 included STERNA: semantic web-based thematic European reference network application (2007-2012). It was coordinated in Austria and had the *Teylers Museu*m, NIBG and *Naturalis* as Dutch partners. STERNA aimed at linking the web-based resources of 12 European institutions, with the focus on bird collections.[485]

Projects funded during the eContent Plus in 2008 included BHL-Europe (2008-2012). BHL-Europe was a project to improve the interoperability of the digital libraries of 15 natural history museums, botanic gardens and archives. Coordinated in Germany, Dutch participants included *Naturalis* and the European Digital Library Foundation (housed in the Netherlands at the KB).

The Europeana v1.0 project (2009-2011) developed and implemented a system for content availability via Europeana, and succeeded EDLnet (which created the Europeana prototype). It was coordinated by the European Digital Library Foundation.

FP7 started in 2007 and ended in 2013. Its goal was to further the FP6 (creation of a research area) by developing a knowledge-based economy and society in Europe and thus meeting the Lisbon strategy. Its tools were: supporting transnational cooperation, enhancing investigator-driven basic research, strengthening human potential in research and technology, and developing and enhancing research institutions and universities.[486]

FP7 had eight challenges, including technologies for digital content and languages, with specific calls for digital libraries, technology enhanced learning, and digital preservation. Digitization projects included the Virtual Museum Transnational Network, or V-MusT.net (2011-2015) coordinated in Italy with the *Allard Pierson Museum* participating as Dutch partner. The project aimed at integrating virtual museums as a sustainable solution for research fragmentation.[487] Another project funded under FP7 ICT was Material Encounters with Digital Cultural Heritage, or MESCH (2013-2017). It was a 4-year project aiming at designing, developing and deploying tools for the creation of tangible interactive experiences or exhibits using smart objects. The project was coordinated by the UK, with Dutch partners including *Museon*, DEN, *Stichting De Waag*, and the *Allard Pierson Museum*.

[485]Naturalis Financial Report, 2008:22.
[486] http://ec.europa.eu/research/fp7.
[487] http://cordis.europa.eu/projects/rcn/101496_en.html; APM, 2011:5.

Part of the FP7, the Infrastructure Work Program was responsible for funding the PESI Project, the Pan-European Species-directories Infrastructure (2008-2011). The University of Amsterdam was the coordinator, with Dutch participants also including *Naturalis*. The project provided standardized and authoritative taxonomic information by integrating a number of databases (with authoritative species name registers and nomenclatures).[488]

The Competitiveness and Innovation Program (CIP) was a complementary framework program that ran from 2007 until 2013. CIP succeeded FP6 Innovation but as a separate Framework Program. It aimed at fostering competitiveness of enterprises, promoting innovation (and eco-innovation), accelerating a competitive, innovative and inclusive information society, and promoting efficient, new and renewable energy sources. It funded, among others, the Information and Communications Policy Support Program, or ICT-PSP, responsible for funding NUMERIC (2007-2009) and ENUMERATE (2011-2014) (see section 5.4 of this chapter).[489]

HORIZON 2020 (2014-2020) became the Framework to follow FP7. The new framework merges the Framework Programs for Research and Technical Development together with the Competitiveness and Innovation Program (CIP) and the European Institute of Innovation and Technology (EIT). Horizon 2020 aims at creating a genuine single market for knowledge, research and innovation.[490]

The additional resources by the European funded projects had a great impact on a number of individual museums. The *Allard Pierson Museum* – one of the more active participants - was able to hire 5 new research staff and to achieve many organizational changes. Participation in European projects allowed *Naturalis* to increase resources towards digital activities, as can be seen in table 5.2. Being part of the EC network also supported knowledge exchange regarding best practice for the interoperability and presentation of collections.

[488] http://cordis.europa.eu/; Naturalis Annual Financial Report 2008:22.
[489] http://ec.europa.eu/cip/ict-psp/index_en.htm.
[490] http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=home.

Table 5.2 European project participation by Naturalis

Project	Project framework	Period	Total Project Cost In euros	Naturalis gross income In euros
Three Hundred Pearls	Raphael	1996-2000	NA	€115,248
Fauna Europaea	FP5 EESD	2000-2004	€3,235,029	€11,156
Marbef	FP6 SUSTDEV	2004-2009	€8,707,000	€101,444
SYNTHESIS	FP6 Infrastructure	2004-2009	€14,021,137	€136,384
EDIT	FP6 SUSTDEV	2006-2011	€15,000,000	NA
STERNA	eContent Plus	2007-2010	€1,870,000	€402,400
BHL	eContent Plus	2008-2012	€4,200,000	€55,442
PESI	FP7	2008-2011	€4,057,628	€6,300

Source: Cordis website and Naturalis annual financial reports. NA= data not available.

5.3 Initiatives of the European Commission for digitization

In addition to the Framework Programs, the European Commission develops initiatives that can extend across frameworks to support identified areas of interest. The long-term vision of the European Commission is drafted during meetings and result in Action Plans. These policy documents serve to coordinate the various activities, in this case specific to digitization.

In 2000, The European Commission met in Lisbon to draft the EU 2010 Lisbon Strategy. Its objective was to enable Europe to become the most dynamic and competitive knowledge-based economy in the world. The eEurope 2002 Action Plan (from 2000) stimulated the development and use of digital content and encouraged coordination of digitization programs among member states. On 4 April 2001, member states met and developed the Lund Principles, based on coordination, development of a unified vision on digitization policies and programs, promotion of good practice and skills development and collaboration to increase visibility and access to digitized cultural and scientific heritage. The Principles were made operational through the Lund Action Plan.[491]

The Plan set out to: (1) improve and reinforce the coordination of digitization activities; (2) enable the efficient and effective use of digitization to open up Europe's unique and significant wealth locked in its cultural and scientific heritage; (3) reduce, if not eliminate, redundancy and fragmentation of effort, divergence of technical

[491] http://cordis.europa.eu/ist/digicult/lund-principles.htm.

approaches, and waste of financial resources; (4) facilitate the creation of Europe's eContent industries; (5) capitalize on the investment made in digital resource creation; (6) deliver digital assets that promote and reflect cultural diversity; and (7) bring cohesiveness and shared vision to what is currently a fragmented area of activity.[492]

These goals were to be achieved by coordinating activities, creating centers of competence, developing benchmarking standards for digitization practice, and by forming National Representatives Groups (NRGs). These NRGs met regularly from 2001 to 2006. The seventh meeting took place in The Hague on 17 September 2004 during the Dutch Presidency which, together with the Luxembourg and UK presidencies, focused on developing the successor of the Lund Action Plan: the Dynamic Action Plan for the EU coordination of digitization of cultural and scientific content (2005).[493] Digital activities were supported through the FP5 and FP6 IST Programs.

In 2005, the i2010 Policy Framework for the information society and media called A European information society for growth and employment (2005-2010) was launched. It aimed at joining various policy initiatives into one strategy to establish a single European information space (including a single market for the digital economy), to reinforce innovation and investment in ICT research (to boost the economy), and to promote inclusion, public services and quality of life. One action implemented was the Innovation and Investment in ICT Research.[494]

The Commission recognized that digitization was "instrumental […] to exploit Europe's rich cultural and scientific resources […] and for keeping the past and the present alive for the future."[495] Digitization was key in the creation of educational resources, cultural tourism, and new markets, as well as for conservation and preservation of heritage. The Commission also identified considerable investment towards digitization but its fragmentation jeopardized access and economic sustainability. EU coordination was desired to reduce costs, share know-how, increase the use of standards and build on each other's work. Libraries and digitization were key in this process.[496]

[492] EC, 2001:33.
[493] http://cordis.europa.eu/ist/digicult/nrg.htm.
[494] EC, 2008:1.
[495] http://cordis.europa.eu/ist/ka3/digicult/home.html.
[496] http://cordis.europa.eu/ist/digicult/eeurope.htm.

The Digital Libraries Initiative (2005) promoted collaboration between cultural institutions, including the organization of the High Level Expert Group on Digital Libraries (HLEG) and the *Comité des Sages*. The HLEG (2006-2009) discussed and advised on copyright and orphan works, public-private partnerships for digitization and scientific information and open access. The *Comité des Sages* (2010) made recommendations in a report entitled *The New Renaissance*, on cultural heritage accessibility, for present and future generations, with focus on funding sources, private-public interactions, distribution of responsibilities and copyright.[497]

The i2010 Digital Libraries Initiative recommended setting up large-scale digitization facilities, so as to accelerate the process of getting Europe's cultural heritage online.[498] The European Digital Library, known as Europeana, was a result of these initiatives and was launched on 20 November 2007. Europeana was formed as a single website to bring together Europe's digital archives of culture, as well as to advance R&D on services and systems for digital libraries[499] and content to improve access to and digital preservation of cultural heritage. Europeana is a single access point dependent on partner institutions committed to the project. By 2012 Europeana gave access to over 22 million objects, from more than 2,200 institutions in 34 countries. The Netherlands was fourth in content delivery with 2,092,067 objects (or 9.37%). Europeana made its content (and therefore that of participating institutions) accessible for reuse, facilitated by the Europeana API (Application Programming Interface) and by the Europeana licensing scheme, a CC-0 license (Creative Commons public domain dedication).[500]

Digital preservation and ICT for access to cultural resources were identified as research priorities. The 2007-2008 Work Program focused on large-scale European-wide digital libraries, including cost-effective digitization processes, semantic based search facilities, and tools for preservation of digital content, in addition to developing new approaches to digital preservation. The 2009-2010 Program focused on handling end-to-end workflows for different types of digital resources, advanced

[497] http://ec.europa.eu/digital-agenda/
[498] http://cordis.europa.eu/ist/digicult/eeurope.htm.
[499] In the digital context, the term *library* has come to denote a digital access point to any information from any type of memory organization, such as libraries, archives and also museums.
[500] http://pro.europeana.eu/web/guest/about.

preservation scenarios, collaborative use, adaptive cultural experiences, interdisciplinary research networks and the uptake of EC funded research.[501]

The 2011-2012 work program focused on creating more reliable and secure preservation technologies and methods, for recovering loss and repairing damaged digital objects, for ensuring long-term availability (including 3D objects), and for developing quality assurance. It also required technologies and systems for intelligent management of preservation, interdisciplinary research networks and the promotion of schemes for the adoption of digital preservation. The ICT for access to cultural resources had four aims: (1) developing technologies for the creation of personalized and engaging digital cultural experiences; (2) supporting open and extendable platforms for building services that support the use of cultural resources for research and education, including all formats (sound, image, 3D, text) and characteristics (e.g. language, temporal, spatial); (3) improving technologies for the digitization of specialized forms of cultural resources, including tools for virtual reconstruction, and making them more affordable; and (4) rising awareness of research results.[502]

i2010 was followed by the Europe 2020 Initiative. The Digital Agenda is one of seven flagships for achieving the European Commission's growth strategy. One area involves Creativity and Media, including Cultural Heritage and involving the digitization of libraries, archives, museums and audiovisual archives collections to increase access, now and in the future.[503] At the time of writing, granting schemes and projects were being formulated.

5.4 Statistics on digital activities

The impact of the European Commission in the Dutch museum sector is not always easy to identify. This is because the magnitude of any international collaboration is not always easy to translate into lasting national efforts. In any case, there are collaborative projects in which Dutch participation has received sufficient national support to be able to continue beyond the initial EC effort. Such is the case of the NUMERIC project (2007-2009), designed to define empirical measures for digitization activities and to establish the current investment towards digitization in the 27 member states (with the exception of Malta, all other member states

[501] http://cordis.europa.eu/fp7/ict/telearn-digicult/digicult-previous-wp_en.html.
[502] http://cordis.europa.eu/fp7/ict/telearn-digicult/digicult-objectives_en.html.
[503] http://ec.europa.eu/digital-agenda/.

participated).[504] Though previous surveys had been done on individual collections (libraries, archives and AV), NUMERIC was the first effort to gather data across the heritage sector, not surprisingly encountering several methodological difficulties (e.g. definitions, units of measure). 788 libraries, archives and museums reported their digitization activities (representing a 51% response rate). 48% of institutions reported having a digitization budget, amounting to close to 1.1% of the total institutional budget, and reported allocating 2.5% FTEs (full time equivalents) to digitization activities.

The project was very successful in the Netherlands because of the national interest in gathering data and because of the financial support from the Ministry of Culture. The Netherlands was the only country participating in the project that received additional funds from its government. The national project was called *De Digitale Feiten* (Digital Facts) and was coordinated by DEN. This was an important digital statistics effort that would give the Netherlands the role of expert in the subject.

Digitale Feiten had two main goals: to develop a system that could be implemented for the structural gathering of digital heritage data (its production output and costs), and to gather statistical data that would give policy makers insight into the digital heritage currently available and the investment that has taken place.[505]

The project duplicated the NUMERIC approach and worked in four phases: (1) desk research was conducted to inventory known data and current data gathering efforts; (2) an on-line survey was tested with 20 national heritage institutions (100% response rate); (3) a revised on-line survey was sent to a larger population (N=214) collecting 108 responses (50% response rate); and (4) data was analyzed and reported to NUMERIC and to the Dutch Ministry of Culture.[506] Data was collected from libraries, museums, archives, historical centers and heritage related organizations in the Netherlands.

The desk research identified several data gathering efforts, including the Yearbook of Monuments, Archeology and Cultural Landscape; the bi-annual Bench Marking for University Libraries; the ICT Use in Museums Survey; and the annual ICT Archives Monitor. None of these surveys reported specific information on

[504] NUMERIC took place from May 2007 until April 2009. For a full description of the NUMERIC project see via the Internet Archive on 18 July 2009 at www.numeric.ws.
[505] Navarrete and Huysmans, 2009.
[506] Navarrete, 2009.

digitization production and costs. There was also a Project Bank coordinated by DEN, where organizations were able to submit information about their digital activities. The Project Bank was an inventory of projects including a project description, organizational and technical information, and a (rarely provided) financial report.[507] Museums reported an average annual expenditure of €729,918 for digital activities and reported wanting to digitize another 56% of their collections, against 33% that had already been digitized. This would amount to nearly 30 million museum objects yet to be digitized, using estimates from MusIP.[508]

Reporting data on the size of the digital collection at an aggregate level was challenging but reporting production and cost of digital materials at an object level proved impossible. The object type unit model used in the Digital Facts, based on NUMERIC, required a translation to fit the in-house accounting methods used. Insufficient data on production resulted in a partial result of the costs of production. Still, museums were able to report an average of 7% of the total labor being directed towards digital activities. Only 26 museums (or 43%) reported having an allocated budget for digital activities averaging 5% of the total institutional budget.[509]

Data on access proved to be similarly incomplete. Institutions reported insufficient knowledge of web statistics. There was no history of reporting the availability of digitized collections and no comparable information was available from other museum surveys. Access was the main reason to digitize, either for the general public, for specialized users or for schools, in the present and in the future. Access to collections is considered key in ensuring museums' relevance in society.[510]

The *Digitale Feiten* project provided the first measure of digital activities in 2008 (table 5.3) and highlighted the need for a method of reporting data at a national level. Gathered data demonstrated the need for sustainable investment towards digital activities in order to benefit from past investment. Museums reported undergoing digitization activities for ten years or more; some reported a history of up to 33 years. That represents substantial investment. Furthermore, estimating the extent to which

[507] Navarrete, 2009.
[508] Navarrete, 2009; Veeger, 2008.
[509] Navarrete, 2009.
[510] Navarrete, 2009. Data on access to heritage materials gathered from the Netherlands Institute for Social Research, or SCP (*Sociaal en Cultureel Planbureau*), is not specific enough about content from museums to be compared to the data available on production (Navarrete and Huysmans, 2009).

collections have been digitized first brought to light the lack of a homogenized vocabulary in the field.[511]

Table 5.3 State of digitization Dutch museums 2008 (N=60)

Type of museum	Museum of Science and Technology	Museum of Art, History and Ethnology	Maritime (incl. Other)	Audio-visual or Film Institute	Total
Number	7	42	6	5	60
% FTE for Digitization	3%	9%	3%	11%	7%
% budget for Digitization	1%	5%	0%	15%	5%
% collections to be digitized	57%	43%	81%	42%	56%
% registered collections on-line	75%	72%	70%	88%	76%
% digitized collections on-line	8%	37%	2%	-	16%
% registered collections on-site	100%	13%	50%	-	54%
% digitized collections on-site	42%	4%	2%	-	16%
Museums with an information plan	3	17	1	-	21 (35%)

Source: Adapted from Navarrete, 2009. FTE = Full Time Equivalents.

Digitale Feiten faced some methodological shortcomings regarding costs and access. A follow-up project was devised to address this concerns, called *Meer Digitale Feiten* (More Digital Facts). The project ran for one year in 2009 with four goals: (1) to develop a methodology to gather statistical data on the relationship between digitized materials and born-digital collections; (2) to develop a methodology to gather data on the investment towards technical infrastructure to make collections accessible; (3) to develop a method to gather and interpret web statistics; and (4) to monitor the growth of the Digital Collection Netherlands, as the digitization of physical heritage collections.

Regarding born-digital materials (e.g. databases, animations, games, photographs, 3D designs, email archives), an exploratory study on the pioneer heritage institutions was conducted with the goal of developing a methodology to measure born-digital collections. The 29 respondents, of which seven museums, reported easily collecting born-digital materials with a traditional counterpart (e.g. photographs, videos, audio, e-books) while new publication forms were collected ad hoc. User-generated content represented an important new form of acquisition. Costs related exclusively to born-digital materials included the development of digital preservation repository software, larger storage (to keep up with the data explosion),

[511] Navarrete, 2009.

keeping up with technology developments (or technology watch), creating metadata for rapidly growing collections, and licensing software unique to collected objects.[512]

Another report addressed web statistics. 69% of heritage institutions reported publishing images online and gathering web statistics (generally using Google Analytics). Of the 54 participating museums in the survey, 20 (or 65%) reported some form of web statistics on the online annual report, generally including number of visitors, number of visits, and number of pages viewed. The report further noted that institutions seldom reported methodology and definitions, essential during data interpretation, while attention to unique visitors had an importance not before seen with physical visitors, counted the same regardless of the frequency of their visits.[513]

A complementary project commissioned by the Ministry of Culture and coordinated by DEN in collaboration with Kennisland was called *Business Models Innovatve Cultureel Erfgoed* (BMICE - Business Models for Innovative Cultural Heritage). The project resulted in a publication on business models and a cost model, developed to estimate the cost of digitization of paper collections (newspapers, photographs, archives), along with a list of potential cost items: personal costs, handling costs, software, hardware, ICT infrastructure, rights clearance, promotion and presentation, and costs related to management and exploitation.[514] These additional research projects strengthen the Dutch methodological experience in data gathering regarding digital heritage activities which would be put to use during a future European project, known as ENUMERATE.

In 2011, the Commission funded a second European survey on digital collections, through the ICT Policy Support Program ICT PSP. ENUMERATE (2011-2014), led by Collections Trust in the UK and in collaboration with ten partners, aimed to create a reliable baseline of statistical data about digitization, digital preservation and online access to cultural heritage in Europe. These themes were researched through multi-annual surveys and in-depth surveys,. DEN was the Dutch partner in the project.[515]

The ENUMERATE survey received 1,951 responses from heritage institutions throughout Europe of which 864 were museums. In the Netherlands, 141 institutions

[512] Van der Graaf, 2010.
[513] Voorbij, 2009.
[514] Gillesse, 2010; http://www.den.nl/thema/36/. The Cost Model was developed from an earlier model developed by Alfred Stern, in 2008 for the Gelders Archive.
[515] http://enumeratedataplatform.digibis.com/.

responded, of which 93 were museum institutions (not including audiovisual institutions). Regarding production, Dutch museums reported having 41% of their collections digitally reproduced (with a catalogue entry and a digital image), which is higher than the average percentage of digitization in all Dutch heritage institutions (32%) and significantly higher than the average reported European percentage (20%). Drawings, postcards and paintings were reported as the types of object most often digitally reproduced, probably due to the complexity involved with other types of objects (e.g. oversize formats, 3D).[516]

Dutch museums also reported a higher performance when supported by government funding. Table 5.4 below shows the source of financing for digital activities reported by 93 Dutch museums in 2012. Not all museums responded to this question, yet from the partial results it is clear, as is to be expected, that the 26 institutions receiving additional government grants have a higher average of collection digitization production (50%) and online dissemination (39%) than the national average, including 5 museums not allocating institutional funds (i.e. not having an earmarked digitization budget).[517] That is, government grants, additional to regular subsidy, result in a higher production of digital heritage, as well as a higher online distribution of the heritage materials.

Table 5.4 Source of financing towards digital activities (N=93)

	Collections digitized (%)	Collections available online (%)	Number of institutions
Total museums	**41**	**25**	**93**
Internal budget	45	21	52
Government subsidy	50	39	26
Commercial trading	13	34	3
Private investment	30	33	3
Public-private partnership	38	35	7

Source: own, adapted from ENUMERATE data set 2012.

Regarding having a digital preservation strategy, either a written institutional document or being part of a national strategy or infrastructure, Dutch museums ranked lower (27%) than the average reported for the all Dutch heritage institutions (40%) yet higher than the average reported by European museums (19%). Regarding giving access to collections, Dutch museums reported giving access to 62% of their

[516] Stroeker and Vogels, 2012:21; ENUMERATE dataset.
[517] ENUMERATE dataset.

collections offline while only 25% of their collections were accessible on the institutional website, compared to the Dutch averages of 55% and 28% respectively. The average European museum reported similar percentages: 60% of collections were available offline and 20% were available on the institutional website (table 5.5).[518]

The expenditure towards digitization was estimated by dividing the budget earmarked for digitization by the number of FTEs allocated to digital activities. This method was devised to make results comparable between the different organizational sizes (with annual budgets ranging from less than €10,000 to more than €10 million). At the European level, audiovisual institutions reported the highest digitization budget, allocating €103,000 per FTE to digital activities, which sets the total average significantly higher. Dutch museums allocated €17,000 per FTE working with digital activities in 2011.[519]

Table 5.5 European state of digitization 2012 (N=1,951)

	Netherlands N=141	Museums N=93	EU N=1,951	Museums N=864
% of institutions with a digital collection	83%	84%	83%	83%
% of collection digitized	32%	41%	20%	28%
% of institutions with born digital objects	33%	17%	52%	46%
% of institutions with a digitization strategy	54%	55%	34%	39%
% of institutions with a policy for use of digital collections	52%	18%	31%	28%
% of institutions with a digital preservation strategy	40%	27%	23%	19%
Expenditure towards digitization in 2012 (in thousands)	€25	€17	€39	€22
% of digitization staff of total staff (FTEs)	16%	11%	3%	6%
% of collections available offline	55%	62%	60%	60%
% collections available online	28%	25%	43%	29%

Source: Adapted from Stroeker and Vogels, 2012; ENUMERATE dataset. FTE = Full Time Equivalents.

The two international surveys had an important difference in the selection of institutions participating in the survey. Whereas NUMERIC identified *significant* institutions (those involved in the digitization of collections), ENUMERATE invited all institutions to participate, of which 17% were not involved in the digitization of collections at all. This made the pool of institutions considerably different. Division of the type of collections was also changed, giving Art Museums a separate category, while Maritime Museums lost their individual category. Data comparison must therefore be done with caution. For instance, in the NUMERIC survey, Dutch

[518] Stroeker and Vogels, 2012:21; ENUMERATE dataset.
[519] Stroeker and Vogels, 2012:21.

museums reported publishing 54% of their collections online (with an image) while in ENUMERATE only 24% of collections are reported being available online (with an image). This would represent a decrease in online publication, which is not possible. Most probably, the discrepancy is caused by the different pool of respondents resulting in a different average.

A closer look at the 93 responding Dutch museum shows that the type of collection generally represents a difference in practice. The archaeology and history museums reported the highest percentage of FTEs directed towards digital activities (15%) while the art museums reported allocating the highest yearly amount to digital activities (at €33,000 per FTE working on digitization). The museums that allocated a higher amount of Euros towards digital activities (calculated as earmarked expenditure over staff working on digitization) reported a higher percentage of digitized collections. That is not the case when looking at the allocation of earmarked funds as percentage of the total budget, as can be seen with the archaeology and history collections having the highest resource allocation (6%) but a lower reported production (32%). This indicates that the overall size of the institution, and not the ratio allocation of funds, makes the greatest impact. There appears to be a reduction of the average percentage of collections that need to be digitized, from 56% reported in the NUMERIC survey to 37% reported in the ENUMERATE survey and an increase in the collections digitized, from 33% to 49%. This indicates an advance in the digitization efforts at a national level.

Dutch museums in general reported having a digitization policy or strategy more often (55%) than in the NUMERIC survey (35%), which can be an indication that the national policies to support the creation of such plans (starting with the Policy-based Digitization subsidy scheme) have been successful. Dutch museums do not always require a policy for the use of digital content (18%) but are increasingly aware of online use (22% measure some form of online use) (table 5.6).

Table 5.6 State of digitization in Dutch museums 2012 (N=93)

Type of museum	Museum of Anthropology and Ethnology	Museum of Archaeology and History	Museum of Art	Museum of Science and Technology	Other type of Museum	Total
Number	6	39	12	6	30	93
% FTE for digitization	0%	15%	9%	NA	8%	8%
% of budget for digitization	1%	6%	2%	1%	1%	2.6%
% of collections digitized	76%	32%	64%	28%	44%	49%
% of collections to be digitized	22%	54%	31%	40%	38%	37%
% of digitized collections on-line	40%	8%	29%	5%	40%	24%
% of digitized collections on-site	50%	51%	60%	30%	79%	54%
Digital activities expenditure (in thousands per FTE)	**€17**	**€11**	**€33**	**NA**	**€19**	**€20**
Museums with a digitization strategy	3	24	9	0	15	51 (55%)
Museums with a use policy	0	6	5	0	6	17 (18%)
Museums that monitor online use	1	9	2	0	9	21 (22%)
Museums with digital preservation strategy	1	9	3	0	9	22 (23%)

Source: Adapted from ENUMERATE dataset. FTE = Full Time Equivalents.

International surveys try to give an estimate of the resources that need to be allocated in the future to make heritage collections available digitally, as has been a European political goal for some decades. But does allocation of resources to digital collections indeed result in a higher production or higher availability of digital collections? Table 5.7 shows the results from Dutch museums according to the allocation of resources as calculated in Euros per FTE earmarked for digital activities. Clearly, museums with a higher allocation of resources have greater availability of collections online. That is not the same, however, for the production of digitized materials, as percentage of the total collection size. The reason for this may be found in the availability of web support staff, rather than the staff involved with digital collection production. It is to be expected that institutions with a greater budget are able to have the expertise in house needed to ensure the online publication of collections, generally taking place outside of the collections management and care department.

Table 5.7 Digitization budget reflected in production and publication (N=48)

Digitization budget (allocated €/FTEs)	Institutions	Average allocated FTE staff for digitization	Allocated staff for digitization (%)	% of collections digitized	% of collections available online
<1,000	14	0	12	42	16
1,100-5,000	10	1	19	51	18
5,001-10,000	5	1	30	33	6
10,001-50,000	14	4	10	48	46
50,001-100,000	4	2	3	48	43
>100,001	1	1	NA	48	40

Source: Adapted from ENUMERATE dataset. FTE = Full Time Equivalents.

This raises two important points. What constitutes the digital production process? If digitization of collections is meant to increase and enhance access to collections, as was reported, then it is expected that part of the production process will involve the publication of the digitized information. It is relatively simple to convert a selection of fields from the digital information system into a list to be published online so that the public can access the digitized content. Still, institutions report having digitized almost half of their collections yet only a fourth is published online. What is the reason for this? The international surveys do not report on this issue. The national survey from 2007 reported museums experience limited resources (70%), too few ICT staff (69%), too little ICT know-how (46%), too little knowledge of system management (40%) and too little knowledge of the Internet and of web development tools (35%).[520] In addition, issues concerning intellectual property rights may also play a role.

Gathering of subsequent data, with an established methodology, will give a more accurate indication of the policy elements that make an impact on production and publication of digital heritage collections in digital form. Without a doubt, these international efforts have a great impact on countries not only for data gathering, but also for establishing methods for the gathering and evaluation of data to support informed policymaking.

5.6 Conclusions

The adoption of computers by museums abroad had an early influence in the Netherlands, thanks to the dissemination of information during conferences and

[520] DEN and NMV, 2008:21.

through the creation and distribution of various tools, including the registration card used by MDA, which was broadly adopted by Dutch museums. The Netherlands decided early on to support the formation of standards within the international framework, working in teams, instead of striving to produce new applications for museum work. The international community had an important network effect, as it still does, especially for the setup of international collaboration projects financed by the European Commission. The Netherlands has been part of the international network since the mid 1980s, as attendant and presenter in various conferences, as member of international committees, as advisor in numerous research projects and as leader in digital heritage policy making (particularly during the Dutch EU presidency in 2004).

Dutch museums have been part of collaborative projects at an international level since the first European Museum Network in 1989. This chapter presented a selection of projects in which Dutch museums, and other Dutch institutions, took part. *Museon*, *Naturalis*, *Allard Pierson Museum*, NIBG and the RKD have been regular participants while the *Teylers Museum*, the *Rijksmuseum*, the *Filmmuseum* and the NIMk participated once. In addition to museums, KB, NA, multiple universities and research centers, and European foundations housed in the Netherlands (e.g. TEL) have taken part in numerous other projects within the field of cultural heritage digitization. The KB has an important presence in European projects due to its size and because it has the national mandate for advancing research and development for the heritage field. The best practice and standards developed are adopted by museums through the various KB programs, including *Metamorfoze* and *Geheugen van Nederland*.

Some digitization projects involving Dutch museums have been funded from programs specifically aimed at supporting heritage content or digital cultural resources, including digital libraries and digital preservation programs. The majority of projects, however, have been funded by other programs including communication, (multilingual) information, the information society, infrastructure, telematics and telecommunications, sustainable development, intelligent content and semantics, and competitiveness and innovation. As becomes clear from our overview of projects, digital tools can support a number of goals while additionally improving heritage information services.

Early European projects aimed at exchanging collection data and remote access, in several formats (text, images, sound, video and 3D). Exchange of data required the development of systems and web-based tools as well as standards for the organization of information to assist interoperability (thesauri and taxonomies). Exchange of information has also required the establishment of a legal framework to support access. Increasingly, restoration and preservation of materials (starting with audio-visual collections) has gained attention. Projects have generally been organized around thematic networks, including art, natural history, or cultures (e.g. Egypt). Ultimately, collections from Dutch institutions are being merged into the European digital library Europeana, amounting to 9.4%, or 2.5 million objects, of the total contributed content.[521]

European projects began small by connecting heritage institutions, enabling them to work together to find solutions for the exchange of information. However, with the growing complexity of projects and size of budgets, it became increasingly difficult for small institutions to take part. This is further aggravated by complex government structures that govern museum activities, particularly small and state museums, which are not always able to receive funds directly. National and independent museums, therefore, have a certain advantage. Because European projects have focused on building a physical infrastructure, establishing standards for interoperability, and building tools to exchange data, little has been done to support the organizational change required to fully adopt a digital work practice. Only relatively few Dutch museums have participated in European projects, the science museums being most often represented (*Museon* and *Naturalis*).

Another reason for the limited participation of Dutch art museums in European projects may be linked to the complex administrative requirements, which not all institutions are able to meet. There is an *Expertisecentrum internationaal Onderzoek en Innovatie* (EiOI - Expertise Center for International Research and Innovation) in The Hague but it is not very well known within the sector. Furthermore, EU projects continuously change, requiring much effort to keep up with their structure and to understand revised requirements.[522]

European projects have contributed, directly and indirectly, to the building up of networks of excellence in which institutions are able to share knowledge. However,

[521] As of 18 March 2013 (http://www.pro.europeana.eu/web/guest/content).
[522] Visser, 2012.

knowledge transfer from European projects into the field has not always been easy. Projects are not always required to actively disseminate results, which would support the knowledge transfer process. There is also no knowledge-transfer system in place, though this is slowly changing thanks to an increasing awareness of international collaboration and the importance of shared results. DEN supports dissemination through the project bank and through yearly conferences, yet reporting of results is partial, presentation of results from museums occurs ad hoc, and there is no knowledge infrastructure in which projects can contribute their results to stimulate re-use. Conferences continue to be the place to share experiences. The Netherlands has been presenting papers at the Museums and the Web conference since 2001 with on average around two paper presentations per year. A slight increase in Dutch museum participation in European projects may reflect a growing trend of international collaboration. The extent to which all museums may benefit from international participation depends on the sector's ability to share experiences, both positive and negative.

From the most recent European data available, Dutch museums rank high in digital heritage activities with an estimated 41% of collections digitized, against a 28% European museum average, supported by a higher prevalence of having a digitization strategy, at 55% in Dutch museums compared to 39% in European museums. Access online, however, is slightly lower at 25% against 29% found throughout European museum websites. Though expenditure towards digital activities is somewhat lower in Dutch museums (at €17,000 against €22,000 for European museums), a higher percentage of staff is involved in digital activities (11% against 6% FTEs in European museums). The implications of these results on informing funding policies to stimulate the production and access of digital heritage materials require careful analysis. Museums respond differently to national incentives based on their organizational make-up, including size, collection type, and individual staff. It is to be expected that national differences will also influence the museum's ability to implement European guidelines.

Finally, what becomes abundantly clear from projects funded by the European Commission is that in the digital world the traditional distinction between memory institutions (such as libraries, archives and museums) is losing its significance. European policy is all about (digital) access to and preservation of cultural heritage, irrespective of format, type of object, subject matter or institution. Libraries, archives

and museums share ideas and technical solutions, and cooperate in research and development projects. A Europe-wide service such as Europeana is, in fact, a digital library, archive and museum under a single roof. It remains to be seen how this will impact on traditional institutions and the organization of the cultural sector as a whole.

6. Becoming digital: the history of adopting computers in museums

The work of museums has fundamentally changed with the adoption of computers. However, the *friendship* between museum work and the new digital tool was not instant. Initially, museum collections, particularly in art museums, appeared to be incompatible with the computer. The adoption of the computer and, eventually, of the Internet as essential components of museums' work has required an adaptation process that has lasted almost 50 years. Work practices had to be adjusted in response to the emerging new processes, which meant that procedures deeply embedded in the organization had to be made transparent, often to the discomfort of museum staff. The transition further included a few unintended results, among which the loss of information during data migration from a manual information system to an automated one. The relationship was confrontational; it required *starting everything over again*. Museum staff did not always respond positively and sympathetically to the slow metamorphosis that accompanied the new work tool; there was no interest in making any sort of dramatic change, while long-term benefits became increasingly visible. Eventually, something new was formed out of the alliance between the conflicting computer and the museum organization: a digital museum.

Museums had not anticipated becoming digital, partially because there was no precedent that could serve as a point of reference. Museums adopted a technology to improve collection management but, as a result, the tool became an agent of change that reshaped the organization. As stated by a museum staff: digitization came in to paint the front door, but ended up remodeling the entire house. Museums, and their collections, were becoming digital.

Being a *digital* museum refers to an institution able to use the digital tool throughout its core activities to enhance collecting, preserving, researching, exhibiting and communicating. Allowing the digital to unify production, on all levels, dissolves the isolated fragmented project approach to investment in digital tools. As institutions become digital, the computer is positioned to enable new working methods that increase transparency and allow the establishment of two-

way communication channels with a greater exchange of information. Key is to include all information assets as part of the collection and to allow objects (and their stories) to be positioned in new contexts, also outside of the institutional borders. What characterizes the emerging digital museum organization is its increasing institutional reach in the networked market of information.

There is a clear three-part process to becoming digital: first, museums use computers for internal management, with all the problems and solutions that entails. Second, museums use computers to communicate with their public, publishing institutional information followed by placing collections online. Last, museums fully adopt digital tools, allowing them to permeate all core activities and eventually merge into the networked market of information.

As the following sections will explain, the half century process of adopting computers has had important consequences: there seems to be a common view of the role of computers in the creation of a digital museum, institutions are having to work within networks to develop different areas of their work process, and the visitor increasingly defines the nature of the communication with the institution.

Why did the computer turn out to be an agent of such transformational change? Why do institutions continue to have *mixed feelings* about their relationship with the networked computer? And why is the visitor key in allowing museums to become digital? This section discusses these changes supported by the works of Pinch and Bijker, who studied technology as a social agent, by applying economic network theory described by Shapiro, Varian, Katz, and Economides, and by mapping communication in the information market as proposed by Mackenzie Owen.

6.1 Users and technology

Museum staff members were the first users of computerized collection information. At the very start, museums and governments dreamed of multiple applications and identified myriad possibilities for change. The Ministry of Culture linked research and computers (in the 1976 *Naar een Nieuw*

Museumbeleid policy document) and institutions explored potential applications. Anything was possible. Soon, it became clear that the computer required systems of order in which information was structured during input to enable some kind of sensible output. This led to a first general understanding of the computer as a management tool to facilitate object inventory: information about objects was retrieved based on inventory number, maker or year. During the following decades, objects were ordered in inventory systems, data fields grew to accommodate more information and additional information was linked (e.g. an image for identification), all serving as tools for location, administration, and budget allocation. In the early 1990s, government subsidies supported the acquisition of computers and stimulated a good inventory of collections, mostly to facilitate identification of objects in need of preservation. The computer was not seen as a tool to assist preservation, but as a tool to ensure accountability of collections by the autonomous managing museum. In the background, the tool continued to promise assistance to other activities, such as curatorial research (identified by the AMI group in 1980) and communication with the public (as in the European Museum Network launched in 1989). In the 2000s, the generally accepted role of computers changed: computers were seen as a way to advance communication with the public. Since then, numerous policy programs have been set in place to ensure collections are published online (such as the *Geheugen van Nederland* project from 2000). Soon after, institutions have explored the potential of the computer to assist research (e.g. in the CATCH projects) and further core activities of the museum.

The role of the computer changed from being a machine that facilitated collection inventory to a tool that enhanced communication with the public to an essential part of the everyday activities of the digital museum. This change was brought about not only by the technical advancements, which are certainly vast, but more so by our perception of what the computer is capable of doing and ought to do. This assertion has been the basis of the SCOT theory, or the Social

Construction of Technology theory developed by Pinch and Bijker.[523] SCOT theory revolves around the idea that "technology and society are entangled together."[524] Pinch and Bijker argue that adoption of technology is based on people's interpretation of its use and value, which are defined by social, cultural and political determinants and not only based on technology's intrinsic characteristics. That is, adoption of technology depends on how people *interpret* technology.

Interpretations can vary among social groups when a new technology is introduced, sometimes even leading to opposing perspectives. This is because different groups may experience a different problem when adopting the technology depending on the social, cultural and political context. Eventually, one interpretation of the use of a technology will prevail over the others in what Pinch and Bijker call a *closure*. That is, when a social agreement is reached for the role of a technology, that one interpretation will be adopted into the overall system of belief and practice while rendering alternative interpretations as unpractical. In this way, technology gives a solution to the perceived problem. Closures can also be attained when the problem changes: a new problem redefines the role of technology and therefore requires a new interpretation, in a sense giving closure to the previous perceived problem. As it is expected, closures are not fixed. Eventually, the use of technology in society will be confronted by new problems, new technologies and new interpretations making this a long-term cyclical process of closures and openness.

Why did the computer turn out to be an agent of change in museum institutions? Why did it not remain an inventory tool to support the management of collections? From the account presented in this work, the problem of efficiency in the management of objects was experienced as being so great that the computer

[523] Pinch and Bijker, 2012:16. In the late 1980s, a group of academics explored the bridging of social studies and technology and developed the Social Construction of Technological Systems framework, or SCOT. SCOT, also known as LTS (Large-Scale Technological Systems), was joined by ANT (Actor-Network Theory) to make a new sociology of technology. SCOT highlights group dynamics, while ANT considers the influence of nonhuman (machines and natural forces) factors.
[524] Pinch and Bijker, 2012:xxiii.

became to be seen as a very welcome solution. All interpretations initially envisioned in the 1970s, including the computer as a tool to support research, were minimized by the great efficiency brought to collection inventory: the computer served to manage quantitative data (e.g. inventory number, location). A first closure in the adoption of computers thus came when the museum sector, and the government, interpreted computers to be a tool to facilitate the inventory of collections and assist in the management of object care. There was a major social investment in adopting computers, not only financially but mostly requiring a change of work practice to accommodate the new inventory work form. With the development of the Internet, new interpretations emerged: the computer provided a platform for publication, it supported full documentation of collections, it provided a new preservation medium, it served to lower staff costs, and it facilitated the exchange of information. The computer also served to manage qualitative data (e.g. historic documentation). However, the prevailing interpretation of the use of the computer points to a more transcendental application: it serves to transform museums into *digital* museums. The concept of a digital museum can be defined as a museum having fully incorporated digital tools in its work methods, having digitized its objects and object-related information, and having a presence on the Internet (and through other digital modes of communication such as *apps*) that is a full-scale digital equivalent of (if not a substitute for) the traditional, "physical" museum. The sector appears to have come to a *closure* on how to use the changing digital technology, even if that interpretation has not been fully realized in practice. A future interpretation, currently only on the horizon, is that of *the* digital museum: the total – national or even global – collection of cultural artifacts and heritage information, in some way organized and contextualized as a *virtual* museum separate from and above individual museums. Europeana provides a glimpse of what that future may be.

Table 6.1 below presents the changes in interpretation of computers during the 50-year adoption period for the museum sector, for the financing government and for the visiting user. From the account in this work, the interests of the government have been found to be different from the interests of the individual

museums. During the 1970s, the government saw computers as a way of assisting research, but museums focused on controlled data entry systems for object inventory. During the 1990s, museums found the national basic inventory card to be an impoverishment of the institutional information systems while the government saw the benefit of the use of standard: a standard inventory card supported interoperability. Curiously, little has been documented on the perception of the visitor regarding computers at the initial stage since their role was kept marginal.

Table 6.1 General interpretation of computers changing over time

Group	Interpretation 1 (1960s-1970s)	Interpretation 2 (1980s-1990s)	Interpretation 3 (2000s)	Interpretation 4 (2010s)
Museum	New tool: Serves to explore application possibilities	Administration tool: Serves to fight registration backlog improving work efficiency (quantitative data)	Communication tool: Serves to broadcast collection information (qualitative data)	Transformation tool: Serves to enable museums becoming *digital*
Government	Research tool: Serves to facilitate research	Management tool: Serves to enable eGovernment transition	Economic tool: Serves to support economic growth	Economic tool: Serves to position Dutch service industry worldwide
Visitor	N/A	Communication tool: Serves as alternative publication format	Communication tool: Serves as alternative publication format	Communication tool: Serves to exchange information

Source: own.

By identifying museums interpretation of computers as an administration tool explains why certain early applications were more predominant over others. For instance, it is striking that museums, with many 3D objects, did not adopt 3D technology until after the 2010s. Isolated experiments with rotating photographs have been identified in 2005 (the bird collection at *Naturalis*), while x-ray and CT scans date from 2004 (sculptures from the *Rijksmuseum*). In contrast, augmented and virtual reality visualizations using museum objects were used in 2010 (archeology reconstructions at *Allard Pierson Museum*). So while the technology was available to map objects three-dimensionally since the 1970s, Dutch museums began exploring new visualizations using 3D applications in the mid 2000s and did not fully adopt the technology until after 2010. Even if the

computer power and memory was limited and expensive, museums did not believe 3D was as important in the 1970s as they do today.

Identifying the successes as well as the encountered dead ends when adopting computers for museum work enables a holistic analysis of the role of a new technology in society, as proposed by the SCOT theory. This has been the goal of this book, to present a wide perspective of the elements that have shaped the current digital heritage landscape.

6.2 The variety in museums

SCOT theory states that interpretations vary depending on the social, cultural and political context of society. In the case of Dutch museums adopting computers, what are the determinants that shape the adoption of computers? Is adoption of computers in Dutch museum work comparable? Based on the data presented in the previous chapters, it can easily be said that the type of collection and the type of museum are important elements that influence the adoption of computers. Table 6.2 below presents selected differences relevant to the process of adopting computers in a selection of museums. Important elements include the main source of funding (national, university and city), as well as the type of collection (natural science, art and history, ethnographic, maritime and archaeological).

Naturalis had a noticeable early start in the use of computers (1974, but in fact plans for automation started in 1970). The process of automating collection registration from a manual taxonomy-based information system received less resistance than from history-based information systems. The art and history collections of the *Rijksmuseum* have focused on achieving and delivering high-quality standard digital images, as opposed to *Allard Pierson Museum's* archeology collection, which has recently been focusing on interactive displays of enhanced object visualization, or to the *Naturalis* mass-digitization approach.

Autonomy of decision-making regarding digitization policy and allocation of resources can influence digital activities. From the case studies, it has become evident that being part of a larger management body can reduce freedom of

decision-making. Such was the case when the *Allard Pierson Museum* chose a collections information management system, or when the *Amsterdam Museum* decided to publish collections online. In contrast, the *Tropenmuseum* has benefited from international collaboration.

Table 6.2 Adoption of computers by different type of museums (2013)

	Allard Pierson Museum	Amsterdam Museum	Maritime Museum Rotterdam	Naturalis Biodiversity Center Leiden	Rijksmuseum Amsterdam	Tropenmuseum Amsterdam*
Type of collection	Archaeological	Historical (local)	Maritime	Natural History	Art and History	Ethnographic
Year opened	1934	1926	1874	1820	1885	1871
Size of collection	15,000 objects	90,000 objects	600,000 objects	37 million objects	1 million objects	600,000 objects
Type of museum	University	City	National	National	National	National
Autonomy since	NA	2009	NA	1995	1995	NA
Digitization started in	1985	1992	1980	1974	1985	1992
Year of current collections system adopted	2013 (Adlib)	2002 (Adlib)	(Adlib)	2010 (CRS)	1998 (Adlib)	2000 (TMS)
Total FTEs	12	97	42.5	200	392	55
Digitization FTEs	1	-	-	-	-	-
Total annual budget	€2.1 million	€10 million	€3.8 million	€24.7 million	€84.4 million	€9.2 million (KIT €43.2 million)
Digitization budget	-	€50,000	-	-	-	€25,000
Year of first website	1997	1999	1998	1998	1999	2002
Collection online since	2004 (catalogue)	2010	2002	2001	1998 (ARIA) 2004 (Adlib)	2002
% of collection digitized	100% (catalogue)	100% (catalogue) 60% (with image)	-	10% (catalogue)	50% (catalogue) 10% (with image)	100% (catalogue) 85% (with image)
Use license of online content	CC BY-NC free use, otherwise paid use.	CC-0	CC BY-NC free use, otherwise paid use.	CC BY-NC free use, otherwise paid use.	CC-0	CC-BY SA
Characteristic priority in digitization	Interactive/ enhanced	Linking objects	Regular production	High-quantity production	High-quality content/images	Contextual information

Source: own. NA=Not Apply. (-)=Data not available. * Data from the Tropenmuseum in Amsterdam reflects the situation before the merger with two other ethnogracphic collections, changing the institutional make-up dramatically.

The relationship with the public has developed in different ways for the various museums. The difference does not seem to be linked to the type of collection or the source and size of the budget but to market trends. An inclination

can be seen toward greater communication with the public, allowing greater quantity and quality of content available online, either on a (thematic) institutional website or through other channels (e.g. Wikimedia, Europeana). This is further enhanced by the CC-0 license (No Rights Reserved) used by the *Rijksmuseum* and the *Amsterdam Museum*, as well as the CC-BY SA license (Attribution, Share Alike) used by the *Tropenmuseum*. Generally, museums have a history of using a CC-BY NC type licenses (Attribution, NonCommercial) for small projects, while commercial projects remain a source of income.

There does not seem to be a direct relation between the year digital activities were started, or the year the current system of collection information management system was adopted, and the percentage of collections digitized or those available online. Insufficient data is available about the use of resources, as number of FTEs and digital activities budget, to make any comparison among institutions. The lack of available data may be related to a culture discouraging institutional transparency (financial information is perceived as highly sensitive information not easily shared). Considering the total institutional budget against the size of collections, with the *Allard Pierson* having the highest rate (€140 per object) and *Naturalis* the lowest rate (€1 per object), in relation to the percentage of collections digitized shows a slight relation (correlation 0.59) suggesting museums engagement with multiple activities (beyond digitization). In contrast, considering the total staff per object, where the *Amsterdam Museum* has the lowest rate (928 objects per staff) and *Naturalis* the highest rate (185,000 objects per staff), in relation to the percentage of collections digitized shows a higher correlation (0.84) suggesting that digitization of museum collections remains a highly manual activity.

It can be concluded that the approach to adopting a digital work practice is dependent on the combination of a number of elements, including the type of collection, available resources, application of technology and the access strategy to deliver a digital collection, in combination with market trends, available technology and user demands. There is no success formula or one-size-fits-all solution. However, the case study accounts also show that charismatic individuals

capable of overcoming resistance to innovation within the museum - what Everett Rogers has called *champions* - have greatly influenced the adoption of computers.

6.3 Getting into the Network

Digitization has brought with it a sense of belonging to a network that has expanded with the arrival of the Internet, but has its origins in the early projects of computer adoption. Before adopting computers, collaboration among museums was limited to the exchange of objects for exhibits, sharing work practice during conferences, or the occasional joint publication. With computers, all aspects of museum work benefited from a collaborative approach because adopting the new working tool required a tremendous effort. Museums understood this and worked together to pool resources and to share the workload. Early collaborative projects involved the identification and selection of object identifiers to form the standard object documentation (leading to the basic registration card), and the development of controlled vocabularies and thesauri to structure data in an automated information system. And so a network of ethnographic museums, art museums, and natural history museums developed around collection documentation and access.

Not everyone shared experiences or participated in the network, particularly not in the early stages. Little by little, the early experiences were shared across institutions, serving to decrease the repetition of problems when adopting computers. The communication of institutional experiences made evident that there were issues that all institutions shared, making possible the application of one solution for multiple institutions (e.g. controlled vocabularies). The networked computers tested the goals of museum work: the adoption of a standard system to document objects facilitated data exchange (benefit) but also required updating the existing information system, which meant high labor costs (disadvantage); the establishment of controlled vocabularies harmonized and professionalized work (benefit) but also simplified and limited the expression of knowledge about the objects (disadvantage); the adoption of a digital information system increased efficiency and search possibilities (benefit), but it was

complicated and triggered preservation warnings (disadvantage); publishing objects online increased visibility (benefit) but threatened to reduce visitor numbers within the museum itself (disadvantage). Eventually, and with the spread of the Internet, the benefits of being part of the network became too strong to be ignored.

Benefits were noticeable particularly to those joining later on: the basic standards were established (the basic registration card was launched nationwide in 1987), the software and hardware were established (most of the software currently used was in place by 2000), the Internet had proven its permanence (it was not a fad), and all the important players were using computers. Museums that joined later did not bear the costs of developing the network, yet could gain benefits by adopting standards (joining the museum network) and by getting online (joining the greatest of networks). Those already in the network further benefited by newcomers. It was a network of museums working together as within the larger network of information exchange, the Internet.

The process of museums adopting computers and joining the Internet follows the characteristics observed in economic network theory. Network theory explains the mechanisms at play as people connect and build linking systems, including roads (e.g. railroads, highways) and telecommunication systems (e.g. telegraph, telephone, internet). Network theory argues that the "value of connecting to a network depends on the number of other people already connected to it."[525] The larger the network is, the larger the benefit received. This is because of *positive feedback*. Positive feedback is key to networks because of its magnifying nature: it makes the most popular network grow as users will prefer and choose the largest and strongest network, in turn making the weaker network weakest through negative feedback.

As networks became larger and stronger, they offer additional value to the consumer. A good example is email: getting an e-mail account became more interesting as more people had e-mail, and the more people that joined the electronic mail system reinforced the value to those already using it. Another

[525] Shapiro and Varian, 1999:174.

example is the electricity network: as more people demanded electricity services, additional products were more likely to be made available (e.g. different watt or bulb types) as producers sought economies of scope (delivering varied and complementary goods). Benefits can be direct, as in the case of e-mail, or indirect, as with electricity.[526]

Like feedback, networks can bring positive or negative effects to those joining. These effects are called *network externalities*.[527] They are called externalities because an effect is received without payment or compensation.[528] An example is the Internet: a consumer seeking information will benefit from a greater selection of content when more producers have joined the medium, publishing their products and services online (incurring the costs). On the contrary, a negative externality, such as a computer virus, will be greater to those in a larger network. Luckily, network externalities are generally positive.

What networks are emerging from the adoption of computers in Dutch museums? And what do museums miss when they refrain from joining? It is important to distinguish between two kinds of networks present in the Dutch museum landscape: one refers to people and organizations (a social network), forming a network of e.g. information specialists (such as SIMIN, described in section 3.2), while the other network involves a physical infrastructure of cables connecting various users through internal networks or through the Internet.

Social, organizational networks have formed at a national level, including the NMV (with 487 members[529] out of a total of 810 museums), SIMIN, with seven core members and 271 registered members, and the Museum Register (with 426 registered museums). These networks have provided a supportive context for digitization within individual institutions. Other, more thematic and procedural networks have also formed to support the adoption of computers, not all of which remain active. Among the early networks, MARDOC played a fundamental role in guiding the formation of standards and advising museums in the adoption of

[526] Economides, 1996:673-679.
[527] Katz, Michael and Carl Shapiro, 1985, 1986.
[528] Shapiro and Varian, 1999:183.
[529] NMV jaarverslag 2013:6.

computers, as can be seen in the explosion of computer use in the late 1980s. MARDOC, SIMIN and DEN have been the most important organizational networks for the documentation and dissemination of the digitization process since the 1980s.

SIMIN is still active though with a smaller role since the creation of DEN (1999), which has a larger network covering the entire heritage sector (including museums as well as libraries, archives and archeology). According to network theory, the larger network receives positive feedback and grows to give more value to its members. Nevertheless, the majority of museums (72%) continue to rely on the NMV (and SIMIN) for ICT-related support, as was reported in 2007. This compared to 57% museums that seek advice from DEN.[530] The reasons behind this are yet to be researched, but can indicate the strength of the specialized museum network, or the lack of specialized ICT-related knowledge in museums that prevents them from seeking advice from a thematic specific network (DEN).

These networks, among others, are responsible for advocating the use of computers at work, for developing best practice, for establishing a professional and recognized information management role, for ensuring inventory and documentation of the state of affairs (statistics), and for renewing the position of heritage collections in the information market.

What do museums miss out on when they decide not to join the social network? In 2007, only 33% of museums reported collaborating with other museums on ICT activities.[531] Museums that collaborate on the production and distribution of digital collections benefit from the pooling of resources, which gives them a greater reach, and, in turn, increases the outreach scope and strengthens the network. Table 6.3 below summarizes the potential areas of impact.

[530] NMV and DEN, 2007:21.
[531] NMV and DEN, 2007:20.

Table 6.3 Benefits brought to museums by participating in a digital network

Benefits	Area of impact
Joining resources	Know how (policy, best practice, solutions, legal aspects) Complementary collections result in value added Finances to enable actions, to reap benefit from past investment Technology and access to specialized processes and infrastructure Richer result from individual effort
Greater outreach	Multilingual presentation Larger geographic coverage and representation Increased interoperability Agreement for cooperation (legal aspects, standards)
Strengthening the network	Greater benefit to greater openness Access to a greater market Benefit from other members Improved service to costumers

Source: own.

Direct benefits for museums in the network include gaining a richer result from the individual effort. An example can be found in the object registration cards, made by museum staff participating from five different institutions, which in turn were sent to the UK to be computerized. The network coordinated by MARDOC made this possible. Indirect benefits for museums include gaining a greater acceptance of the digital work form, in the museum sector and beyond, as well as an increase in the understanding of the digitization process (or adopting computers at work). Another example can be found in the development of statistical data by the MusIP team, which established a methodology for accounting at the collection level to produce the first overview of the size and state of the Dutch heritage collection. All museums gained understanding of the state of affairs and were able to compare their practice and develop benchmarking.

In terms of the *physical* computer network connections, benefits from joining relate to having a greater and deeper communication reach. Museums began exchanging data internally through local networks as early as the 1980s. By 1995, 27 museums were connected to the Internet and six museums reported having a website.[532] Slowly but surely museums followed and by 2002 81% of museums had a website, increasing to 99% by 2007. In contrast, by 2009, only

[532] Starre, 1995.

31% of collections were published online.[533] Museums' participation in the network was limited or collection information online was not being published, ultimately restricting the presence and potential benefits gained from being in the network, both for individual museum institutions and for the rest of the network. Not sharing collection information through the online network can be compared to acquiring email but restricting use to messages containing only contact information. Ideally, collections are made available online either through the institutional website or, for those not able to design, publish and maintain their own website, through online networks that can provided an alternative to publishing collections (e.g. *Geheugen van Nederland*, *MijnGelderland*).

Before the 2000s, the value of the online network was limited not only by the amount of data published and by the number of museums publishing data, but also by the number of consumers with Internet access. The speed of Internet did not allow data transfer as it is possible today, which enables e.g. live streaming video to be displayed on mobile phones. According to data from the last 8 years, about half of all Dutch households had broadband Internet in 2005, which increased to 84% in 2012, while access to the Internet via the telephone increased from 11% in 2005 to 61% in 2012 (table 6.4, fig.6.1). Being online, having ubiquitous access to the Internet, brings with it expectations regarding the availability of content. In the perception of the user, what is not online does not exist. This puts into perspective the fact that the availability of museum content in the Netherlands is estimated to represent between 25% and 31% of collections, as reported in 2012.[534]

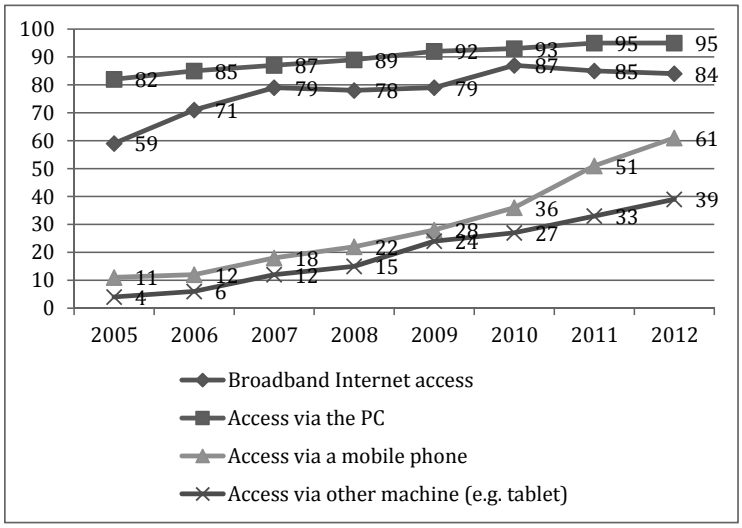
[533] Numeric, 2009:25.
[534] Enumerate, 2012.

Table 6.4 Internet connection in the Netherlands households 2005-2012 (in percentage)

	2005	2006	2007	2008	2009	2010	2011	2012
Broadband Internet access	59	71	79	78	79	87	85	84
Access via the PC	82	85	87	89	92	93	95	95
Access via a mobile phone	11	12	18	22	28	36	51	61
Access via other machine (e.g. tablet)	4	6	12	15	24	27	33	39

Source: CBS.

Figure 6.1 Internet connection in the Netherlands households 2005-2012 (in percentage)



Source: CBS.

Network externalities are most prominent for consumers, as they are able to enjoy a greater content base in addition to complementary services. That is, as museums position their content as catalogue lists, as image banks or as a searchable dataset, other products are more likely to emerge, including those created by private producers. Publishing content online opens up opportunities for

third parties to provide further services (e.g. apps, repositioning collections) increasing usability of heritage content and ultimately increasing consumer network externalities.

The digital information network continues to grow, through participating individuals and increasingly through the amount of information being exchanged. Museums are slowly adding their collections information to the online network to reap the benefits accordingly (the more information shared the greater the benefit). The greatest beneficiary of it all is the consumer, for whom more content is becoming available in an increasingly personalized way. However, Dutch museums still have a long way to go.

6.4 Choosing the *right* technology

The effort to construct a collections information management system is considerable. It not only includes getting the system in place but also requires learning how to use it and populating it with information. Dutch museums prefer not to be international trendsetters but rather be cautious when adopting new technologies, fearing they might make a poor choice with costly consequences.

Choosing the *right* technology is essential. For museums that chose to take on new technologies and invest in the cutting edge, there always is a risk of choosing an impermanent technology. One such example can be found in the ARIA system developed by the *Rijksmuseum* in the 1990s. It was very innovative to present collection information to the general public using multimedia, but production did not consider the Internet or linking back to the collection database. The project was celebrated for what it wanted to achieve, but it resulted in a static system with antiquated technology right from the launch.

Many Dutch museums refer to this experience as the "dialectics of progress" (*de wet van de remmende voorsprong*). The expression alludes to the initial role a museum may have as a pioneer when adopting an emerging technology, bearing the costs of exploration and development, but ending up with a technology or application that is inferior to the one established or adopted in the wider market. As other, later technologies are developed and *interpreted* as

successful, they became the standard, causing the pioneering museum to lag behind. However, the large investment in the initial technology may prevent a quick change to the newer, more successful technology. This process is called *lock-in* in economic theory, and results from a *switching cost* that is too large to bear.[535]

Switching costs are ubiquitous in information technologies, because "information is stored, manipulated, and communicated using a system consisting of multiple pieces of hardware and software and because specialized training is required to use specific systems."[536] However, lock-in occurs when a significant durable investment is done towards a particular information technology system, including its *complementary assets*. These assets typically include data files (e.g. information on the registration cards, software system), the hardware (e.g. the filing system, computers) and the know-how, or what Shapiro and Varian refer to as the hardware, the software and the netware.[537] That is, a museum investing in a manual paper information system, will also invest in acquiring the cards and the filing cabinets for those cards in addition to spending many man-hours populating the cards. As systems begin to age and require updating, institutions are more likely to consider changing information systems.[538] Switching from a manual to a digital information system requires not only the acquisition of computers, software and training, but also the migration of all the data from the cards to the digital database.

In addition to the costs incurred by the museum, or producer, Shapiro and Varian identified switching costs experienced by the consumer.[539] Examples can be found in recent websites designed with Flash, which are only available to those with up-to-date systems, or the various presentation styles that require consumers to learn how to use multiple information sources. Together, the costs for the

[535] Shapiro and Varian, 1999:104.
[536] Shapiro and Varian, 1999:116.
[537] Shapiro and Varian, 1999:12,104.
[538] Shapiro and Varian, 1999:12.
[539] Shapiro and Varian, 1999:12.

producer and the consumer when changing information technologies result in the *total switching costs*.[540]

There are three types of lock-in found in the process of adopting computers by Dutch museums. The first relates to the acquisition of durable equipment, which includes hardware costs that decrease over time because of depreciation. Rapid development of technology reduces the hardware lock-in.[541] The subsidy given through the Delta Plan during the early 1990s for acquiring a computer with a museum management system (Q&A) was highly influential. Dutch museums have never had excessive funds and the subsidy provided the opportunity to explore the new technology. It is no surprise that Adlib, the firm that took over Q&A, still has the largest market share in museums information systems: museums tend to remain locked-in to their initial systems and suppliers.

Secondly, training for brand-specific software may result in higher costs over time as the need to switch software arises. As people become more familiar with a specific system, they will have a harder time switching to a new system unless the new system is easy to learn.[542] Dutch museums have struggled with this for decades: digital system have not been adopted equally by staff in museum institutions, the result being that it is the *less* experienced staff that generally adopt the new working systems. Curators are a specific group who have yet to adopt the digital medium as a research tool, beyond searching for data inputted by their colleagues. Lack of expertise prevents a switch from traditional to digital research tools.

The final and most important lock-in found in Dutch museums is related to information (data) and databases (data storage). Museums have developed their information systems over many years of documentation practice, increasing the cost of lock-in with time. The information gathered manually is the result of years of specialized work. It has changed over time, making the system grow in complexity. Eventually, the information base becomes one of the greatest assets of the museum. The information is often tied into to the *system*, so that the

[540] Shapiro and Varian, 1999:12.
[541] For a typology of 7 types of lock-in see Shapiro and Varian, 1999:117-119.
[542] Shapiro and Varian, 1999:117,121-122.

information can only be *read* by that one system. Transferring the information to a new system inevitably results in some form of information loss, unless the right standards and interfaces are used (or the currently emerging open standards are in place).[543] Early in the digitization process it became clear that museums organized (or classified) their collections differently, which led to high costs for the conversion of data to the new standard format required by the government (the basic registration card). Once that basic card was in place, the information could be transferred without loss from a paper to a digital format. Most paper information systems have been *partially* transferred to a digital system, so that both are used alternatively: the former contains detailed data and the latter facilitates searching and management of large and complex data collections. The paper system will continue to be used until sufficient resources are made available to complete the transfer (often requiring a great deal of manual work), or until the digital system evolves to automate some of the migration procedures.

6.5 A new heritage information space

Museums have a long history of being physical spaces to be visited where heritage is displayed and explained. The content on display is selected and controlled to reflect the ultimate institutional authority on the subject. The exhibition halls serve to distribute the information to the visitor, supported by catalogue publications. The work behind the scenes, on the other hand, is kept invisible. This view, even if still prominent in the sector, is limiting to the communication capacity of museums. Digitization, and most importantly the Internet, has expanded the available spaces in which information can be made available, enriching communication between the museum and the visitor. Museums are no longer closed information spaces but have increasingly become porous to external information sources (co-production) and exhibition spaces (content distribution), changing their communication dynamic with the public.

The traditional vision of communication is often conceptualized as a convenient one-way linear process starting with the production side and ending up

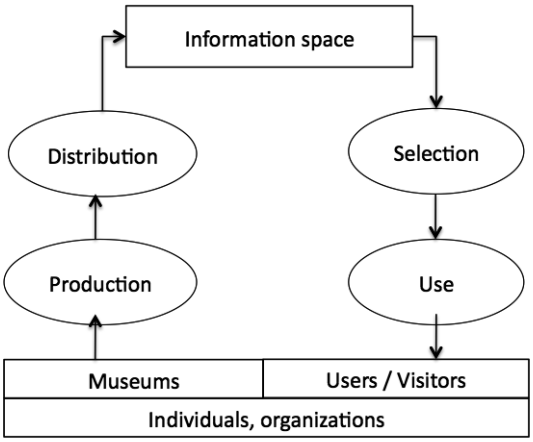
[543] Shapiro and Varian, 1999:117,122-123.

with the consumer (receiver). Sometimes this model is extended to become a cycle, where the consumer is informed and further participates in the conversation. This is, however, an artificial view. Mackenzie Owen points out that communication is more complex than that. For it to be an exchange, people must be placed as anchor points performing various key selections. Communication begins with the producer, who selects what to produce and what to distribute, and how (or what to showcase in a catalogue or an exhibit and how). The process continues with the consumer who selects what to consume and through which channels (what leisure activity or in which museum). That is, it is consumers who ultimately define whether communication takes place or not through their selection choices.[544]

In such a model, seen in figure 6.2 below, communication does not take place directly between the producer and the consumer but is mediated by a *market of information*, or transaction space. On the Internet, this is even more prominent: the producer places an *information product* on the *information market* (or the Internet) where producer and consumer interact and where, eventually, the consumer will participate in the communication process.[545]

[544] Mackenzie Owen, 2007:56-60.
[545] Mackenzie Owen, 2007:56-60.

Figure 6.2 The heritage information market (adapted from Mackenzie Owen)



This approach to understanding communication in an information market can be applied to museums communicating with their public by publishing their collections online. Digital collections become part of a massive market of information available on the Internet, along any other type of content. Visitors are no longer inside the museum information system but interact in an open information space and are free to satisfy their information needs from multiple suppliers. On the Internet, or information market, the museum and the visitor meet to exchange information about collections based on a series of choices, or selection moments, particular to their roles. Even though museums wish to and do preserve their identity on the Internet (e.g. by means of an identifiable design of their websites), many non-specialist users are more aware of the content than of the institution (which at best functions as a form of *branding*).

Museum visitors are no longer limited by the restrictions of space and time (or location and opening hours) but can interact with online content related to the collections and the museum from any place and at any time. Museums can even allow visitors to participate in the production and distribution processes, as in the

case of the *Tropenmuseum* making images available on Wikimedia for the public to use as illustrations for various Wikipedia articles.

Choices from the production side greatly influence the constitution of the heritage information market. Selection, from the perspective of museum institutions, begins with the choice of objects, or content, to be digitized. This selection for production has two aspects: the number of (related) objects to be digitized (quantity), as well as the type of information produced about each object (quality). This may include metadata, contextual information, or one or multiple images. The quantity of objects chosen depends on policy as well as on the size of the overall collection. Large museums have recently switched to some form of mass digitization (as seen at *Naturalis* or at the *Rijksmuseum*) in order to increase the quantity of content being published. The quality of information has generally responded to the standards established by the government (e.g. basic registration card), or by sector institutions (e.g. NMV registration card), in combination with the institution's history of practice. All museums have a specific way to document and manage their objects and proprietary thesauri may be used in addition to the international norms in place (e.g. AAT).

Selection of distribution from the production side also has two aspects: the information made available (quantity and quality) and the environment in which it is to be consumed. Museums generally publish their collections on their website but the collections can also be repositioned in other environments, like portals (e.g. *Geheugen van Nederland*), external websites (e.g. *Hollandse Hoogte*, Wikimedia), or digital applications (e.g. Layar, guided tours). Museums may choose (or be forced) to display information with low resolution or no image at all of objects with copyright, or else to restrict user rights. Other elements present in the environment involve the possibility to query or browse the collection through different methods (e.g. search box, keywords, visual pivot), the ability to participate (e.g. download, print, tag, rate, share, contribute, edit), the encouragement to appropriate and further disseminate content (e.g. open data), or the accessibility segmentation (e.g. require password, personalized display, professional and public site, require payment).

The supply of digital heritage information reacts to the increasingly prominent role of the consumer. The consumer has an equally great power of selection when choosing what digital objects or digital content to seek: "identify, find, evaluate and acquire" (table 6.5). Consumer selection is influenced by publicity, by access and by trust. That is, the consumer must know about the content, be able to access it and trust the source in order to select a product for consumption.[546]

Table 6.5 Selection factors in the production of digital heritage content

	Selections determined by	Restrictions determined by
Production of information	Object quantity Content quality	Institutional make up Available resources Technology know how
Distribution of information	Type of content Environment	Available technology Access strategy Trust

Source: own.

The consumer's first selection moment is greatly influenced by what is available on the market. That is, a consumer will base a first choice on other goods available. A search for an image of a flower may turn results from paintings in several museums (substitute goods), but it may also result in botanical information (complementary goods). A consumer with a very specific information need, searching for the Night Watch painting, may choose between various image qualities and sources, whereas a browsing consumer may choose between a Rembrandt or a Kahlo. Consumers with higher information literacy may be able to consciously select a product based on the information source (e.g. a museum) but selection may be limited by the available technology (e.g. screen size, internet speed).

A second selection moment takes place with the choice and decision to actually consume a particular product (table 6.6). This is very much determined by the ease with which content can be used. The information need of the consumer further determines if text or an image for a screen saver or for an

[546] Mackenzie Owen, 2007:58.

academic publication is selected. The expectation that content is available free of charge deters many consumers to pay for access and for use.

Table 6.6 Selection factors in the consumption of digital heritage content

	Selections determined by	Restrictions determined by
Consumption of information	Information need Information access	Ease Information need
Accessibility of information	Market supply Information literacy Available technology	Costs, rights, limitations Information need Trust

Source: own.

From the data available, it becomes clear that *trust* is a key factor for both producers and consumers. From the museums perspective, *giving away* the content can only take place with trust that the public will continue to visit the museum and interact with the physical objects, as well as trusting there will be no misuse of the content. From the consumer's perspective, selecting the content of one museum reflects the trust in the source. The 2011 Europeana survey reported that users rated Europeana as a more trustworthy source of content than competitors.[547] Trust, however, is constructed. Existing users were more trusting and likely to recommend Europeana than first-time users.[548] Furthermore, museums opening up their production lines to users through different sorts of crowdsourcing reflects another aspect of trust. Consumers participating as producers in such projects must in turn trust the institution.

The fear of institutions that their content will be copied, allegedly illegally, is only endemic of poor distribution systems. According to Mackenzie Owen, "the more dynamic and functional a resource is, the less incentive there will be for copying."[549] That is, when the public has unrestricted, sustainable and reliable access to the desired information via the Internet, it has no further need to ensure future access through copying.

[547] IRN Research, 2011:15.
[548] IRN Research, 2011:21.
[549] Mackenzie Owen, 2007:120.

6.6 The value of information

Selection of digital heritage information for consumption is based on product valuation. Consumer valuation may differ from producer valuation methods. For instance, museums may select collections to be digitized based on national valuation models (e.g. the Delta Plan collection categories A, B, C and D), institutional criteria (e.g. the top-100 objects in the collection, fragile objects), or on more ad hoc methods (e.g. objects featured in a publication, objects requested by the public, objects in a certain section of the storage room). Valuation of collections for production generally follows a culture-based system, which Throsby has disaggregated into several value characteristics including aesthetic value, spiritual value, social value, historical value, symbolic value, and authenticity value.[550] Valuation from the production side is reflected in the digitized collections online. These valuation systems are based on having sufficient information about the collections, which may not be the case at the time of consumption.

Generally, the indicator of consumer value is found in the consumption that can be seen in payment for access, but also in the downloading of a document or entering a website. A sound, meaningful and standardized system for measurement of online consumption has yet to be designed and institutionalized. Only 22% of Dutch museums perform some form of online measurement of consumer behavior (most often using web statistics) through metadata or digital objects.[551] There are other forms of valuation, which are much harder to measure. These are linked to what Frey has identified as *external effects*, including availability value, education value, prestige value and bequest value. According to Frey, consumers may value the availability of digital collections for a future consumption, making it hard for the museum to presently receive an indication of such valuation expressed as consumption.

What is the consumer value of a digital collection? There are two elements that give value to the information product: the usability value of the *content* and

[550] Throsby, 2001:28-29.
[551] ENUMERATE dataset 2012.

the *information service* that delivers it. This information service functions as *packaging* for the information and may take the form of a catalogue, an exhibit, or a website. The package, in turn, adds knowledge value to the information based on the museum's research activities regarding objects and collections.[552]

Use of digital collections may be linked to cultural consumption, leading to enjoyment and the above-mentioned forms of value, or to the use of *information*. Valuation of information is something that is hard, if not impossible, to measure because of the nature of the *product*. As Mackenzie Owen states, "information has no value in itself. The economic value of information is given only with *use*."[553] In museums, administrative information is produced by a type of use determined beforehand, for the record keeping of object loans for instance, and is generally only for internal (restricted) use. The value of such information can be estimated before consumption because the use of it is known. However, most information produced by the museum is meant for the communication and exchange of ideas, for instance about a type of culture or a period of time. Mackenzie Owen refers to such information as *documentary information*.

Documentary information has no defined use beforehand. Anybody can use it in a number of ways. That is, it has the ability to serve as catalyst for development and for innovation for any interested consumer. Its effects may not be revealed for a long period of time and it is generally hard to link them back to the original document prompting the new use. That is, visiting a museum (or viewing an online exhibit) may inform a number of decisions years after the consumption has taken place.[554]

Estimating and measuring the use of documentary information poses methodological challenges for which the solutions are yet unclear. On the other hand, estimating the use of the *package* that delivers the information may serve as an indicator, since packages are an important determinant for consumer valuation:[555] a consumer may be unable to visit an exhibit but may be interested in

[552] Mackenzie Owen, 1995:7-8.
[553] Mackenzie Owen, 1995:2,5.
[554] Mackenzie Owen, 1995:3.
[555] Mackenzie Owen, 1995:7-8.

purchasing the catalogue, or a consumer may want a high-resolution image for immediate download. It is the consumers that will select the most convenient packages, or distribution channels, to best fit their needs.[556]

How can museums best position their content to facilitate consumption? Since consumers value information not only by the content and expected use, but also based on the information service provided, it can be expected that having a fancy package with no content or a lot of content but available through a poor information service would not be appealing. In other words: careful alignment of content and packaging is required.

This raises an interesting question as to the focus of digitization. How should one strike a correct balance between production and distribution? The analysis of the determinants in consumer valuation of information as presented by Mackenzie Owen, as well as what we know about network externalities, indicate that digitization should concentrate on both the production of information as well as on its distribution. In practice, however, this is not always the case. Many resources are allocated to the production of fancy packages, the trend changing with the times (e.g. website, social media, apps) yet the actual information, the production of the content, lags behind. From the national estimates, all museums have a website, but less than half of the collections have been digitized and only one fourth is available online.[557]

The gap between digital content production and distribution is supported by government policies of financing; grant schemes generally favor the innovative publication, or more recently the revalorization of collections, but the production of the information infrastructure is neglected. Museum organizations are also shaped to separate the two elements; the IT department cares for the technical infrastructure (including the website and other digital services) and has, of course, its focus on the digital. The collections department on the other hand is responsible for the creation of the information, but has other concerns than digitization alone.

[556] Mackenzie Owen, 2007.
[557] NMV and DEN, 2008; ENUMERATE dataset 2012.

For the consumer, the supply of digital information continues to grow and services increasingly allow participation in the production and distribution of information. Museums face the challenge of adopting the digital to position their most important asset, the collection information, in attractive packages for consumption. So far, the Netherlands ranks high on the European market of digital heritage information, but for the consumer that interacts on the Internet, how can 2.5 million digital objects be found among all other content available on the Internet? [558] Digitizing content and presenting it on the Internet is not sufficient. Finding optimal solutions to *position* heritage content in the information market is the current challenge of each and every museum, together with the Dutch government.

6.7. Conclusions

The history of digitization of museum collections can be told starting with the first grant allocated to a museum library cataloguing projects in the late 1960s which aimed to organize and code data for machine readable queries. Currently, digitization of museum collections refers to organizing data so that machines can link content from multiple sources and formats to enrich the (re)user experience on a movable device of choice. A lot has happened in forty years beyond the increased sophistication of the object descriptions, standards for registration and information retrieval processes. Changes have been brought in the general understanding of the role of museums in an information context based on a new approach towards digitization:

[558] The Netherlands contributes with 2.5 million digital objects (or 8.7%) to Europeana, ranking fourth after Germany, France and Spain (http://www.pro.europeana.eu/web/guest/content).

Concept	Change in perspective about digitization
Definition	From automation process to rightful information service.
Reason	From accounting and data management efficiency to stimulate the economy by facilitating knowledge regeneration.
Process	From working in isolation (task oriented) to being part of a national networked information infrastructure (and process oriented).
Content	From expert selection to user relevance.
Function	From administrative challenge to enabler of organizational transformation.

Museums adopted computers initially for the administration of collections, and the occasional experimentation of other applications such as exhibition layout. In time, computers became a tool to support all core activities (collecting, researching, exhibiting, presenting and conserving) and even all institutional processes (e.g. ticketing, sponsor information administration). The digitization process was first task driven (data coding and input) at institutional level but eventually transformed into a national core process (ensuring sustainable access to heritage content). The type of content being documented changed, as technology developed to allow richer data and as use increased sophistication: tagging and describing objects to infinite detail (e.g. scientific name and color of a flower depicted on a painting) increases potential links and therefore usability. Ensuring rich context requires an enormous effort which, for organizations with limited resources, has generally been directed towards selected collections exponentially increasing the obscurity of the remaining objects.

As digitization projects seeped into all areas of the museum work, more people became involved in the new digital workflow to ultimately involve the end user. In this way, collection information was no longer the property of curators but it became the one of the most important exchangeable and expandable assets of the museum institution. Monopoly over production and dissemination of collection information became a hindering factor in the networked information landscape. New challenges involve the definition of responsibilities for long-term care of content, as costs are involved in ensuring sustainable access.

This study documented four main changes in museums' information processes brought by digitization of collections: (1) collection registration had a marginal and supporting role in the museum organization prior to the adoption of a digital work form, digitization positioned collection information processes at the core of the organization, overarching and supporting all other processes; (2) these processes were exclusively institutional in nature (collection information inside the museum walls), eventually expanding to become cross-institutional collaborating processes (networked information across sectors); (3) digitization changed the goal of all information processes from controlling content to communicating with the user; and (4) information production, dissemination and, to a certain degree, use was monopolized by professionals, digitization enabled a democratization of participation by all types of users throughout the collection information production process.

A significant effort and resource allocation has been directed towards digitization of collections resulting in a fundamental transformation of museums, yet little is known about the process. This study is an effort to remedy that situation by compiling a detailed overview of the process of digitization, the underlying policies and the people involved, as well as by drawing some tentative conclusions.

Nederlandse samenvatting

Als uitgangspunt voor dit onderzoek dienen de vragen: welke processen hebben Nederlandse musea doorlopen bij het toepassen van informatietechnologie en hoe zijn deze processen terug te zien in het digitale museum? De digitalisering van collecties roept vragen op over de aard van de werkwijze van musea. Deze vragen hebben bijvoorbeeld betrekking op de definitie van objecten, op de aard van het museumbezoek en op de rol van het museum in de productie en consumptie van informatie. Veranderingen als gevolg van digitalisering treden op binnen de gehele erfgoed sector, waar ook bibliotheken en archieven geconfronteerd worden met soortgelijke vragen en bij elkaar op zoek gaan naar oplossingen. Een andere belangrijke kwestie die door digitalisering aan de orde wordt gesteld, heeft betrekking op de gevolgen van het gebruik van werkwijzen uit het verleden in wat nu deel uitmaakt van een digitale collectie. Dit onderzoek gaat hier op in door het analyseren van de geschiedenis van activiteiten rond de digitalisering van collecties, om zo de gevolgen van de toepassing van digitale media te achterhalen.

Het eerste hoofdstuk geeft een overzicht van het onderzoek en de gevolgde methodologie. Na een inleidend literatuuroverzicht werden gegevens over de Nederlandse ervaringen verzameld uit documenten, gesprekken en een vijftal case studies. Analyse van de gegevens resulteerde in de identificatie van vier hoofdperioden van verandering: Adoptie van informatietechnologie (vóór 1990), Toepassing en Verspreiding (jaren 1990 – jaren 2000), Institutionalisering (jaren 2000-2010), en Regeneratie (na 2010). Een aantal aandachtsgebieden zijn naar voren gekomen, waaronder de organisatie van het museum, beleid, technologie, de gebruiker en de economische aspecten. Conclusies werden gepositioneerd binnen een theoretisch interdisciplinair kader.

Het tweede hoofdstuk biedt een algemeen overzicht van het proces van computertoepassing vanuit het perspectief van de Nederlandse museumgemeenschap. Het hoofdstuk begint met een beschrijving van de museumsector van rond 1950, toen informatietechnologie zich ontwikkelde in een naoorlogse context, ondersteund door de vorming van internationale organisaties (ICOM en CIDOC). Collecties in Nederlandse musea werden aanvankelijk handmatig beheerd in informatiesystemen volgens een aangepaste versies het Witboek (1953), de NMV Richtlijnen (1974) en uiteindelijk de Basisregistratiekaart (jaren 1980). Computers werden in de jaren zestig toegepast als instrument ter ondersteuning van collectiebeheer, maar waren alleen beschikbaar in grote instellingen (doorgaans universiteiten).

Musea begonnen met het verkennen van datavoorbereiding (normalisatie en codering), gefinancierd door het Ministerie van Cultuur. De eerst dergelijke subsidie werd in 1969 verleend aan het Visserijmuseum in Vlaardingen voor het documenteren van de bibliotheekcollectie. Het succes van dit project leidde tot de vorming van VISDOC, en later MARDOC, dat diende als nationaal raadgevend orgaan voor de toepassing van computers in Nederlandse musea. De belangrijke processen die zijn waargenomen zijn de uitwerking van een standaardterminologie en de registratie van collecties, welke beide werden ontwikkeld gedurende de volgende twee decennia (jaren 1970 - 1990). Deze activiteiten vonden plaats in commissies, doorgaans gecoördineerd door MARDOC in samenwerking met SIMIN. De voorkeur werd gegeven aan collectie-inventarisatie met behulp van een DOS systeem. De jaren negentig was een periode van informatie-infrastructuurontwerp voor de sector, daar vele musea overgingen op computers (PC's werden algemeen beschikbaar) en de eerste portals werden gelanceerd. Digitale beelden werden ook onderdeel van objectregistratie.

De toename van het gebruik van het internet veranderde de manier waarop musea met computers werkten, daar de kracht van het informatienetwerk werd vergroot met de komst van het World Wide Web. In de jaren 2000 lanceerden de meeste musea websites en werden verschillende bedrijfsmodellen onderzocht. Overeenkomsten werden gesloten voor de online beschikbaarstelling van collecties en er werden verdere stappen gezet op het gebied van de registratie en het creëren van digitale afbeeldingen (imaging) van objecten in de collecties. Musea onderzochten ook alternatieve vormen van imaging en digitale object manipulatie (3D, AR, VR). De jaren 2010 werden gekenmerkt door het gebruik van digitale middelen om tot betere communicatie met het publiek te komen.

In hoofdstuk 2 concluderen we dat de toepassing van computers de museum-organisatie fundamenteel heeft veranderd in haar werkprocessen, in haar relatie met de bezoeker (later de ‘gebruiker’ genoemd) en in de manier waarop de collectie wordt beheerd. Een zeer belangrijke verandering is het ontstane besef van de *waarde* van informatie als belangrijk bezit van het museum en de basis voor de waardering van objecten die steeds toegankelijker worden voor hergebruik buiten de muren van het museum.

De conclusies van de case studies, die worden gepresenteerd door de verschillende hoofdstukken heen, komen op het volgende neer: de toepassing van digitale activiteiten wordt in hoge mate bepaald door mensen die werken binnen een specifieke organisatorische context. Dit wil zeggen dat toepassing van computers in musea

afhankelijk is van vijf belangrijke determinanten: (1) personen, hun kennis van computers en hun invloed op de besluitvorming en toewijzing van middelen; (2) het soort instelling, toegang tot hulpbronnen, bestuur en niveau van afhankelijkheid van andere bovenliggende instellingen; (3) het type collectie, de homogeniteit en de grootte van de collectie; (4) het netwerk vermogen, de reikwijdte, verbondenheid met de andere instellingen en werkgemeenschappen en de relatie met het publiek of de gebruiker; en (5) de beschikbare technologie.

In het derde hoofdstuk worden vijf gevallen van samenwerkende musea gepresenteerd waarbij de gezamenlijke inspanningen een nationaal bereik hadden. De verschillende groepen werden gevormd ter ondersteuning van een nieuw werkgebied (SIMIN in de jaren '70), om collecties te inventariseren (SVCN, MusIP en OKBN in de jaren '90) en om musea vertrouwd te maken met aspecten van (digitale) duurzaamheid (NCDD in de jaren 2000). De conclusie van hoofdstuk 3 is dat museale instellingen (en hun bibliotheken) het meeste bereiken wanneer zij samenwerken, onder meer door middelen te delen, werkwijzen onderling af te stemmen, en samen te werken aan een sterkere onderhandelingspositie voor verandering.

Hoofdstuk 4 behandelt het perspectief van de Nederlandse overheid en haar rol in de ondersteuning en regulering van de digitalisering van museumcollecties. Na een overzicht van de huidige nationale structuur van museumbeheer en de eerste beleidsdocumenten, worden in dit hoofdstuk de beleidsdocumenten en subsidieregelingen besproken die zijn opgesteld om digitalisering te bevorderen. De eerste commissie werd samengesteld in de vroege jaren '80 maar werd tijdelijk stop gezet wegens bezuinigingen, om later in de jaren '80 opnieuw te worden bijeengeroepen als onderdeel van een plan voor het managen van overheidsinformatie opgesteld door het Ministerie van Binnenlandse Zaken. Dit was de eerste subsidieregeling ter ondersteuning van de toepassing van computers in de erfgoedsector en duurde van 1987 tot 1994, met een budget van €6,27 miljoen uitsluitend bestemd voor informatiediensten in musea.

Het tweede grote programma ter ondersteuning van digitalisering begon als een conservatieproject: het *Deltaplan voor het Behoud van Cultureel Erfgoed* (1990-2000). Dit project was in het bijzonder afhankelijk van objectregistratie voor de identificatie van die objecten die in aanmerking konden komen voor subsidie. Een nationale waarderingsmethode werd opgesteld en digitale inventarissen werden van alle musea gevraagd. De inventarissen vergemakkelijkten de reorganisatie van de sector; de musea begonnen de overgang naar particuliere stichtingen, waarbij de overheid eigenaar bleef

van de meeste collecties (en gebouwen die collecties huisvesten) terwijl de musea voor het beheer van objecten verantwoordelijk werden gemaakt, deels gefinancierd door de overheid. Uiteindelijk eindigde het Deltaplan zonder dat de registratie van de collecties was voltooid.

Een derde invloedrijke subsidieregeling was *Digitaliseren met Beleid* (2006-2008), onderdeel van het eCulture programma dat liep van 2004 tot 2008 met een begroting van €24 miljoen, waarvan een aanzienlijk deel was bestemd voor de digitalisering van erfgoedcollecties. Van musea werd verwacht dat zij zich hielden aan een reeks eisen, om zo bij te dragen aan de nationale digitale infrastructuur waarbij al tijdens productie van digitale objecten rekening werd gehouden met duurzaamheid, en verbeterde toegang ook hergebruik mogelijk maakte.

Er zijn sindsdien geen andere belangrijke regelingen opgesteld ter ondersteuning van de digitalisering van collecties. Individuele subsidies gericht op digitalisering zijn zeldzaam, met uitzondering van €154 miljoen toegekend aan NIBG voor het behoud van media collecties en de herpositionering van content in de markt. Projecten die de economie stimuleren worden sinds de jaren 2000 ondersteund als onderdeel van publiek-private initiatieven.

Het hoofdstuk eindigt met een beschrijving van de belangrijkste instrumenten van het Ministerie van Cultuur met betrekking tot de digitalisering van collecties, waaronder de Mondriaan Stichting, belast met de distributie van de fondsen naar erfgoedprojecten; DEN, verantwoordelijk voor de coördinatie van de infrastructuur van digitaal erfgoed; en de KB, die dient als belangrijkste R&D-centrum voor digitaal erfgoed.

In hoofdstuk 4 wordt geconcludeerd dat de overheid een belangrijke rol heeft gespeeld in het experimenteren met, de toepassing en het gebruik van digitale hulpmiddelen in de erfgoedsector vanaf het einde van de jaren 1960. Subsidieregelingen, doorgaans deel van een groter overheidsprogramma van diverse ministeries, hebben een brede dekking gehad en hebben het digitaal erfgoedlandschap veranderd. Deze subsidies werden echter toegekend via verschillende instellingen en regelingen, waren van korte duur en hadden niet altijd een duidelijke bestemming. Er heeft maar een gedeeltelijke evaluatie van programma's en regelingen plaatsgevonden, wat heeft geresulteerd in een gefragmenteerd beeld van de doeltreffendheid van het beleid.

In hoofdstuk 5 wordt een overzicht gepresenteerd van internationale instellingen die invloed hebben (gehad) op de Nederlandse erfgoed digitalisering, waaronder CIDOC (1950), MCN (1967) en MDA (1977), evenals projecten gefinancierd door de Framework

Programma's van de EG. FP2 financierde als eerste een gezamenlijk project waaraan een Nederlands museum deelnam (EMN in 1989), waarna projecten steeds groter en complexer werden. De initiatieven van de EG hebben veel van het digitaliseringswerk van Nederlandse erfgoedinstellingen geïnspireerd, vooral omdat Europeana en andere groepen in Den Haag zijn gevestigd.

De EU heeft in belangrijke mate bijgedragen aan ons inzicht in de mate van digitalisering in de erfgoedsector, ook in verhouding tot andere Europese landen. Nederlandse deelname aan de digitale inventarissen van de EU bood nieuwe ervaring in de ontwikkeling van een statistische methode voor verantwoording van digitaal erfgoed activiteiten en ondersteunde tevens gegevensverzameling ten behoeve van beleidsvorming. Resultaten tonen aan dat de helft van Nederlandse musea (55%) een strategie voor digitalisering heeft, dat digitale activiteiten worden ondersteund door gespecialiseerd personeel (11% FTE's) en dat bijna de helft van de collecties zijn gedigitaliseerde (41%), hetgeen hoger ligt dan bij het gemiddelde Europese museum (respectievelijk 39%, 6% en 28%). Online beschikbaarheid van Nederlandse museum-collecties lag met 25% achter in vergelijking tot EU musea (29%) en het EU gemiddelde met 43%. Nader onderzoek van de resultaten van Nederlandse musea toont verschillen per type collectie, waarbij etnografische collecties het hoogste percentage gedigitaliseerde collecties melden (76%) en wetenschappelijke en technologische collecties de laagste (28%). De online beschikbaarheid van collecties is het hoogst bij etnografische en kunst musea (boven de 30%) en het laagste bij geschiedkundige, archeologische en wetenschappelijke musea (minder dan 8%). Overigens heeft slechts ongeveer 11% van de Nederlandse musea deelgenomen aan de enquête.

Deelname aan statistische programma's van de EU heeft geresulteerd in datasets van 2008 tot en met 2013. Het is nog onduidelijk hoe de gegevens toekomstige nationale financieringsprogramma's zullen beïnvloeden. Nieuwe strategieën voor het verzamelen en analyseren van gegevens zijn nodig voor het vergemakkelijken van de processen en het motiveren van de gegevensverstrekkers – de Nederlandse musea – die onzeker zijn over de voordelen van transparantie. De methodologische ervaring heeft vooral de complexiteit en de diversiteit van digitale activiteiten in de erfgoedsector verduidelijkt.

In hoofdstuk 5 word geconcludeerd dat financiering door de EG niet algemeen benut is door Nederlandse musea, dat slechts 9 Nederlandse erfgoedinstellingen hebben deelgenomen aan één van de 35 projecten, en dat de voordelen van experimenteren en samenwerken niet voldoende met de gehele erfgoedsector worden gedeeld. Statistische

werkzaamheden hebben de stand van zaken verduidelijkt maar er zijn nog verdere uitdagingen: deelname is beperkt, definities variëren, nieuw beschikbare technologieën veranderen werkwijzen en digitale activiteiten blijven ontbreken als expliciete post op de begroting van erfgoedinstellingen.

In hoofdstuk 6 wordt het proces besproken waarbij het museum zich ontwikkelt tot een nieuwe instelling – een digitaal museum – die digitale technologie in al haar kernactiviteiten kan toepassen en tevens het gebruik en hergebruik van informatie kan ontsluiten voor een groter genetwerkte informatiemarkt, het Internet. Hoewel het proces is gestart, is er nog een lange weg te gaan.

Hoe kunnen we de manier verklaren waarop musea informatietechnologie hebben toegepast? De theorie van de 'Social Construction of Technology' (SCOT) laat zien dat de toepassing van een digitale werkwijze afhangt van de *interpretatie* van de technologie, d.w.z. van opvattingen ov er aard en doel ervan. Computers werden aanvankelijk toegepast ter ondersteuning van administratieve activiteiten. Digitale technologie wordt pas sinds kort opgevat als veranderingsinstrument voor musea dat voor maatschappelijke relevantie kan zorgen door het bevorderen van de communicatie en het verbeteren van de algemene dienstverlening.

Wat zijn de belangrijkste voordelen van digitalisering? Naast efficiëntie op het werk (met betrekking tot toegang en gebruik van informatie) kunnen musea inspelen op een mondiale markt van online informatie. Het bundelen van middelen, een grotere reikwijdte en de versterking van het netwerk zijn onderdeel van het proces. Daardoor kan het museum beter tegemoetkomen aan de verwachtingen van de gebruiker met betrekking tot onbeperkte, duurzame en betrouwbare digitale toegang tot erfgoed content.

Wat zijn de belangrijkste uitdagingen bij de toepassing van digitale technologie? Verschillende Nederlandse musea ervoeren de dialectiek van de vooruitgang, als gevolg van de hoge toepassings- en ontwikkelingskosten, gepaard met de even hoge overstapkosten die inherent zijn aan informatietechnologie. Lock-in is de voornaamste kracht die de transformatie van musea afremt, omdat dit van oudsher organisaties zijn met beperkte middelen en onvoldoende vertrouwen in nieuwe technologieën.

Welke lering kan worden getrokken uit de ervaring van Nederlandse musea bij het toepassen van een digitale werkwijze? De huidige context waarin musea functioneren is niet vergelijkbaar met het pre-PC tijdperk van de jaren '60. Musea zijn onderdeel geworden van een nieuwe wereld van erfgoed informatie waarbij de gebruiker en de producent informatie uitwisselen op basis van een reeks selectieprocessen die

kenmerkend zijn voor een bepaalde context. De beschikbaarheid van informatie is afhankelijk van een aantal beslissingen die worden genomen tijdens de productie en distributie van content, met de samenstelling van het individuele museum als context. De selectie door de gebruiker wordt bepaald door wat toegankelijk is en door de kwaliteit van de consumptie, terwijl de context wordt bepaald door de specifieke informatie-behoefte. Bepalend is de keuze van de gebruiker om daadwerkelijk gebruik te maken van een deel van de content.

De gebruiker kan in feite iedereen zijn en elke keer wordt met een nieuwe informatiebehoefte naar content gezocht. Hoe beter de informatie beschikbaar wordt gemaakt (of verpakt), des te meer zal de content worden gebruikt, en dus des te waardevoller zal de content zijn. Het heeft daarom geen zin om pakketten voor niet noemenswaardige content te ontwikkelen of een schat aan informatie te publiceren met verouderde technologie. De oplossing is het vinden van balans tussen het produceren van kwalitatief hoogstaande content en het ontwikkeling van bruikbare toegangspunten naar die content. Digitale productie moet dus samengaan met digitale distributie en kan baat hebben bij een uniforme aanpak.

De belangrijkste conclusie van hoofdstuk 6 is dat er vele voordelen kunnen worden behaald uit het deel uitmaken van een open digitaal informatienetwerk waarin individuen gebruik maken van en betekenis geven aan onze universele erfgoedcollectie.

Deze geschiedenis van de digitalisering, weergegeven aan de hand van de ervaringen van Nederlandse musea, is het eerste nationale overzicht dat poogt de elementen die van invloed zijn op de huidige status van online beschikbare digitale collecties in een kader te plaatsen. De digitale collectie die voortvloeit uit de digitalisering is afhankelijk van de betrokken personen, de beschikbare technologie, de institutionele samenstelling en organisatorische processen, de veranderende informatiemarkt en de steun van de overheid. Het perspectief van de *gebruiker* (aanvankelijk gespecialiseerd museumpersoneel en zich uitbreidend naar ieder potentiele gebruiker) is meer op de voorgrond gekomen, daar deze een belangrijke speler is in het toekennen van waarde aan de digitale collectie door selectie en gebruik. De digitalisering van collecties heeft geleid tot het ontstaan van een nieuwe instelling, het digitale museum, met zich ontwikkelende nieuwe diensten waarmee het zich in een digitaal erfgoed informatiemarkt positioneert.

Veel werk is reeds verricht en nieuwe grenzen liggen in het verschiet.

English summary

This research is guided by the question: what processes have Dutch museums followed to adopt information technologies and how are these reflected in the digital museum? The digitization of collections has questioned the essence of museum work practice. Some of the issues raised relate to the definition of an object, to the notion of a museum visit, and to the role of the museum in the production and consumption of information in society. Adjustments can be seen across the heritage field, where libraries and archives face similar questions and look at each other in search for answers. Another important question brought up by digitization relate to the effects of past practice in what currently constitutes a digital collection. This study responds by analyzing digital activities historically, centred around the digitization of collections, to identify the consequences of the adoption of the digital media.

The first chapter presents the overview of the book and methodology. Following an introductory literature review, data on the Dutch experience was collected from documents, interviews and five case studies. Data was analyzed to identify periods of change: introduction (pre 1990s), adoption and diffusion (1990s-2000s), institutionalization (2000s-2010s), and regeneration (post 2010s). Areas of impact emerged, including the museum organization, policy, technology, the user and the economic aspects. Conclusions were positioned within a theoretical interdisciplinary background.

The second chapter presents a general overview of the process to adopt computers from the perspective of the Dutch museum community. It starts by describing the museum sector of the mid 1900s, where information technologies developed in a post-war context supported by the formation of international organizations (ICOM and CIDOC). Administration of collections in Dutch museums was managed manually in information systems that followed a customized application of the White Book (1953), the NMV Guidelines (1974) and eventually the Basic Registration Card (1980s). Computers emerged in the 1960s as tools to support collection administration but were only available in large institutions (generally universities).

Museums began exploring with data preparation (standardization and coding) financed by the Ministry of Culture. The first such subsidy was granted in 1969 to the Fishing Museum in Vlaardingen to document the library collection. The success of the project led to the formation of VISDOC and later MARDOC, serving as the national advisory association for the adoption of computers in Dutch museums. The key processes observed were the generation of a standard terminology and registration of collections, developed during the following two decades (1970s-1990s) and continuosly updated. These activities took place in commissions generally coordinated by MARDOC in collaboration with SIMIN, preference was given to collection inventory using a DOS-based system. The 1990s was a period of

designing the information infrastructure of the sector as many museums adopted computers (PCs were widely available) and the first portals were launched. Objects registration began to include digital imaging.

The spread of the use of the Internet changed the way museums worked with computers as the strength of the information network was magnified with the adoption of the WWW. Most museums launched a website during the 2000s and various business models were explored. Alliances were made for the publication of collections and work continued to advance registration and imaging of collections. Museums explored alternative imaging and digital object manipulation (3D, AR, VR). The 2010s was marked by the use of digital activities to develop a closer communication with the public.

The conclusion from chapter 2 is that the adoption of computers changed the museum fundamentally in its organization, in its working processes, in its relationship with the visitor (later referred to as the user) and in the way collection information was managed. A key change has been the awareness of the value of information, the museum's main asset and base for object valuation, increasingly accessible for reuse beyond the museum walls.

The conclusions from the case studies presented throughout the various chapters converge in the following: the adoption of digital activities was driven by individuals working in a specific organizational context, with a unique collection, making each case significantly different. That is, adoption of computers in museums depended on five main determinants: (1) individuals, their knowledge of computers and their influence on decision-making and resource allocation; (2) type of institution, accessibility to resources, governance and level of dependence on other parent institutions; (3) type of collection, level of homogeneity and size of collection; (4) networking ability, outreach, connectedness with other institutions and community of practice, relation to the public or user; and (5) available technology.

The third chapter presents five cases of museums working in group where collaborative efforts had national reach. The various groups were formed to support an emerging field (SIMIN in the 1970s), to inventory collections (SVCN, MusIP and OKBN in the 1990s) and to raise awareness of sustainability issues (NCDD in 2000s). The conclusion of chapter 3 is that museum institutions (and their libraries) have a greater outreach when working together, partly due to pooled resources, to an agreed work practice and to a greater bargaining power for change.

Chapter 4 presents the perspective of the Dutch government and its role in the support and regulation of digitization of museum collections. After an overview of the current national structure in the management of museums and first policy documents, the chapter discusses the policy papers and subsidy schemes to advance digitization. The first committee was formed in the early 1980s but efforts were temporarily stopped, due to budget cuts, to be picked up again in the later 1980s as part of a plan for the management of government

information driven by the Ministry of Internal Affairs. This was the first subsidy scheme to support the adoption of computers in the heritage sector, lasting from 1987 to 1994 with a budget of €6.27 million exclusively for the information services in museums.

The second major program that supported digitization started as a preservation project, the Delta Plan for the Preservation of Cultural Heritage (1990-2000), which depended on object registration for the identification of significant objects (eligible for subsidy). A national valuation method was established and digital inventories were requested from all museum. Inventories facilitated the reorganization of the sector: museums started a transition to become private foundations, the government remained owner of most collections (and buildings housing collections) while museums were made responsible for the management of objects, financed partly by the government. Eventually, the Delta Plan ended yet collection registration was not completed.

A third subsidy scheme with great impact was the Policy-based digitization grant (2006-2008) part of the eCulture program running from 2004 until 2008 with a budget of €24 million, a considerable amount earmarked for digitization of heritage collections. Museums were expected to follow a set of requirements to contribute to the national digital infrastructure where production considered sustainability and access allowed reuse.

No other significant schemes have been set up to support digitization of collections since. Individual grants directed towards digitization are seldom, with the exception of a €154 million given to NIBG for the preservation of media collections and for the repositioning of content in the market. Projects that stimulate the economy have been given support since the 2000s as part of public-private initiatives.

The chapter ends with a description of the most important instruments of the Ministry of Culture regarding digitization of collections, including the Mondriaan Foundation, in charge of distributing funds to heritage projects, DEN, responsible for coordinating the digital heritage infrastructure, and the KB, serving as the main R&D agency for digital heritage solutions.

The conclusion of chapter 4 is that the government has had a key role in the experimentation, adoption and application of digital tools in the heritage sector since the late 1960s. Subsidy schemes (three so far) have a wide coverage and have changed the digital heritage landscape, generally part of a larger government program involving several ministries. Grant programs, on the other hand, are distributed via various institutions and schemes, are short lived and are not always clearly earmarked. Evaluation of programs and schemes has been partial, resulting in a fragmented view of policy effectiveness.

Chapter 5 presents an international landscape of institutions influencing Dutch heritage digitization, including CIDOC (1950), MCN (1967) and MDA (1977) as well as the projects funded by the EC FPs. FP2 was the first to fund a collaborative project where a

Dutch museum participated (EMN in 1989), after which projects became increasingly larger and more complex. The EC initiatives have further inspired much of the work on digitization of Dutch heritage institutions, particularly since Europeana and other groups are housed in The Hague.

Dutch participation in the EU digital inventories gave new experience in the development of a statistical methodology to account for digital heritage activities and further supported data collection to inform policymaking. Results show that half of Dutch museums have a digitization strategy (55%), that digital activities are supported by specialized staff (11% FTEs), and that almost half of collections have been digitized (41%), representing higher results than the European museum average (39%, 6% and 28% respectively). Publication of Dutch museum's collections online lag behind, at 25% compared to EU museums at 29% and the EU average at 43%. A closer look at the Dutch museums results reveals differences per type of collection, where ethnographic collections report the highest percentage of digitized collections (76%) while science and technology report the lowest (at 28%). Availability of collections online is highest among ethnology, art and other type of museums (above 30%) and lowest for history, archaeology, and science museums (less than 8%). Only about 11% of Dutch museums participated in the survey.

Participation in the EU statistical programs has resulted in data sets from 2008 through 2013. It is still unclear how the data will inform future funding schemes at national level. New data collection and analysis strategies are needed to facilitate the processes and to empower the data providers, the Dutch museums, which remain uncertain of the benefits brought by transparency. The methodological experience has, above all, brought much clarity into the complexity and iniquitousness of digital activities in the heritage sector.

The conclusions of chapter 5 are that EC funding is not readily available to Dutch museums, only 9 Dutch heritage institutions participated in 35 projects, and that benefits brought by experimentation and collaboration are not clearly shared to the larger heritage sector. Statistical efforts have brought clarity in the state of affairs yet challenges remain: participation is limited, definitions vary, new available technology change work practice and digital activities continue to lack an earmarked budget line.

Chapter 6 discusses the process of museums transforming into a new institution, a digital museum, able to adopt digital technology in all core activities while opening the use and reuse of information into a greater networked market of information, the Internet. Though the process has been started, there is still a way to go. Why did museums adopt computers the way they did? SCOT is used to explain that adoption of a digital practice depended on the interpretation of the technology. Computers were initially adopted to support administrative activities. Only recently, digital technology is perceived as a transformation tool for museums

that would ensure social relevance by opening communication and improving the overall information service.

What are the main benefits of digitization? Besides increasing efficiency at work (related to information access and use), museums can tap into a global market of information online. Joining resources, a greater outreach and the strengthening of the network are part of the process. The user expects unrestricted, sustainable and reliable digital access to heritage content. What are the main challenges when adopting the digital technology? Several Dutch museums experienced the dialectics of progress, resulting from high adoption and development costs with an equally high switching cost inherent of information technologies. Lock-in has been the mayor force slowing the transformation of museums, traditionally being organizations with limited resources and not enough trust in new technologies.

What lessons can be learnt from the experience of Dutch museums adopting a digital work practice? The current context where museums exist is not comparable to the pre-PC era of the 1960s. Museums have become part of a new heritage information space where the user and producer exchange information, based on a series of selection processes specific to a context. The availability of information depends on a series of decisions made during production and during distribution of content, the context being the individual museum make-up, while the selection by the user is determined by what is accessible and by the quality of consumption, the context determined by the specific information need. Key is the user's selection to actually use a piece of content.

The user is in fact anybody and everybody, with a new information need every time content is sought. The most convenient the information is made available (or packaged), the more used the content will be, and therefore the most valuable. There is, however, no use in developing packages for negligible content or publishing an information mine with obsolete technology. The key is finding the balance between producing quality content, represented by collection information (registration, contextualization, imaging), and developing convenient access points to the linked content. Digital production, thus, involves digital distribution and can benefit from a unified approach.

The main conclusion of chapter 6 is that there are many benefits to be gained by being part of an open digital information network where individuals use and give value to our universal heritage collection.

This history of digitization sketched through the experience of Dutch museums is the first national overview that tries to frame the elements that have influenced the current state of digital collections available online. The resulting digital collection depends on the individuals involved, the available technology, the institutional make-up and organizational processes, the changing information market, and the support of the government. The perspective of the user has gained visibility, being a key player in giving value to collection information by selection

and use –starting with the specialized museum staff member and expanding to any potential individual in the future. Digitization of collections has led to the creation of a new institution: the digital museum, developing new services that will position it in a digital heritage information market.

Much work has been done, and new frontiers await.

Tables

Annex table 1. Number of museums and government support

Year	Number of museums	Number of registered museums	Total expenditure cultural heritage (x1 million euro)	Total expenditure museums (x1 million euro)
1950	243	-		
1955	304	-		
1960	311	-		
1965	323	-		
1970	328	-		
1975	355	-		
1980	485	-		
1985	538	-		
1990	697	-	-	125.5
1991	735	-		
1992	723	-		
1993	732	-		
1994	741	-		
1995	774	-		
1997	942	-		
1998	-	20		
1999	902	51		
2000	-	90	284.7	183.5
2001	873	149	260.1	138.4
2002	-	212	227.1	141.4
2003	828	242	229.5	140.6
2004	-	293	267.0	157.7
2005	775	336	371.6	166.2
2006	-	343	396.8	152.5
2007	773	359	296.2	186.1
2008	-	378	347.9	178.0
2009	810	401	314.3	196.0
2010	-	416	342.2	200.5
2011	-	426	331.7	189.8

Number of museums: http://statline.cbs.nl; *Museumvisie*, Jr. 25(1):52 with data from CBS museums 1999; *85 jaren statistiek in tijdreeksen*, CBS, 1984.

Number of registered museums: https://www.museumregisternederland.nl/Geregistreerdemusea.aspx.

Direct ministry spending on museums, excluding what is channeled through the funds: Kerncijfers 2001-2005:131, Kerncijfers 2005-2009:165, Kerncijfers 2007-2011:165, OCW; Kiezen voor Kwaliteit (1991):37-38.

The decrease in museums reflects a change of definition adopted by the statistical office. The Dutch Statistics Netherlands uses the ICOM statutes adopted in 2007 with the following definition:

> *"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."*
>
> (http://icom.museum/the-vision/museum-definition/)

Annex Table 2. Ministry of Culture in the various Ministries

Culture has fallen in different ministries throughout the years. Currently, the Direction Culture (and Media) and subsequent Direction Cultural Heritage has most impact in the activities related to museum.

Year	Minister of Culture	Ministry	Year	Secretary of Culture	Direction Culture (and Media since 2003)	Direction Cultural Heritage
1952-1963	Jo Cals	OKW				
1963-1965	Theo Bot	OKW				
1965-1966	Maarten Vrolijk	CRM				
1966-1971	Marga Klompe	CRM				
1971-1973	Piet Engels	CRM				
1973-1977	Harry van Doorn	CRM				
1977-1981	Til Gardeniers-Berendsen	CRM				
1981-1982	Andre van der Louw	CRM				
1982-1982	Hans de Boer	CRM				
1982-1989	Elco Brinkman	WVC				
1989-1994	Hedy d'Ancona	WVC				
1994-1998	Jo Ritzen	OCW	1994-1998	Aad Nuis	Jan Riezenkamp	Cees van het Veen
1998-2002	Loek Hermans	OCW	1998-2002	Rick van der Ploeg	Jan Riezenkamp	Ronald van Hengstein
2002-2007	Maria van der Hoeven	OCW	2002-2003	Cees van Leeuwen	Jan Riezenkamp	Monique Vogelzang
			2003-2006	Medy van der Laan	Judith van Kranendonk	Monique Vogelzang
			2006-2007	Bruno Bruins	Judith van Kranendonk	Sander Bersee (2004)
2007-2010	Ronald Plasterk	OCW	2007-2010	Ronald Plasterk	Marjan Hammersma	Sander Bersee
2010-2012	Marja van Bijsterveld	OCW	2010-2012	Halbe Zijlstra	Marjan Hammersma	Sander Bersee
2012-2013	Jet Bussemaker	OCW	2012-2013	Sander Dekker	Marjan Hammersma	Sander Bersee

Source: Ministry of Culture, LinkedIn and Wikipedia (http://nl.wikipedia.org/wiki/Lijst_van_Nederlandse_ministers_van_Onderwijs,_Cultuur_en_Wetenschap).

OKW = Ministry of Education, Arts and Science (*Ministerie van Onderwijs, Kunst en Wetenschappen*)
CRM = Ministry of Culture, Recreation and Social Work (*Ministerie van Cultuur, Recreatie en Maatschappelijk Werk*)
WVC = Ministry of Wellbeing, Health and Culture (*Ministerie van Welzijn, Volksgezondheid en Cultuur*
OCW = Ministry of Education, Culture and Science (*Ministerie van Onderwijs, Cultuur en Wetenschap*)

Annex table 3. Policy trajectory for museums, the management of collections and for the digitization of collections

Year	Objective	Policy document
1921	*Report on reorganization of the national museums*	National Advice Commission. Policy document. *Rapport der Rijkscommissie van Advies inzake reorganisatie van het Museumwezen hier te lande*.
1953	*Report to improve museum visits*	Ministery of Culture. Policy rapport. *Rapport van de Commissie ter bevordering van het museumbezoek*.
1976	*Towards a new museum policy*	Ministry of Culture. Policy report by J.W.M. van Spaandonk. *Museum meer dan pronkkamer: nota 'Naar een nieuw museumbeleid'* Identifies museum object registration (with perceived significance) as essential base for renewing the museum institution. Links computers to research.
1979	*Seeking legitimacy*	Policy report by Jan Vaessen. *Een analyse en interpretatie van de Nederlandse museumdiscussie 1974-1979*.
1985	*Stimulating a policy for the automation of collections*	Ministry of Culture. Draft Policy. Proposed integral automation of National collections in a 7-year period.
1986	*Legitimizing museums in a museum culture*	Policy report by Jan Vaessen. *Musean in een museale cultuur: de problematische legitimering van het kunstmuseum*.
1988	*Reporting general state of national collections*	Audit Office. Report. States the problem of poor collection management.
1989	*Creating autonomous museums*	Monument Council policy advice. *Advies inzake verzelfstandiging van Rijksmusea en onderstaande instellingen*.
1990	*Delta Plan for the Preservation of Cultural Heritage*	Ministry of Culture. Document. *Deltaplan voor de Cultuurbehoud.* Action plan contains (a) policy foundation, (b) policy instrument, (c) phased implementation plan.
1991	*Ensuring quality of access and preservation*	Ministry of Culture. Policy document by Minister d'Ancona. *Kiezen voor kwaliteit, beleidsnota over de toegankelijkheid en het behoud van het museale erfgoed.* Gives attention to access and care of museum heritage. Basic level registration established.
1991	*Cultural Assets at Risk*	Minister d'Ancona. Policy report. First inventory phase of the Delta Plan.
1991	*Fighting against decay*	Ministry of Culture. Report. *Vechten tegen Verval.* Implementation plan for the Delta Plan.
1992	*Investing in Culture*	Ministry of Culture. Policy report. *Investeren in cultuur*.
1992	*Cultural policy in the Netherlands*	Cultural Council policy advice. *Advies inzake sectornota cultuurbeheer*.
1993	*Cultural policy in the Netherlands*	Ministry of Culture. General cultural policy document.

1993	*Preservation of culture*	House of Representatives. Report. *Cultuurbehoud.* Evaluation stating limited participation of Ministry to fight backlog.
1993	*Evaluation of the Delta Plan*	Office of Independent National Institutions. Report. *Het tij gekeerd…: tussentijdse evaluatie van het Deltaplan voor het cultuurbehoud van de Rijksmuseale instelingen*.
1994	*Evaluation of the Delta Plan*	Ministry of Culture. Report. *Werken in de Delta.* Evaluation 1991-1993. Confirmation of goals and shifting priorities between the sectors. Plan for the policy period 1997-2000, with financial overview.
1994	*National action plan Electronic Super Highway*	Ministry of Economic Affairs. *Nationaal Actieprogramma Elektronische Snelwegen*.
1995	*Principles of cultural policy*	Ministry of Culture. Policy report. *Panster of Ruggengraad. Uitgangspunten voor cultuurbeleid*. Policy document 1997-2001. Repositioning of priorities.
1996	*A culture of change*	Cultural Council policy advice. *Een cultuur van verandering: advies cultuurnota 1997-2000.*
1996	*Repositioning of priorities*	Ministry of Culture. Policy report. *Panster of Ruggengraad. Cultuurnota 1997-2000.* Policy document 1997-2001.
1998	*Cultural policy in the Netherlands*	Ministry of Culture. General cultural policy document.
1998	*Financing scenarios for digitization*	SURF. Report. *Alles uit de kast*.
1998	*Quality of museum registration*	SIMIN. Report. Evaluation on the quality of collection registration.
1998	*Electronic Government*	Ministry of Internal Affairs. Action Program *Actieprogramma Elektronische Overheid*.
1998	*Administrative consequences and responsibilities of ICT*	WRR. Report *Staat zonder land*. Locates the Annex E focuses on ICT and culture.
1999	*Digital Delta*	Ministry of Internal Affairs, Economic Affairs, Culture and Education. Policy report. *De Digitale Delta – Nederland oNLine.*
2000	*Cultural policy in the Netherlands*	Ministry of Internal Affairs. Policy report. *Contract met de toekomst*.
2000	*An information society for everybody*	Action Plan e-Europa 2002
2000	*Cultural diversity and audience reach, entrepreneurship*	Ministry of Culture. Policy report by Minister van der Ploeg. *Cultuur as Confrontatie*.
2000	*Cultural policy in the Netherlands*	Cultural Council policy advice. *Van de schaarste ende overvloed: advies cultuurnota 2001-2004*.
2002	*Cultural policy in the Netherlands*	Ministry of Culture. General cultural policy document.
2002	*State of ICT use in museums and international comparison*	PWC. Report. *ICT gebruik in musea*.
2002	*Internet and cultural*	WRR. Report.

	policy	Builds up from 'City without ground' to develop consequences of ICT for the Dutch cultural policy. *Internet en cultuurbeleid*.
2002	*Inventory of the digital heritage Infrastructure*	Research defines 'proper digitization' based on re-usability of content to form a national knowledge infrastructure.
2002	*Reduction of bureaucracy and government spending*	Ministry of Internal Affairs. Action Program. *Actieprogramma Beter Beleid voor burger en bedrijf*.
2003	*To improve services, renew relations with the provinces*	Ministry of Internal Affairs. Cabinet policy. *Kabinetvisie Andere Overheid.* .
2003	*A comprehensive funding approach to digitization*	Art Council report. *eCultuur: van i tot e*.
2003	*Accessibility of content from a user perspective*	Position paper on EU Added Value and post-Lund Strategy
2003	*Less bureaucracy and more individual responsibility in the cultural system, more connection among sectors, and a higher economic impact of the arts in society*	Ministery of Culture. Policy report by Minister van der Laan. *Meer dan de Som: Beleidsbrief Cultuur 2004-2007*.
2004	*Towards an electronic government*	Ministry of Internal Affairs. Policy document. *Op weg naar de elektronische overheid.*
2004	*Cultural policy in the Netherlands*	Cultural Council policy advice. *Spiegel van de cultuur: advies cultuurnota 2005-2008*.
2004	*From ICT to e-Culture: Advisory report on the digitization of culture and the implications for cultural policy*	Cultural Council defines e-culture as the integration of ICT into all aspects of cultural expression. English version of *eCultuur: van i tot e*.
2005	*Museums to have a relevant role with communities*	Ministry of Culture. Policy report by Minister van der Laan. *Bewaren om teweeg te brengen: museale strategie*.
2005	*Cultural policy in the Netherlands*	Ministery of Culture. Policy report. *Verschil maken. Herijking cultuurnotasystematiek*.
2006	*Improvement of information access and development of data standards*	*Informatie op orde*
2006	*Digitization policy*	*Digitaliseren met beleid.* Subsidy program managed by Senternovem (2006-2008).
2009	*Collaborative activities that would increase the value of cultural expression*	*Subsidieregeling Innovatie Cultuuruitingen* Subsidy program managed by Senternovem (2009-2011).

Source: own.

Annex table 4. European programs related to the digitization of heritage

Year	Name of program/project	Program/project goals	Total costs (EU contribution)	Dutch organization participating
1987	FP2 RACE 1 Community program EEC in the field of telecommunications technologies (1987-1992)	Framework program 2C: Promote the internal and external competitiveness of the Communities' telecommunications industry. Total of 94 projects funded. Total 94 projects granted.	€550,000,000	
1988	IMPACT 1 (1988-1990) Plan of action EEC for setting up an information services market	Program. Preceded IMPACT 2. Succeded INFOMAR C. Set up an internal information services market by the end of 1992, stimulate and reinformce the competitive capability of European suppliers of these services, promote the use of advanced information services within the context of a world market. Total 20 projects granted.	€36,000,000	
1991	FP3 RACE 2 Communication technologies (1991-1994)	Framework program 3: Specific research and technological development program (EEC) in the field of communication technologies. Contributed to the introduction of Integrated Broadband Communications (IBC) with the development of the Integrated Services digital Network (ISDN) and the national strategies. Total of 123 projects funded.	€554,000,000	
1991	IMPACT 2 (1991-1995) Program for the establishment of an internal information services market	Program. Succeded IMPACT 1. Proceded INFO2000. Establish an internal information service market, identify the strength and weaknesses of existing information services, promote the use of advanced information services, stimulate and reinforce the competitite capability and make use of results supplied by other national programs. Total 121 projects granted.	€64,000,000	
1991	FP3 LIBRARIES (1991-1994)	To facilitate user access, by optimum use and development of equipment and telematic systems, to the wealth of knowledge held in libraries. Total of 51 projects funded.	€22,500,000	
1992	RAMA Remote Access to Museum Archives	Project. Partnership with telecommunications to develop a network for museum data exchange. Part of FP3 RACE 2.		Museon (Coordinated in UK)
1993	Van Eyck Visual Arts Network for the Exchange of Cultural Knowledge (1993-1996)	To develop the technical means for storing, selecting and transmitting high quality images in digital form held in the collections of three art history photographic libraries. Funded by the Libraries program in the Telmatics program of FP3 and FP4.		RKD, Utrecht University, (Coordinated in UK)
1993	White Paper for Building a National Information Infrastructure	Al Gore.		
1994	Europe and the Global Information Society	EC. Bengemann Report.		
1994	FP4 ACTS Specific program of research,	Framework program 4: To develop advanced communication systems and	€671,000,000	

	technological development and demonstration in the area of advanced communications technologies and services (1994-1998)	services for economic development and social cohesion in Europe. Total of 222 projects were funded.		
1994	Europe and the Global Information Society	Bangemann Report: Corfu European Council meeting to plan for the trans-European telecommunications network.		
	Electronic Libraries (G7 pilot) (1995-1999)	Constitute a large distributed virtual collection of the knowledge of mankind available to the public via networks (France and Japan).		
1995	G7-Heritage C (1995-1999)	Program: Towards open multimedia access to the world's cultural heritage: museums and galleries. To accelerate the multimedia digitization of collections and to ensure their accessibility to the public (Italy and France).		
1995	EURO-ISDN Integrated Services Digital Network	Intents to identify the objectives and priorities, while supporting projects (standards and business) with common interest to develop a European digital network.		
1996	MLIS (1996-1998) Multianual program to promote the linguistic diversity of Europe in the Information Society.	Program. Proceded eContent. Stimulate the use of technologies, tools and methods which reduce the cost of transferring information between languages and the development of multilingual services, to encourage the strengthening of the language industry, to encourage the development of multilingual services, and to promote the linguistic diversity of the European Union in the global Information Society. Total 18 projects granted.	€15,000,000	
1996	AURORA (1996) Automated Restoration of Original Film and Video Archives	Pilot to develop a video restoration system with real-time detection of impairments and estimation of quality level, restoration in real time with control of level of correction by the users, and interactive restoration tools for high quality restoration or for badly damaged materials. Funded by ACTS, part of FP4 ICT.		Technical University Delft (coordinated in France).
1996	INFO2000 (1996-1999) Multiannual Community program to stimulate the development of a European multimedia content industry and to encourage the use of multimedia content in the emerging information society	Program. Sucesor of IMPACT 2 program. Predecesor of eContent program. To stimulate demand for, and use of, multimedia content; to create favorable conditions for the development of the European multimedia content industry; and to contribute to the professional, social and cultural development of the citizens of Europe. Budget allocated to stimulate demand and raise awareness (22-32%), exploit information (18-23%), trigger multimedia potential (45-47%) and support actions (3-8%). Total of 80 projects granted.	€65,000,000	
1996	Raphael (1996-2000) Community action program in the field of cultural heritage	Program. Aimed to contribute to the creation of an ever closer union among the peoples of Europe and to the flowering of the cultures of the Member States.	€70,000,000	
1997	TEN-ISDN	Program: Trans-european Network – Integrated Services Digital Network. Set of guidelines for the development of EURO-ISDN.		
1997	Trans European telecommunications network	Agreement to ensure circulation and exchange of information among the member states, supporting citizens and the industry to advance the information		

		society.		
1997	CHAMPOLL (1997) Cultural Heritage and Multilingual Program of Long-standing Legaciy in Open Network	Project. Produce multimedia CD-ROMS containing data and images relating to selected Egyptian artefacts in museums in six different European countries. The multilingual database will be accessible in 5 lanugages. Allard Pierson participated with 100 objects. Part of INFO2000.	€93,291	Universiteit Utrecht as coordinator, Allard Pierson Museum.
1998	FP5 (1998-2002)	Framework Program 5: to maintain and enhance, in the context of a genuine 'European research area', the research potential of European laboratories, universities and companies and their ability to produce knowledge of the highest level and high-quality technologies; and to help ensure that European research serves the Union's economic and social objectives: increasing industrial competitveness and the quality of life for European citizens.	€14,960 million	
1998	PF5 IST Program for research, technological development and demonstration of a "user-friendly information society" (1998-2002)	Framework Program 5: To realize the benefits of the information society for Europe both by accelerating its emergence and by ensuring that the needs of individuals and enterprises are met. Total of 2,465 projects granted.	€3,600,000,000	
1998	PF5 EESD Program for research, technological development and demonstration on Energy, Environment and Sustainable Development (1998-2002)	Framework Program 5: to contribute to sustainable development by focusing on key activities crucial for social well-being and economic competitiveness in Europe. Total of 1,984 projects granted. Followed by FP6 SUSTDEV.	€2,125,000,000	
1998	NEDLIB Networked European Deposit Library (1998-2000)	Find ways to ensure that electronic publications and documents of the present can be used now and in the future. Will model and demonstrate a basic infrastructure upon which a networked European deposit library could be built. Part of TELEMATICS 2C program (part of FP4).		KB as coordinator National Archive, Elsevier Science, Kluwer Academic, Springer Verlag.
2000	Fauna Europaea (2000-2004)	It aimed at producing a taxonomic framework, a software tool to support data transfer, and to collate and validate expert data files.	€3,235,029 (€3,235,029)	University of Amsterdam Zoological Museum as coordinator, Naturalis.
2000	2010 EC strategy	Lisbon meeting.		
2001	Lund Action Plan established	Sweden EU-presidency.		
2001	eContent (2001-2005)	Program. Succedded MLIS and INFO2000. Preceded eContentPlus. Focuses on issues of multilingual content, pan-European databases and an observatory for viable business models. Total of 136 projects granted.	€100,000,000	
2001	TEL The European Library Project (2001-2003)	Project. To develop a pan European distributed digital library with integrated multi-lingual access, based on European national digital collections. Part of IST, FP5 Access to digital collections of cultural and scientific content.	€1,977,527 (€1,197,562)	KB, Conference of European National Libraries, (Coordinated in UK)
2001	OpenHeritage (2001-2003)	Project. To provide core building blocks to support the European digital cultural heritage and to enable effective access of citizens, professionals and business operators. Part of FP5-IST Access to digital collections of cultural and scientific content.		Museon Foundation (Coordinated in Italy)

2002	eCULTURE Net (2002-2003) European Network of centers of excellence: digital culture research and education network	Preparatory project for e-culture Net in the FP6.	€439,371 (€439,371)	University Maastrict as coordinator.
2002	MINERVA Ministerial Network for Valorizing Activities in digitization (2002-2005)	Project. Creates a network of Member States' Ministries for creating an agreed European common platform, recommendations and guidelines about digitization, metadata, long-term accessibility and preservation. Part of FP5 IST.	€1,400,000 (€1,400,000)	(Coordinated in Italy)
2002	FP6-INNOVATION (2002-2006) Research and innovation in the specific program for research, technological development and demonstrations 'Structuring the European Research Area'	Framework Program: Encourage a more innovation-friendly policy and regulatory environment through research and innovation activities and to stimulate technological innovation and the setting up of innovative technology business. Part of FP6 Structuring. Preceded CIP. Succeeded FP5-Innovation SME. Total 238 projects granted.	€319,000,000	
2002	FP6-IST (2002-2006)	Information Society Technologies: thematic priority under the specific program "Integrating and strengthening the European research area". Part of FP6-INTEGRATING. A total of 1,156 projects were funded.	€3,984,000,000	
2002	eEurope 2005 drafted	Sevilla meeting. It aimed to develop modern public services and a dynamic environment for e-business through widespread availability of broadband access at competitive prices and a secure information infrastructure.		
2002	EMII-DCF European Museums' Information Institute Distributed Content Framework (2002-2003)	Project. Developed a framework for content creation, use of standards, legal requirements and overall project organization for European projects aiming at giving access to digital heritage content. Followed EMII financed by RAPHAEL. Part of FP5-IST.	€446,779 (€446,779)	(Coordinated in the UK) Adlib Information Systems BV.
2003	Evamp European Visual Archives Market validation Project (2003-2004)	Lower the threshold for archives to make their image collections digitally available via internet, to increase accessibility to historic photographs and archival information to attract use from the general public.	€69,000 (€34,000)	
2003	CALIMERA (2003-2005)	Project. Monitors and selects technical developments that would facilitate preservation and access to digital cultural objects at lower costs. Part of FP6-IST.	€899,932 (€899,932)	Eblida, Public Library Foundation Eindhoven (Coordinated in Portugal)
2004	Prestospace (2004-2008)	Preservation towards storage and access. Standardized Practices for audio-visual contents in Europe. Part of FP6.	€15,752,750 (€9,000,000)	Netherlands Institute of Sound and Vision, Filmmuseum, NOB Cross Media Facilities. (Coordinated in France)
2004	EPOCH Excellence in Processing Open Cultural Heritage (2004-2006)	Project. Foster integration within the cultural heritage sector, set up a joint research agenda, and spreading best practices. Focus on application of technologies to tangible culture (monuments, archaeology, and cultural landscape) using AR/VR, 3D, etc. Part of FP6-IST.	€7,880,000 (€7,880,000)	University of Groningen, Heritage Solutions, Hogeschool van Utrecht and the Stichting Bedrijfsregion Kop van Noord-Holland (Coordinated in UK)
2004	MINERVA-Plus (2004-2006)	Project. Enlarges thematic network, promoting recommendations and	€840,000	(Coordinated in Italy)

		guidelines about digitization, metadata, long-term accessibility and preservation. Part of FP6.	(€840,000)	
2004	SYNTESYS Synthesis of Systematic Resources (2004-2009)	Project. 20 EU natural history institutions to create a network and to give access to collections for researchers. Part of FP6 Infrastructures.	€14,021,137 (€13,000,000)	University of Amsterdam, Fungal Biodiversity Center, National Natural History Museum Naturalis, National Herbarium Netherland (Coordinated in UK)
2004	MARBEF Marine biodiversity and ecosystem functioning (2004-2009)	Project. Integrate research by forming a network of excellence about marine biodiversity. Funded by FP6-SUSTDEV, part of FP6-INTEGRATING.	€8,707,000 (€8,707,000)	Netherlands Institute of Ecology (coordinator), Naturalis, National Institute for coastal and marine management, the Rijkswaterstaat waterdienst, the University of Amsterdam, Dutch Foundation Institute for Sea Research, Wagening University, RIVO Netherlands Institute for Fisheries Research, University of Groningen, Wageningen Imares B.V., and Maastricht University.
2004	MICHAEL Multi-lingual Inventory of Cultural Heritage in Europe	Provides simple and quick access to the digital collections of museums, libraries and archives from different European countries.		
2004	eTEN Trans European Network (2004-2006)	Themes include eGovernment, eHealth, eInclusion, eLearning, eBusiness, and Trust and Security services.		
2005	2005-2008: eContent Plus	Program. Succeded eContent. Aims to make digital content in Europe more accessible, usable and exploitable, facilitating the creation and diffusion of information.	€149.000.000	
2005	i2010 action plan	Program.		
2005	MICHAEL-Plus	A continuation of MICHAEL.		
2005	TEL-ME-MOR (2005-2007)	Project. Part of the European Library. The European Library: Modular Extensions for Mediating Online Resources. Part of the FP6.	(€1,400,000)	KB (Coordinated in Germany)
2005	Digital Libraries Initiative	Makes Europe's diverse cultural and scientific heritage (books, films, maps, photographs, music, etc.) easier and more interesting to use online for work, leisure and/or study.		
2006	EDL European Digital Library (2006-2008)	Part of the European Library. This project will become Europeana. Part of eContent Plus.	(€1,000,000)	
2006	Bernstein: the memory of papers (2006-2009)	Project. Integratedd digital environment for the expertise and history of paper. Part of the eContent Plus.	€3,200,000 (€1,600,000)	Technical University Delft, KB. (Coordinated in Austria)
2006	VARIAZIONI cultural heritage contents	Project. Improving the musical metadata tagging. Part of eContent Plus.	€2,350,000	European Association of

	over the next generation of mashup web services (2006-2009)		(€1,880,000)	Conservatories, Music Academis and Music Schools in the Netherlands. Coordinated in Spain.
2006	Michael Plus (2006-2008)	Extend the number of countries involved in the current Michael project. Contribute both cultural and economic development by transforming digital cultural heritage resources into cultural and touristic products.	€49,300,000 (€4,920,000)	
2006	MINERVA EC	Project. A continuation of MINERVA. Part of eCulture Plus.	(€950,000)	
2006	EDIT (2006-2011)	Project. Toward the European Distributed Institute of Taxonomy. Part of FP6-SustDev.	€15,000,000 (€11,900,000)	Zoological Museum Amsterdam, Foundation Netherlands Center for Biodiversity Naturalis, Fungal Biodiversity Center (Coordinated in France)
	euromuse.net		€3,000,000 (€900,000)	
2007	i2010 Digital Libraries launched (2007-2013)	Makes European information resources easier and more interesting to use in an online environment.		
2007	TEL-Plus (2007-2008)	Project. Makes content OAI compliant, to OCR content. Part of eContent Plus.	€6,500,00 (€3,250,000)	KB (Coordinated in Estonia)
2007	STERNA Semantic Web-based thematic European reference network application (2007-2012)	Project. Outcomes: (1) a theme-oriented European semantically rich information space; (2) a methodology for content enrichment; (3) guidelines for implementing the STERNA architecture; (4) partnership agreements for new partners to join the network; (5) an extension plan for further European roll-out; (6) a road show in Europe to demonstrate the system; (7) a cooperation agreement with the European Digital Library to ensure sustainability of the digital resources in a federation of contributors.	€1,870,000 (€1,500,000)	Foundation Teylers Museum, Foundation NIBG, Foundation National Natural History Museum Naturalis. (Coordinated in Austria)
2007	OAPEN Open Access Publishing in European Networks (2007-2011)	Project. Find useful, exciting and beneficial ways of publishing scholarly work in Open Access, enhancing access to important peer reviewed research from across Europe. Most importantly it will find a financial model which is appropriate to scholarly humanities monographs, a publishing platform which is beneficial to all users and create a network of publishing partners across Europe and the rest of the world. Part of eContent Plus.	€1,800,000 (€900,000)	Amsterdam University Press BV (coordinator), University of Amsterdam, Leiden University.
2007	GAMA Gateway to Archives of Media Art	Project. Central Platform to enable multilingual, facilitated and user-oriented access to a significant number of media art archives and their digitized content.	€2,500,000 (€1,200,000)	Foundation Netherlands Institute for Media Art, Foundation Higeschool for the Arts Utrecht. (Coordinated in Germany)
2007	PESI Pan European Species directories infrastructure	Project. To provide a standardized and authoritative taxonomic information by integrating a number of databases, with authoritative species name registers and nomenclators. Part of FP7-Infrastructures.	€4,057,628 (€2,640,000)	University of Amstedam (coordinator), Dutch Biodiversity Center Naturalis.
2007	FP7 Framework Program for Research and Technological Development (2007-2013)	Funding program to support and encourage research in the European Research Area. Precedes HORIZON2020. Succeeds FP6. Part of FP6. It works with 4 programs: Cooperation, Ideas, People and Capacity.	€50,521,000,000	

2007	CIP Competitiveness and Innovation Framework Program (2007-2013)	Supports innovation activities (including eco-innovation), provides better access to finance and deliver business support services in the regions. It encourages the use of ICT and helps develop the information society. Made by three operational programs: Information Communication Technologies Policy Support Program (ICT-PSP), Entrepreneurship and Innovation Program (EIP), and The Intelligent Energy Europe Program (IEE).	€3,621,000,000	
2007	ICT PSP ICT Policy Support Program (2007-2013)	Stimulating smart sustainable and inclusive growth by accelerating the wider uptake and best use of innovative digital technologies and content. It provides funding to support the realization of the Digital agenda for Europe (1 of 7 flagship initiatives of Europe 2020 strategy). Supports Digital Libraries projects. Part of Competitiveness and Innovation Framework Program (CIP).		
2007	NUMERIC (2007-2009)	Contributes statistical assessment of the digitization of Europe's Cultural Heritage. Founded by ICT PSP.		
2007	FP7-ICT Specific program Cooperation – Research theme "Information and communication technologies" (2007-2013)	To improve the competitiveness of European industry and enable Europe to master and shape the future development of ICT. To strengthen Europe's scientific and technology base and ensure its global leadership in ICT (part of FP7-COOPERATION). A total of 1,514 projects have been funded.	€9,050,000,000	
2008	LIWA Living Web Archives (2008-2011)	Establish web archive that adapts over time, that improves archive fidelity and authenticity, and that captures content from a wide variety of sources.	€3,624,871 (€2,682,371)	Institute for Image and Sound (Coordinated in Germany)
2008	IMPACT Improving Access to Text (2008-2012)	Push innovation in OCR technology and language technology for historical document processing and retrieval while sharing expertise. Part of FP7-ICT.	€15,503,509 (€11,500,000)	KB as coordinator
2008	PEER Publishing and the Ecology of European Research (2008-2012)	Project. Pioneering collaboration between publishers, repositories and researchers.	€4,250,000 (€2,120,000)	Foundation International Association of Scientific, Technical and Medical Publishers (Coordinator), Foundation SURF.
2008	DL.ORG (2008-2011)	Coordination action on digital library interoperability, best practices, and modeling foundations. Part of FP7-ICT.	€1,681,077 (€1,200,000)	(Coordination in Italy)
2008	EDLnet European Digital Library Network	Part of eContent Plus.	(€1,300,000)	
2008	ATHENA Access to Cultural Heritage Network across Europe	Aggregates museum content and promotes standards for museum digitization and metadata. Part of eContent Plus.	€5,250,000 (€4,200,000)	Rijksmuseum Foundation, European Digital Library Foundation. (Coordinated in Italy)
2008	European Film Gateway (EFG)	Aggregates cinema related material. Part of eContent Plus.	€5,630,000 (€4,500,000)	Netherlands Filmmuseum Foundation, European Digital Library Foundation. (Coordinated in Germany)
2008	Europeana Local	Brings content from regional and local content holders.		
2008	ARROW Acecssible Registries of Rights	Aggregates content to Europeana. Part of eContent Plus.	€5,100,000	KB.

	information and Orphan works towards Eruopeana (2008-2011)		(€2,550,000)	(Coordinated in Italy)
2009	KEEP Keeping emulation environments portal (2009-2012)	Develop an Emulation Access Platform enabling the accurate rendering of objects produced on obsolete machines.	€3,973,445 (€3,149,741)	KB (Coordinated in France)
2009	APEnet Archival Project of Europe	Aggregates content from Europe's national archives. Part of eContent Plus.	€3,100,000 (€2,400,000)	European Digital Library Foundation, National Archive. (Coordinated in Spain)
2009	BHL-Europe Biodiversity Heritage Library	Brings biodiversity heritage into Europeana.	€4,200,000 (€3,360,000)	National Natural Museum Naturalis, European Digital Library Foundation (Coordinated in Germany)
2009	Europeana Connect	Adds sound material to Europeana. Part of eContent Plus.	€5,630,000 (€4,500,000)	Christian University, University of Amsterdam, Netherlands Knowledge land Foundation, European Digital Library Foundation, KB, and Amsterdam University Press BV.
2009	PrestoPRIME (2009-2012)	Researches and develops practical solutions for the long-term preservation of digital audiovisual material. Part of FP7-ICT.	€12,122,873 (€8,000,000)	Europeana Foundation, Dutch Institute for Image and Sound Foundation, Dutch Media Production (*Nederland Omroepproduktie Bedrijf NV*), and the Christian University (Coordinated in France)
2009	MIMO Musical Instruments Museum Online	Creates a single access point to digital content about musical instruments in European museums. Part of eContent Plus.	€3,200,000 (€1,600,000)	(Coordinated in UK)
2009	Judaica Europeana Jewish Urban Digital European Integrated Cultural Archive	Looks at the Jewish contribution to Europe's cultural heritage. Part of eContent Plus.	€3,000,000 (€1,500,000)	(Coordinated in Germany)
2009	Europeana Travel	Brings material associated with travel, trade, tourism and migration into Europeana.	(€1,400,000)	
2009	EUscreen	Contributes television material to Europeana. Part of eContent Plus.	€5,650,000 (€8,820,000)	Coordinated in the Netherlands. University Utrecht, Netherlands Institute for Sound and Vision Foundation, European Digital Library Foundation, Noterik BV.
2009	PuppyIR (2009-2012)	An open source environment to construct information services for children.	€4,182,665 (€3,024,899)	Coordinated by University Twente, with collaboration from Academic Medic Center of the University of Amsterdam,

				Technical University Delft, and Museon Foundation.
2010	EURO Photo (2010-2012)	Disclosing the European Library on Common visual historical heritage. Part of ICT PSP.	€4,600,000 (€2,300,000)	ANP Foundation, European Press Photo Agency (Coordinated in Italy)
2010	ECLAP European Collected Library of Artistic Performance (2010-2013)	Making Performing Arts Heritage material available. Part of ICT PSP.	€4,250,000 (€3,400,000)	University of Amsterdam, Netherlands Institute for Sound and Image (Coordinated in Italy)
2010	CARARE Connecting Archaeology and Architecture in Europeana (2010-2013)	Providing Archeology and architecture content to Europeana. Part of ICT PSP.	€5,380,000 (€4,300,000)	n303bv, European Digital Library Foundation, OCW, KNAW, The Netherlands Institute for Heritage. (Coordinated in Denmark)
2010	ASSETS Advanced Search Services and Enhanced Technological Solutions for the European Digital Library (2010-2012)	Improve usability of Europeana by developing, implementing and deploying large-scale services focusing on search, browsing and interfaces. Part of ICT PSP.	€5,310,000 (€4,250,000)	European Digital Library Foundation. (Coordinated in Italy)
2010	DigiBIC (2010-2013)	Deployment of best practice, tools and results from FP6, FP7, and national research projects to the wider Creative Industry sector and small-medium size enterprises.	€1,570,593 (€1,197,988)	Institute for Image and Sound (Coordinated in Belgium)
2011	ENUMERATE (2011-2014)	A European Survey for Statistical Intelligence on Digitization, Digital Preservation and Online Access to Cultural Heritage. Part of ICT PSP Digital Libraries.	€320,000 (€320,000)	DEN, KB. (Coordinated in UK)
2011	OpenUp! (2011-2014)	Opening up the Natural History Heritage for Europeana. Part of ICT PSP.	€4,37,000 (€3,500,000)	Netherlands Center for Biodiversity Naturalis, Expert Center for Taxonomic Identification Foundation. (Coordinated in Germany)
2011	DCA Digitizing Contemporary Art (2011-2013)	It focuses on art made after 1945, still missing from Europeana. Part of ICT PSP.	€3,950,000 (€1,970,000)	Boijmans van Beuningen Foundation, Netherlands Institute for Media art Montevideo. (Coordinated in Belgium)
2011	Europeana Libraries (2011-2012)	Europeana Aggregating digital content from Europe's Libraries. Content includes 1,200 film and video, 1850,000 images and 4.3 million texts. Part of ICT PSP.	€3,870,000 (€3,090,000)	KB coordinating Liber Foundation, Europeana Foundation.
2011	HOPE Heritage of the People's Europe (2010-2013)	Networks the digital collections of European institutions in social history and the history of the labor movement. Part of ICT PSP.	€3,320,000 (€2,650,000)	KNAW coordinates. European Digital Library Foundation.
2011	AXES Access to Audiovisual Archives	Develop tools that provide various types of users with new engaging ways to	€8,347,341	Dutch Institute for Image and

	(2011-2014)	interact with audiovisual libraries.	(€5,900,000)	Sound Foundation and the University of Twente (Coordinated in France)
2011	SCAPE Scalable Preservation Environments (2011-2014)	Enhance the state of the art of digital preservation by developing infrastructure and tools, providing a framework for workflows and by integrating these components with a policy-based preservation planning and watch system.	€11,358,914 (€8,599,833)	KB and Internet Memory Foundation (Coordinated in Austria)
2011	APARSEN Alliance Permanent Access to the Records of Science in Europe Network (2011-2014)	Building on the established Alliance for Permanent Access to ensure sustainable digital information infrastructure providing permanent access to digitally encoded information.	€8,748,277 (€6,840,000)	KB, Liber Foundation, International Association of Scientific, Technical and Medical Publishers, European Alliance for Permanent Access Foundation, KNAW Dutch Academy for Science and Phillips Consumer Lifestyle BV (Coordinated in UK)
2011	ARCOMEM Archive Communities Memories (2011-2013)	Help transform archives into collective memories integrated with their community of users and exploit the Social Web to make web archiving a more selective and meaning-based process.	€8,013,031 (€6,000,000)	Internet Memory Foundation (Coordinated in UK)
2012	V-Must.net Virtual Museum Transnational Network (2011-2015)	Create a virtual research area, identify researches for further development, identify the virtual museum of the future, increase competitiveness of the EU-ICT industry, create a quality evaluation procedure.	€5,066,534 (€4,550,000)	Allard Pierson Museum (Coordinated in Italy)

Source: own (http://cordis.europa.eu; http://ec.europa.eu/information_society/activities/econtentplus/projects/index_en.htm).

Figures

Figure 1 Screen shot TINman Main Menu

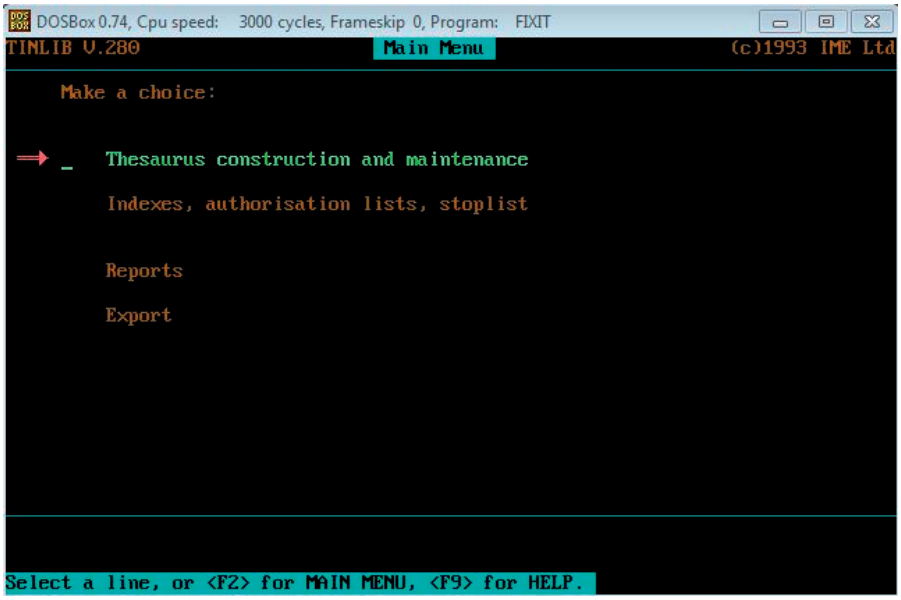


Figure 2 Screen shot TINman Options Menu

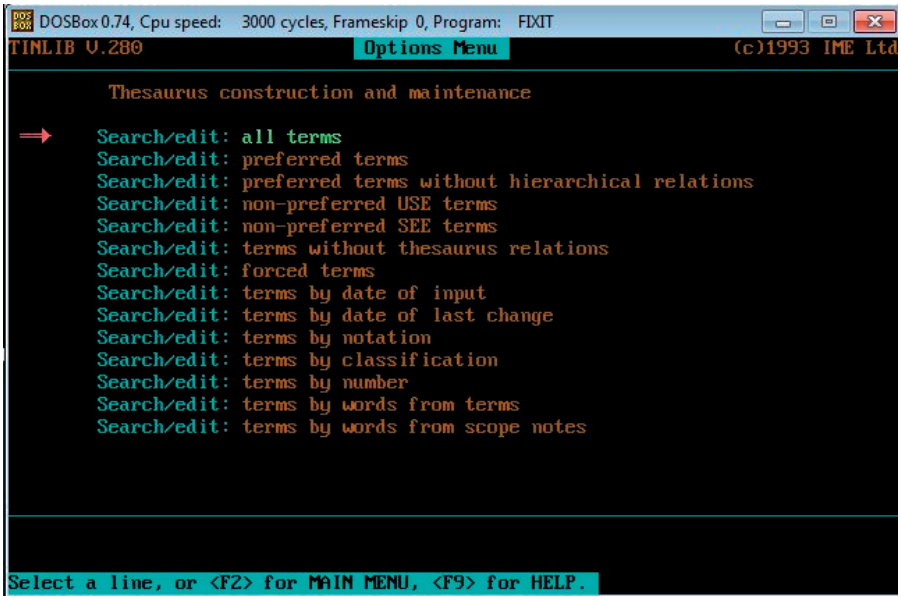


Figure 3 Screen shot TINman Options Menu

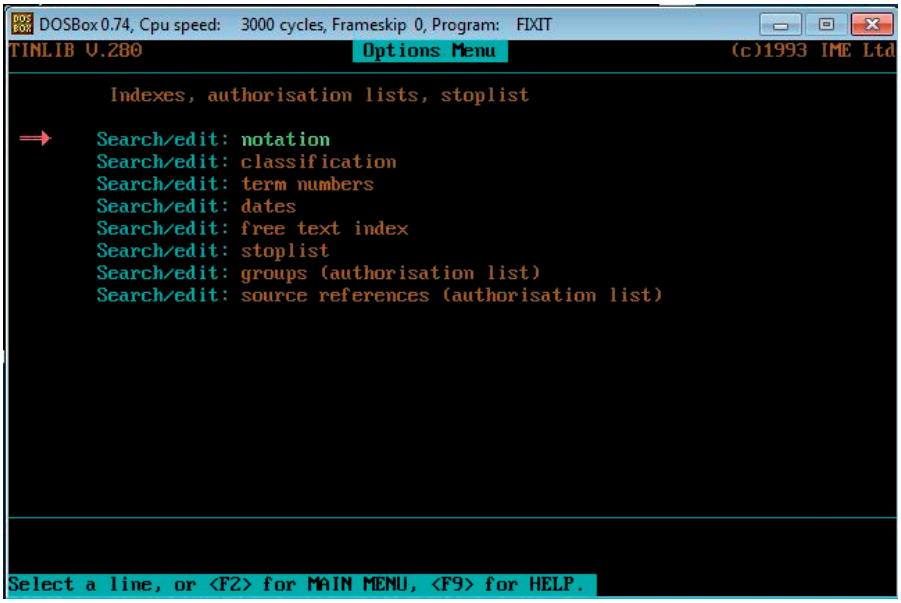


Figure 4 Screen shot TINman Record Details

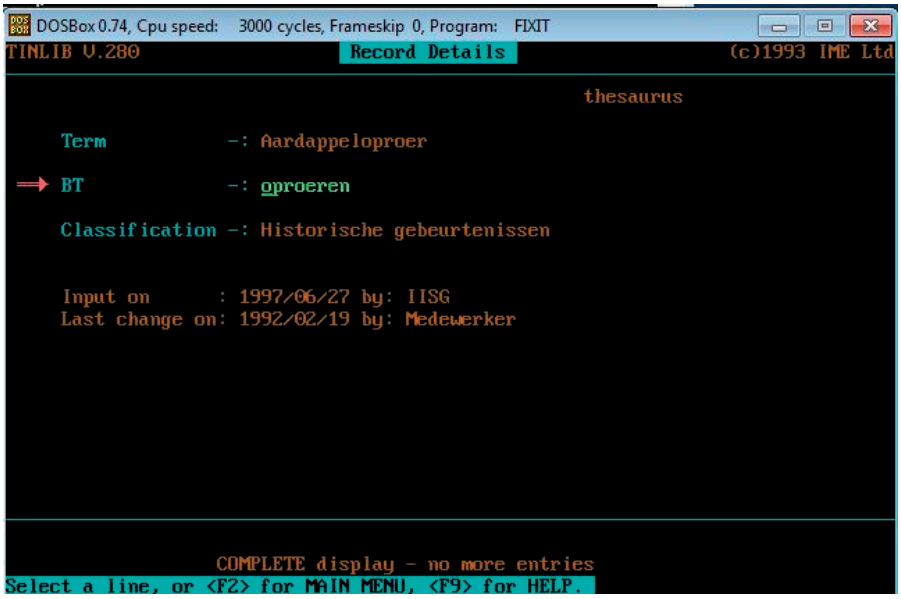


Figure 5 Screen shot TINman Editor

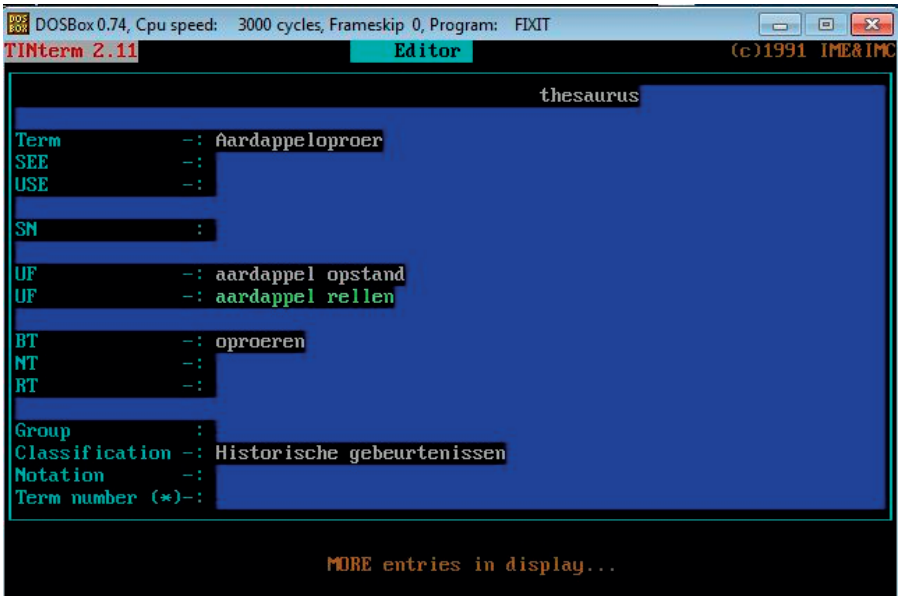


Figure 6 Screen shot TINman Browsing

Figure 7 Screen shot TINman Export

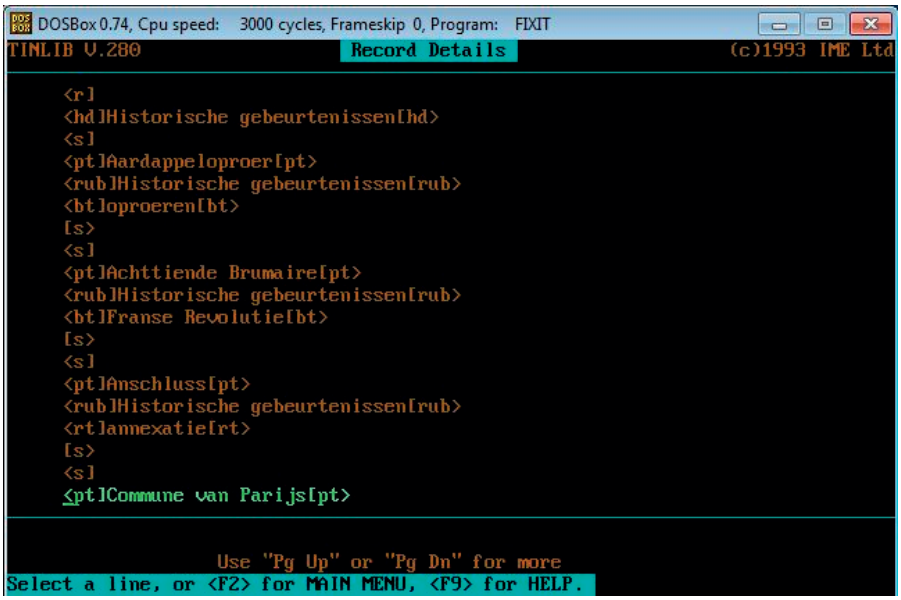


Figure 8 Screen shot Glass Collection main page

Figure 9 Screen shot Glass Collection main menu

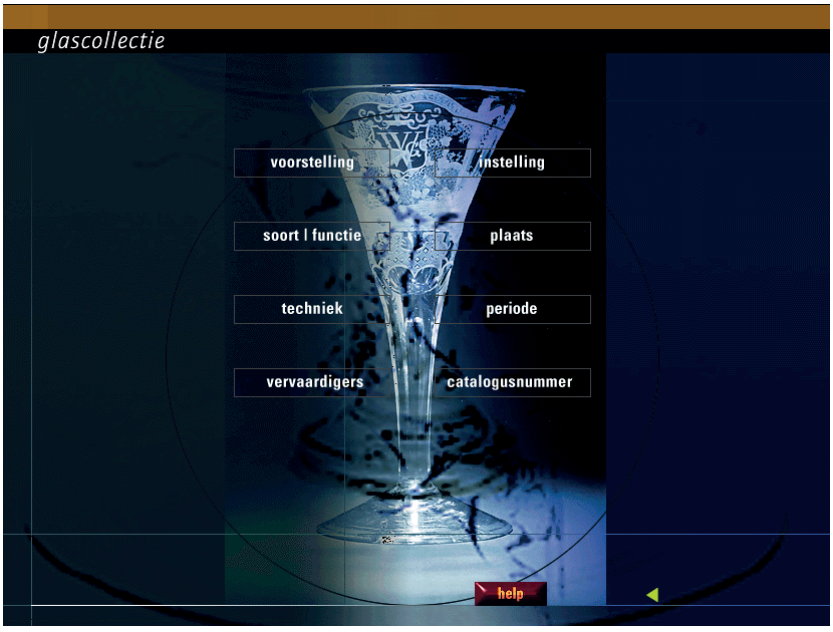


Figure 10 Screen shot Glass Collection exhibition menu

Figure 11 Screen shot Glass Collection diamond engraving technique

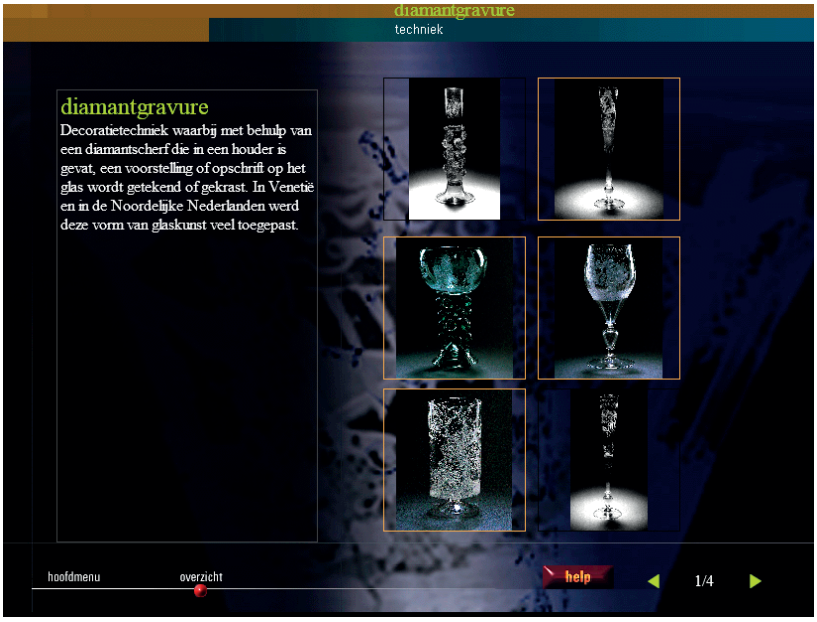
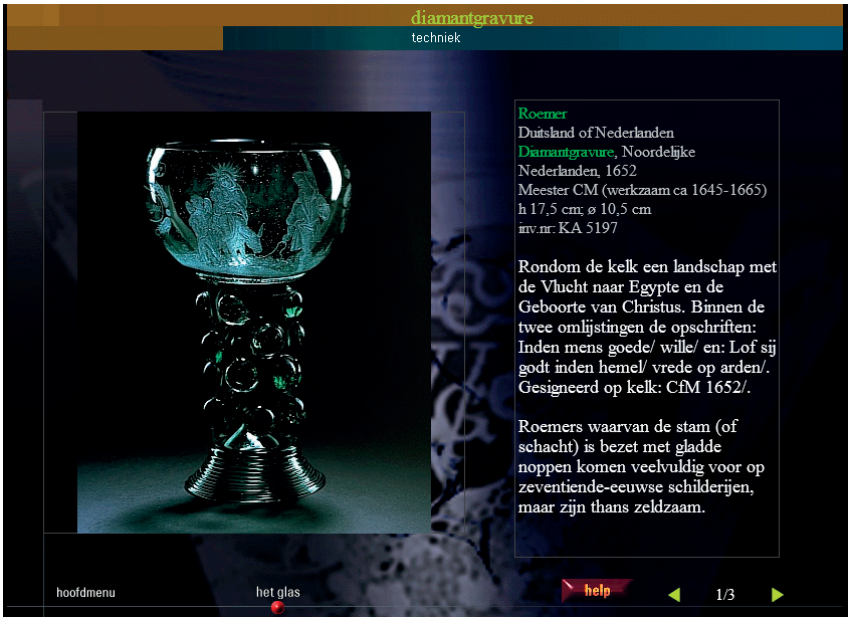


Figure 12 Screen shot Glass Collection diamond engraving object view



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Interviews: a total of 68 people were interviewed. The information on date, time and place of the interview is reported on the references list.

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Rijksmuseum Amsterdam: Jeroen de Vliet, Jean Piet Filedt Kok, Rob Hendricks, Daniel Horst, Geertje Jacobs, Lizzy Jongma, Huigen Leeflang, Renata Mijer, Kees Schoemaker, Marja Stijkel, Susan van Gelderen, Cecile van Harten, and Mirjam Wijnands.

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Archives: a total of 13 archives were reviewed.

Personal archives: Frank Bergevoet, Bert Degenhart-Drenth, Jeanne Hogenboom, Gerhard-Jan Nauta, Marius Snyders, and Jan van de Voort.

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