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Deciding on Digital Archives

*Improvement through
Collection Management Systems*

I'm sitting in front of my computer screen, eager to find out more about Indian cultural heritage collections. While some British museums have online collections with Indian content, along with a few European and North American institutions, Indian museums themselves are comparatively new to the scene. The Indian government, however, has commenced a project aiming at digitizing and disseminating online all Indian museum collections. In the course of this digitization, it is not just a few highlights that will be accessible, or short descriptions of the collections (as many museums all over the world still have); the project strives to present complete inventories of every single object preserved in all large Indian museums.

My online search for 'museums of India' provides several suggestions from Sahapedia, Wikipedia, tour operators and Trip Advisor. A bit further down the search results, I find what I am looking for: www.museums.ofindia.gov.in. Click. 'National Portal & Digital Repository.' A large banner with a Radha and Krishna painting dominates the page, which changes to a photo of the temples of Khajuraho, to a Buddhist painting, to a photo of a stone statue, to a painting of a British nobleman. Below are ten large squares with photos and names of Indian museums: 'Allahabad Museum, Allahabad; ASI Museum, Goa; Indian Museum, Kolkata; ASI Museum, Nagarjunakonda; National Museum, New Delhi; NGMA, Bengaluru; NGMA, New Delhi; NGMA, Mumbai; Salar Jung Museum, Hyderabad; and Victoria Memorial Hall, Kolkata'. These are the museums participating in the first round of digitization. The right-hand upper corner offers what I was looking for: 'Search across museums'. This is the database, the core of a digital collection. I want an overview, not to search for single objects. 'Direct access' allows me to

click on either ‘Museum’, ‘Object Type’, ‘Material’, ‘3D Gallery’, ‘Artist’ or ‘Technique’. A small thumbnail for each of these.

I choose ‘Museum’. *Click.* ‘Salar Jung Museum, Hyderabad (Total:27958)’ and a line of eight colour photographs with objects from that museum appear as a preview: a statue on a light blue background, two paintings, a vase, a bowl, two more statues with dark blue and yellow backgrounds, another painting. ‘National Museum, New Delhi (Total:23978)’, with another eight photographs. ‘Allahabad Museum, Allahabad (Total:19156)’, also with a line of pictures. A fish image with a green background looks interesting. *Click.* The enlarged picture covers the left half of the screen, a column with metadata is on the right:

Title: Figure of a Fish.

Title2: Figure of a Fish.

Museum Name: Allahabad Museum, Allahabad.

Gallery Name: Archaeological Gallery.

Object Type: Bead.

Main Material: Stone.

Manufacturing Technique: Cutting.

Main Artist: Not Known.

Artist’s Nationality: Indian.

Author: NA.

Country: India.

Origin Place: Kaushambi, Uttar Pradesh.

Find Place: Kaushambi, Uttar Pradesh.

Scribe: NA.

Style: NA.

School: Not Known.

Patron/Dynasty: NA.

Period/Year of Work: Early Historic.

Inscription: No.

Tribe: NA.

Costume: NA.

Culture: NA.

Detailed Description: The fish shaped figure may have been used as bead because it is still perforated by the artist. It is made in soft stone. Fish is beautifully carved and polished with accuracy. Carving occurred on the both side of the fish in square shape with prominent eyes and mouth.

Brief Description: The fish shaped figure may have been used as bead.
[sic]

The photo is to the left of the description. A yellow-brown fish photographed against a green background. The lower right corner of the photo shows a watermark in the shape of an official stamp, a circle with the national emblem of India – the lions from the Ashoka pillar – and the words ‘Ministry of Culture, Government of India’, ‘The Allahabad Museum’, ‘© Copyright. All rights reserved’. Below the photo are small icons. *Click. Click. Click.* I can zoom in and out. *Click. Click,* rotate the photo clockwise and anti-clockwise, *Click. Click. Click,* see it fit to the screen, original size and in full screen.

The online archive of the museums of India provides access to and information about museum objects, allowing a search across ten of India’s largest museums. Navigating through and looking at the entries on the website raises questions about the whereabouts of this digital archive. Why was the database constructed in this way, with photographs and metadata? Who decided on the comparatively old-fashioned design of the website, for format aspects and visualization? What were the reasons and motives behind assembling the collections of India’s largest museums into one digital archive?

To understand the appearance of this ‘Digital Repository’, this chapter looks at its construction. What we encounter online on www.museumsofindia.gov.in are the publicly available parts of a collection management system (CMS), recently developed for implementation in several Indian state museums. There are currently a number of CMSs on the market, ranging from free, open-source systems like CollectiveAccess and CollectionSpace, to commercial products like Axiell Collections, MuseumPlus and eHive.¹ This variety reflects the fact that there is no longer a one-size-fits-all approach, but that stakeholders in museums and archives have to make conscious decisions when choosing whether to use an already available CMS or programming their own. Since the first introduction of CMSs in the 1960s, technology has advanced significantly. An in-house assessment to select the right CMS can be helpful to determine the required add-ons and features (Kozak 2013: 17), and modified versions can cater to individual needs while making sure that data compatibility and other standards are met.

In this chapter I show that deciding on a CMS at all is in the first place driven by a belief in improvement. Wanting to introduce a CMS is tied to the conviction that digitization brings improvement, and that in a museum, characterized as an ordering institution, a digital collection management system is supposed to bring better workflows and working conditions. As digitization is believed to bring improvement in a wider sense, so a CMS is understood to bring improvement for museums and archives.

However, just as there are no uniform understandings of what the betterment through digitization looks like, there is also no homogeneous agreement on improvement through a CMS for a museum. While a general notion of CMS equalling improvement prevails, the outline and details of the software needed are vague, and imagined benefits can differ from stakeholder to stakeholder. Since we are discussing digital technology, it seems reasonable to suppose that improvement is here above all technological. Indeed, CMS construction has advanced since its first introduction in the 1960s, to the point that, today, there are usually set technical standards for a CMS. Jatan – the CMS created for www.museumsofindia.gov.in – illustrates how these technical standards are incorporated into a CMS that at the same time must adapt to internal demands.

The technological aspects alone do not suffice to explain improvement. The shape of a CMS, including its programmed architecture, is also the result of social factors. One way to explain this is seeing technological changes as part of a technological frame (Bijker 2012). A technological frame manifests as the corollary of both technical state-of-the-art and social possibilities. Another way is to conceptualize improvement as being always specified by sociocultural and technical aspects. Programming a CMS follows available technical specifications, but it also pertains to the established practices, needs and understandings of museums and (digital) archives. The technical side continues to determine, but not dominate the way in which objects and documents are digitized. Resources and practices regarding effective information management are equally relevant, if not, as Darren Peacock et al. (2004) state, foremost in the interplay of technical and sociocultural factors. Tracing the construction of Jatan demonstrates how technical and sociocultural factors intertwine in decisions made about programming this CMS.

Within this process, however, the stakeholders involved do not necessarily foresee these factors. Neither do these stakeholders – in this case the Indian Ministry of Culture, the Centre for the Development of Advanced Computing (C-DAC), the Art Institute of Chicago (AIC) and the museum directors and staff – clearly articulate what improvement entails in detail. There was a consensus that improvement in the museums is desirable and wanted, and that a digital archive is an appropriate way to achieve this. In a general sense, there was unanimity that digitization as technical advancement means enhancing ordering and systematization, which are required in archives and museums. All actors agreed upon the need to improve museums through digital means. Yet the Ministry, C-DAC, AIC and the museums had no clearly defined or

coordinated conception of what this digital improvement might look like. Each of the partners brought their own vague concepts of improvement through digitization into the database construction process. This became, essentially, a process of negotiation, where sociocultural and technological concepts and ambitions – at times quite diverse – eventually codetermined Jatan. The unfamiliarity or uncertainty about what improvement signifies led to the process of constructing a digital archive becoming very much a process of political negotiation. The ambitions and hierarchically structured positions of the stakeholders eventually fed into the technical architecture and layout of this CMS. Technical restraints, data standards expectations and the visions and practices of museum work all played into the understandings of improvement and the construction of the database. Ultimately, Jatan took shape as the result of the Ministry's, the museums', the IT centre's and external advisors' standpoints and individual and collective ideas of improvement.²

Improvement

The website www.museumsofindia.gov.in also features what the makers call the vision behind this online portal and digital repository:

The Ministry of Culture [of India] has embarked upon an ambitious project of the digitization of the collections of the Museums under it with the twin purpose of making effective utilization of technology in museum management and bringing the collections of these museums closer to the public by making them available for online viewing over the internet. In this endeavour, the Ministry of Culture, through the technical expertise of Centre for Development of Advanced Computing (C–DAC) Pune and the Art Institute of Chicago got standardized a software entitled 'Jatan' for implementation in its Museums.³

Meanwhile, the Minister and Secretary of State accompanied the introduction of Jatan with the following words:

Message from Honourable Dr. Mahesh Sharma, Minister of State

Museums are a repository of a nation's culture as they contain explicit examples of the development of a country's culture and heritage over a period of time. The strengthening of the country's museums is an important activity covered under the ambit of the Ministry of Culture. In this modern era of technological advances, Museums worldwide have undergone

major changes in terms of their management and presentation of the interpretation of their historical artefacts. Consequently, more and more emphasis is being laid on leveraging the advantages of advanced technology for improving their activities. One such important area where computers and technology are widely and gainfully being utilized is the area of management of the Museum collections. Computerized collection management ensures the availability of readymade database in the hands of the Museum management which could be accessed any time and from anywhere and is an excellent MIS tool. Further, it could also be utilized for preparation and analysis of condition reports of various objects and more importantly to access all the information about a particular object at a single location. ...⁴

Message from Shri. Narendra Kumar Sinha, Secretary, Ministry of Culture

India is home to exquisite art collections that represent five thousand years of Indian history, traditions and culture. Indian art is manifested in paintings and manuscripts, sculptures, ethnographic collections, costumes and textiles, coins and jewellery, photographs and prints. These collections are displayed in major national museums in Delhi, Kolkata, Mumbai, Hyderabad and Allahabad that are governed by the Ministry of Culture, Government of India.

... the Ministry of Culture embarked on a project to digitize the collections in its museums, whether on display or in stores, to provide better access and information on various themes, national and regional histories and the rich craftsmanship that is reflected in Indian art. ...

I am glad that the Ministry of Culture is involved in the work of modernization of our Museums and in bringing them closer to the public. ... The format of the website in particular will allow the public to enjoy collections online ...⁵

With words like ‘modern’, ‘technical advances’ and ‘improving’, the representatives of the Ministry of Culture see digitization in general, and the construction of Jatan in particular, as an improvement. Improvement is a concept prevalent in management, where the idea of a continual improvement process has become part of the capitalist system, building on continuing growth and advancement. A continual improvement process has even been made a managerial standard (included in the ISO 14000, for example). The Indian Ministry of Culture – and prospectively also the other stakeholders involved in creating Jatan – has taken to the idea that digitization will improve museum work. Constructing and introducing a

CMS is understood as an active, directed effort to make things, practices and workflows better.

Agreeing on the need for improvement is very common in contemporary capitalist societies, and it goes well beyond economics. A culture of improvement exists in every field of society; improvement feels like a given, like an aspect of human nature or an intrinsic human value. However, historically this is not the case. In Europe, ideas of improvement arose in the eighteenth century and in part replaced former prevailing norms of being at the mercy of god as creator (Tarlow 2007: 11). The concept and the term were used increasingly in the sixteenth and seventeenth centuries, ‘particularly in relation to husbandry ... but also in the moral sense of selfcultivation. The economic and moral meanings of the term became increasingly knitted together so that by the mid-eighteenth century “Improvement” meant both profit and moral benefit’ (ibid.: 12). It was only in the eighteenth and nineteenth centuries that improvement spread into all spheres of (European) society. It is hence an omnipresent societal feature, but not a given aspect of ‘human nature’.

CMS Construction as Technical Improvement

For museums and archives, contemporary improvement entails, among other things, digitizing record-keeping and ordering systems. Improving collection records through electronic data processing is thereby very much a technical matter. In recent decades, collection staff, registrars and curators, fascinated by computational collection management, have initiated advancement and improvement in this sector. Technical tools are a means for a better ordering, a more adequate structure, more prompt retrieval or a more complex interconnectedness of objects and information, within and across departments and sections.

The history and development of CMS construction can be traced back more than five decades. In the 1960s, museum computerization took its first steps in US-American museums. In 1966, the Fort Worth Museum of Science and History in Texas collaborated with Ling-Temco-Vought to develop a computer for museum use. Only a few years later, the newly founded Museum Computer Network in New York celebrated GRIPHOS as the first collection management database, to be used by all US museums (Sully 2006: 22–23), while the Smithsonian Institution developed SELGEM as a prominent computer programme to manage collections (Parry 2007; Williams 2010). In opposition to national plans to computerize museums, IBM and the Metropolitan Museum of Art

in New York organized a conference on the topic in 1968, and small-scale solutions became more likely as computers became more affordable (Sully 2006: 24). The 1970s and 1980s saw a rise in the quantity of computers in many North American museums, and the beginning of a trial-and-error policy in developing appropriate software. Ideas prevailed that technical solutions could lead to better, improved versions, meaning a larger variety of CMSs, which would be suitable for museums with special needs as well as for different tasks.⁶

The 1980s also saw the introduction of computerized graphical displays. While file size and limitations in processing large data were initial major obstacles to picture display (Sully 2006: 34), today these are no longer issues when it comes to use of image files. However, technical specifications and limitations became of concern again when external online access to collections came into focus. Decisions about image size needed to be made again, and content management systems needed extensions and applications that allowed for external access and/or the migration of (parts of) its content to websites. These issues were initially resolved in trial-and-error projects that dominated the first years of the internet, when numerous projects were developed, particularly in the US, with 'early enthusiasm for new features, buoyed by an infusion of grants. This ... created inflated expectations on the part of users, a lack of critical examination by developers, and resistance within the institution's administrative structure' (ibid.: 40–41). Over time, the technical side of data processing and handling developed, and CMS construction asserted itself as usually consisting of metadata construction and digital reproduction in image formats. Internet access to digitized heritage material has also matured into a standard feature.

Internationally, CIDOC CRM and LIDO have become the standards for modelling documentation and cultural heritage information; and Dublin Core the standard vocabulary set, with further thesauri, cataloguing rules and procedure manuals being the current state-of-the-art in digital cataloguing and/or subsequent digitization (see Srinivasan et al. 2009: 268). The semantic format CIDOC CRM, developed by the CIDOC Documentation Standards Working Group in the 1990s and 2000s, became an ISO standard in 2006, providing 'definitions and a formal structure for describing the implicit and explicit concepts and relationships used in cultural heritage documentation'.⁷ LIDO (Lightweight Information Describing Objects) can be regarded as a preliminary step for CIDOC, as it is an XML schema for describing museum objects and harvesting data. The development of these standards has improved CMSs regarding national and international compatibility.

Databank committees were important for these standardization processes. These national bodies for the development of data determination, category definitions and file or collection naming tried to ensure at least a computerized communication between collections. Associations such as the Canadian Heritage Information Network in Canada, DEN Kennisinstituut Digitale Cultuur in the Netherlands, the Fachgruppe Dokumentation of the Deutscher Museumsbund, the Nestor network in Germany and the Centre for Development of Advanced Computing (C-DAC) in India, to name but a few, have in the last two to three decades put a lot of effort into developing more and more refined data standards. Still, the application of these standards is voluntary and cannot be enforced. Its longevity or sustainment – what Robert Friedel (2010) termed the ‘capture’ of an improvement – depends on societal contexts, institutional networks and individual attitudes. Their application is still subject to debate.⁸

In sum, the technological development of CMSs has come a long way since their first introduction in the 1960s. Image and data processing have become routine. A standard XML scheme for heritage objects has been formulated, corresponding to Dublin Core and CIDOC CRM as the semantic format and reference model. They are a way of standardizing the electronic exchange of cultural heritage data, but are not binding. An understanding of digitization as constituting visual representations and corresponding metadata is now globally well established.⁹ Further canonical technical parameters are the comparatively fast redundancy of digital data formats and the need to migrate and update digital data, as well as the internet as a medium of external exchange and communication on museum material. Technological advancement has led to CMSs being no longer simple collection inventory tools, but instruments for saving all kinds of information, including lending, restoration, storage, conditions and specifications. Today, CMSs are available in many forms, catering to the individual needs and ambitions of museums and the stakeholders involved (see Swank 2008 for a detailed technical review of various CMSs on the market). CMSs have also made concessions to the idea of the curator as an author of collections, in as much as they try to not only structure and order collections according to narrow frameworks and keywords, but also extend the software in such a way that it at least acknowledges the various forms of predigital database recording schemes, be they the register, the day book, index cards or ‘the curator’s head’ (Parry 2007). They are ordering systems adaptable to individual needs, and supposedly bring about a new quality of ordering, not least because standardization and compatibility are inbuilt features of CMSs, as in all digital media.¹⁰

In India, the development of national museum data standards took off comparatively recently, and C-DAC has been partnering with the government and heritage institutions to develop standards as well as software appropriate for the Indian sector since the 2000s. In 2002, the Indian government stated that museums should place more emphasis on digitization and the documentation of works of art (Government of India 2002). In its Tenth Five Year Plan (2002–07), the government also explicitly mentioned that the National Museum of India will undertake computerization work, including setting up a LAN connection and digitizing its collection. Computation for collection management in heritage institutions in India was, as in many other countries, at first mainly an option for libraries. It is not least the steadiness of books and their interchangeability (as compared to objects or original documents that seem to exist as unique specimens) that make content management systems for libraries a bit less challenging in terms of technological and institutional acceptance. So-called elite Indian libraries were among the earliest institutions in the country to receive microcomputers in the 1970s and 1980s, with automation gaining momentum here in the 1980s (Gulati 2004: 335). Software for books and other printed publications followed suit. In those decades, digitization was not on the agenda for museums and archives. Museums in India at first tried to emancipate themselves from their colonial past (Cohn 2015; Guha-Thakura 2015), establishing themselves as institutions in the context of nation building (Shivadas 2015; Singh 2015), and in the 1980s grappled to find their place between spectacle, entertainment, education and state power (Appadurai and Beckenridge 2015). Conventional national and state archives remained closely monitored and access restricted (Balachandran and Pinto 2011), or in a state of physical disrepair (Rajpal 2012). Describing the current situation in 2014, the British Council India (2014: ix) said, in its report on Indian museums:

The importance of digitization is recognised by most museums. However, most museums in India do not have a digital strategy. Very few museums have a website and an online presence and some are not even listed on any museum or travel site. However in recent years, some museums have turned to social media for attracting visitors to their museums.

Most museums have not actively marketed themselves beyond their small local audiences to increase footfall. Some museums have a website, either independent or under a mother organization. These sites are more like contact information pages. The purpose of these websites is to provide

the location, timings of the museum and in a few cases very basic information about the collection. They lack the dynamic nature required to attract and engage the contemporary online viewer.

Inventory systems used in most of these museums are out-of-date and give superficial information of their collections. While some museums have adopted digitization of their collections and upgrading of the inventory there is an urgent need to develop a detailed object information system for their collection to match standards seen in modern museums abroad.¹¹

In contrast to this assessment, the Centre for Development of Advanced Computing (C-DAC), India's prime governmental IT research and development institution, released the following press statement when the website www.museumsofindia.gov.in went live in 2014. It explained its intentions with Jatan and the website:

Pune, March 18, 2014

JATAN: Virtual Museum Builder, a comprehensive software suite designed and developed by the Human-Centred Design and Computing Group of the Centre for Development of Advanced Computing (C-DAC) has been selected as the standard software for all Museums under the purview of the Ministry of Culture, Government of India. In the light of this new development, the HCDC Group of C-DAC has successfully deployed JATAN: Virtual Museum Builder in 10 national museums of the Ministry of Culture as under-

- National Museum, New Delhi
- Allahabad Museum, Allahabad, Uttar Pradesh
- Indian Museum, Kolkata, West Bengal
- National Gallery of Modern Arts (NGMA), New Delhi
- National Gallery of Modern Arts (NGMA), Mumbai, Maharashtra
- National Gallery of Modern Arts (NGMA), Bengaluru, Karnataka
- Archaeological Survey of India (ASI) Museum, Goa
- Archaeological Survey of India (ASI) Museum, Nagarjunakonda, Andhra Pradesh
- Salar Jung Museum, Hyderabad, Andhra Pradesh
- Victoria Memorial Hall, Kolkata, West Bengal

In this project, as specified by C-DAC, all museums have setup the JATAN software along with digitization facilities, computers, storage and network infrastructure. Human-Centred Design & Computing Group, C-DAC, Pune organized special training programmes for the museum curators and operators of these museums in which they were trained to use JATAN software and digital technologies. JATAN system, ICT infrastructure and training has truly empowered the museum staff in modernizing their museums.

Speaking about the deployment, Dr Dinesh Katre, Associate Director & HoD, HCDC Group, C-DAC said, 'The standardized implementation of JATAN provides unprecedented benefits to the museums in terms of producing the national database of museum collections, enriching the visitor experience and knowledge through digital exhibits, preservation of India's heritage and dissemination of information through internet for the tourists, scholars, teachers and students all over the world.'

JATAN: Virtual Museum Builder is a digital collection management system specially designed and developed for the Indian museums. The system is compliant with open source and standardized formats and helps in image processing, watermarking, unique numbering and managing the digital images with multimedia representations of the antiquities in terms of 360 degree interactive panoramic views, 3D models, audio and video clips.

JATAN provides a collaborative framework over the intranet for the museum curators, historian and scholars to describe and enhance the information about antiquities. It also provides the facilities like user administration, search and retrieval, access control for the portal, location identification, conservation reports, work reports, parameter based sorting, etc. JATAN allows the digital collections to be made online or accessed through mobile or touch screen kiosks. ...¹²

C-DAC and the head of the group constructing Jatan, Dinesh Katre, also present Jatan as an improvement, a 'new development' bringing 'unprecedented benefits'. But Katre and his team also explain and stress the technical features of Jatan. They programmed a database allowing 'user administration, search and retrieval, access control for the portal, location identification, conservation reports, work reports, parameter based sorting, etc.'. They designed Jatan – literally meaning nurturing or preserving – in such a way that museum staff entering data and creating the digital archives do so according to pre-set resolution and format standards. Digital photographing, scanning or otherwise capturing of objects, photographs or documents along with sets of metadata, thus

adhere to defined standards. Equipped with technical features and initially fed with data from ten Indian national museums, C-DAC envisions Jatan being beneficial for several user groups inside and outside the museums. Katre and his team at C-DAC provided the technical part of this first major effort from Indian government museums to digitize the country's cultural heritage.

Seen from this technical point of view, Jatan (as the CMS behind www.museumsofindia.gov.in) is a newly programmed software that adheres to the individual needs of its envisioned users. It thereby falls in line with a contemporary trend of individualizing databases for collection management while still referring to international standards. It embodies the state-of-the-art, showing how the technical and theoretical side of digitizing cultural heritage has by and large become consolidated.

The Sociocultural Side of Improvement

Improvement is not just about technical specifications. Selecting and applying a technical device, inventing or enhancing a new entity, also comprise decision making, which is also a sociocultural process. Choosing which forms or aspects will be most beneficial is a sociocultural as well as technical process. Looking at historical inventions, we see that Edison was conditioned by both economics and coeval science. The domestication of electric light and electricity is evidence that there is a myth around technological developments. It is incorrect to assume that innovation is purely technologically determined. Social determinism and opportunity are the driving forces (Bijker et al. 2012; Green 2002).¹³ It is individual and institutional ambitions, changes in policy, culture and society, as well as economic motivations and technical determinations that drive improvement and change in technology.¹⁴ Sociocultural factors might not question the need for improvement, but very well its configuration. They determine the architecture of a CMS and might also threaten its implementation.

For Jatan, the sociocultural side of improvement was crystallized in the fact that all stakeholders brought their own vague ideas of what improvement through digitization entailed into the CMS construction process, and in retaining or pushing through their various interests within this process. As mentioned above, all stakeholders in general agreed that digitization brought improvement. But constructing Jatan illustrates how the diverse ambitions, expectations and interactions of the stakeholders played out as sociocultural facets of improvement in the process of digitizing cultural heritage.

The first relevant player in the creation of Jatan was the Ministry of Culture, which decided on and pushed forward with digitizing museum

collections and introducing digital databases in its museums. It started this agenda by forming a very precise idea of the improvements needed within the Indian national museums. In 2008, Jawhar Sircar took office as the Secretary of the Indian Ministry of Culture.¹⁵ One of his first official acts was to initiate meetings with the directors of several museums. He wanted to gain an idea of the issues and problems within the Indian museum sector, and wanted to push the museums – perceived by the public as dusty institutions, preserving and administering old artefacts – slightly ‘out of their comfort zone’ (interview, Sircar, 2017). The statements of the directors on current issues were diverse, broad, detailed and sometimes contradictory. Nevertheless, the Ministry of Culture took their concerns seriously and in 2009 formulated a ‘fourteen-point museum reform agenda’. The fourteen points refer to reforms needed in:

1. Collection & Stores Management.
2. Proper/Scientific Display of Artefacts.
3. Information, Signages, Floor Plans & Visitor Facilities.
4. Museum Shops and Souvenirs.
5. Multi-media, Audio Visual and Guide Facilities.
6. Attract Various Audience Segments, including Students/
Children.
7. Image Building, Publicity and Cultural Events.
8. Visiting & Travelling Exhibitions.
9. Expansion & Acquisition of Collections.
10. Professional Development of Museums Personnel.
11. Implementation of Plan Schemes & special projects.
12. Security: Modern Techniques.
13. Conservation and Restoration.
14. Interactions with Academics, Archaeologists and Artists. (Sircar 2009)

The very first point, ‘Collection and Stores Management’, was further defined as the following much-needed reforms to Indian museums’ depots and collections:

- Introduce computer aided collections management.
- Verify physically stocks with registers/database.
- Modernise methods of storage and retrieval & introduce visible storage.
- Develop adequate storage facilities.
- Control/filter atmospheric heat, dust, humidity, light and pest in Stores.
- Take professional quality digital photos of stored items.
- Upload entire collections' database with images of objects online [*sic*]. (Ibid.)

The reform agenda hence defined a CMS as one of the most needed steps for improvement in museums. At the time the fourteen-point programme was drafted, some of the consulted museums had very rudimentary ideas of what could be done with a CMS and what was needed for an up-to-date digital database. There was very limited familiarity with international standards or the aforementioned technical parameters. Some museums pointed out that they already had a visual inventory of ten thousand objects, which, as Sircar later discovered, turned out to be a stock of twenty-year-old black and white photographs that would not meet the envisioned standards (interview, Sircar, 2017). Scanning or photographing in colour (not to mention in specific colour schemes) was by no means customary within the heritage institutions at that time, as illustrated by the fact that the digitization of both the National Mission for Manuscripts,¹⁶ founded in 2003, and the Nehru Memorial Museum and Library's photo collection – both large-scale projects in institutions functioning directly under the Ministry of Culture – was taking place in part or totally in black and white. There was no common ground on the technical front upon which to build. Consequently, what was needed as a preliminary step was the development of a mutual understanding of digitization and of the parameters that every museum could agree on. Without set technical standards, it became clear that it would be a challenge to develop a digitization agenda that could bring together and satisfy everybody's concepts of digitization as a form of improvement.

However, the Ministry – on the basis of formulating its reform agenda – leapt forward by naming digitization as one of its priorities in the Twelfth Five Year Plan (2012–17). It thus continued to define its vision

of museum improvement and announced the following digitization scheme:

Digitization of Museum Collection

This is a new Central Scheme which has been developed for being undertaken during the XII Five-Year Plan period with the aim of developing a national database of all art objects and antiquities available with the Museums at various levels i.e. national level, state level and regional and local museums all across the country in order to provide enhanced accessibility to scholars, researchers and informed visitors.

Background

As a part of the 14-point museum reform agenda undertaken by the Ministry of Culture special focus has to be given to the area of digitized documentation of the antiquities in the museums in various parts of the country. Presently, in most of the museums status of documentation is not up to the mark and details of antiquities available in the museums are only available in physical form in the Accession Registers being maintained by the museums. It has also been observed that in some cases information which is available in the Accession Registers is not authentic and has become obsolete. Therefore, with a view to modernizing the collections management system of these museums it is imperative that they resort to digital collection management system. Further, taking recourse to digitization of the documentation of antiquities would also help in the availability of information about the status of various antiquities at one place. This could then be utilized for the development of website of the concerned museum where all this data could be made available online in order to provide accessibility to scholars, researchers as well as interested individuals.¹⁷

The Ministry continued by laying out the details of the anticipated digitization projects:

Under the scheme funds will be provided by the Ministry of Culture in the form of grants to various museums for digitization of art objects in the museums across the country and for making their images / catalogues available over the website. The scheme will have two components, one relating to the establishment of infrastructure (central server linked to museum level server / computers through dedicated channels) and the other relating to digitization of all collections, cross-indexed with fuller details on a template basis. The ultimate aim of the museum would be to

have an online database of its collections readily available over its website for online viewing by general public. A part of the funds from this scheme (subject to a maximum of Rs. 2 crores per year) may also be utilized by the Ministry of Culture for undertaking projects with technical institutions for creating a combined website showing the collections of Museums under the Ministry and other State Government and Private museums registered under the Indian Societies Act of 1860 or a similar legislation.¹⁸

The Ministry thus created a precedent. It announced a programme and funds for archival digitization, and thereby stimulated engagement with the topic, which would now also need a determination of the desired technical aspects. It stipulated that the digital catalogues should be internet compatible and visually based, and at the same time recognized the conditions existing in many Indian museums at that time. It acknowledged the lack of adequate IT infrastructure, and made the improvement of that infrastructure part of the scheme.

The Ministry of Culture's agenda was also in line with the government's larger agenda, called Digital India. In 2015 this officially became a national agenda, when the government announced their 'vision to transform India into a digitally empowered society and knowledge economy'.¹⁹ The programme, led by the Ministry of Electronics and Information Technology and the Prime Minister's office, but integrating all government departments, aimed to make government services available to citizens in online format, to expand digital infrastructure by connecting rural areas to high-speed internet, and to achieve widespread digital literacy to empower the Indian public. The programme centres around e-governance, but the nine named pillars of the initiative (broadband internet, universal access to mobile connectivity, a public internet access programme, e-governance, e-Kranti delivery of services, information for all, electronics manufacturing, IT for jobs, early harvest programme) go beyond that. The programme is the latest manifestation of the idea that information and communication technology should go hand in hand with effective governance. However, as Biswarup Sen (2016: 2) argues:

An initiative like Digital India ... is not simply a set of instrumental measures that makes day-to-day governance more effective and in line with the contemporary 'best practices'. It stands for an ambitious act of imagination that rethinks the nation through one central notion: information. The digital revolution, according to this emerging perspective, is capable of changing all dimensions of society by means of a technology based on

the production, dissemination, and manipulation of information. This viewpoint, that can be condensed under the rubric of ‘informationalism’, holds great allure for a postcolonial formation like India where questions of national identity and destiny are always at the forefront of public debate. It is therefore not surprising that the premise and promise of informationalism have been widely embraced by all segments of Indian society.

The control of information is one aspect of the vision of a digital India. Yet it needs to come with the provision of said information, and the circulation of not just embedded knowledge, but also literacy in the use of this online information. Consequently, controlling information through Digital India also includes the distribution of information, which in turn comprises a restructuring of economies of access. The previous development of ICT in India laid fertile ground for the distribution and circulation of digital government services, including the provision of information in the country’s cultural heritage sector. It created a highly valued export commodity and an Indian presence in the world market for the first time since independence (Sen 2016). The success story of the Indian IT industry has not only contributed to the Indian government’s enthusiasm for promoting and pushing digital development, but also led to occasionally overemphasized praise of everything digital (Sneha 2016: 4).

The government’s move into ICT and computer-based information has led some authors to argue that it was precisely the lack of government presence that facilitated the heyday of the IT and software development business in India (see Sen 2016: 5). While this assessment is not completely accurate,²⁰ the government’s more intense push for what is called ICT for development (ICT4D) is a comparatively recent one. Digital India also embeds notions of the Right to Information Act, a legislative act adopted in 2005, conforming to the pressing demands of access to documents and information. However, it has also been widely acknowledged that successful implementation of ICT4D is subject to administrative backing and approval. As Geoff Walsham (2010: 16) stresses, there is a

... crucial need for major attitudinal and institutional change in order for an ICT-based initiative to be successful. For example, core administrative processes need to be reformed in government institutions in order for the front-end e-government services to be effective. However, it is widely recognised that such reform of the administrative culture in government is enormously difficult to achieve. Computerised systems, such as those involved in land registration for example, do not by themselves

reduce corruption if this is deeply embedded within existing attitudes and processes.²¹

That this was also an issue with digitization projects in museums is a point I will return to shortly. Initially, however, the Ministry of Culture went forward with its increasingly defined digitization plans and announced its digitization schemes, thereby falling in line with, and time-wise even being ahead of, a national agenda for improving conditions through digitization. In the first round, a number of museums under the Government of Rajasthan and the Centre for Art and Archaeology Gurgaon applied for funding within this scheme, which an expert committee discussed and in parts supported.²² But by far the largest digitization project to be implemented was Jatan.

For Jatan, in 2012 the Ministry allied itself with the Art Institute of Chicago (AIC) as external experts – the second major player involved. The Ministry and the AIC incorporated Jatan's introduction into the Vivekananda Memorial Program for Museum Excellence, a four-year training programme financed by the Ministry of Culture to be conducted by the AIC in both India and Chicago. Madhuvanti Ghose (interview, 2018), curator of Indian, Southeast Asian, Himalayan and Islamic Art at the AIC and in charge of the Vivekananda Memorial Program, describes the efforts as follows:

So when the Ministry of Culture, Government of India, signed the contract with us they asked us if we would take some of the subjects from [the fourteen-point programme] for the improvement of Indian museums that had already been drawn up. And I said essentially, really, you can't move forward with improving museums, you know ... if the people don't know what they have in the museums ... and so I said: okay, then it should be the priority; it should be what we should do right at the beginning, which is to start with a documentation program. ...

And, initially, we also went in with the idea that we would just take something that was shop-bought, or one of the existing database programs but we soon realized that that was not going to work because the country essentially had not done a database; Dhariohar [a CMS developed in Rajasthan] was too ancient, it wasn't really updated enough; they needed something new but at the same time they didn't need something that was as advanced as the systems that we use in the West, so it wasn't something that could be just imported in because they didn't really have the culture of everyone across the museum having access to this database – they wanted a system that had checks and balances.

Ghose's perception of the situation supports the Ministry's conviction that there was clearly a need for improvement (what the Ministry called reform), and that they would have to start with the improvement of collection management. The Ministry named the introduction of computer-aided collections management and the verification of stored collections as the immediate priority, and Ghose's statement is in line with that agenda, combining both tasks in a 'documentation program'. The AIC by then had its own CMS already installed, and Ghose and her colleagues had gained expertise in building and using it. Yet it was evident for Ghose and the AIC from early on that the technical parameters that might be standard in Chicago could not simply be lifted into Indian museums – a presumptuous standpoint in some regards. India's lack of infrastructure is a consequence of the structural inequalities still remaining between countries such as India and the USA. This issue also reflects different understandings of what digitization would be good for – what digital improvement should look like – and consequently how it should be shaped. To tackle the technical side, Ghose (interview, 2018) met with the AIC's Head of Collections and thought about an appropriate CMS, as she had sensed – like Sircar, the Secretary of the Ministry, before her – that there were no clear or uniform notions within the museums of what a CMS can or should be comprised of:

Our Head of Collections spent a huge amount of time – he was the one who was in charge of our inbuilt system here in Chicago – he spent a huge amount of time not only assessing all the different shop-bought systems that were available out there, but also looking at Dharohar and this old Jatan, and then he realized that what they needed was a kind of upgraded Jatan. So he worked with C-DAC to create a system while we worked with the Ministry of Culture to actually create a list of hardware and systems – because the museum didn't even have hardware.

What Ghose describes is the effort it took to come to terms with what Bijker called the technological frame. A technological frame is a 'combination of current theories, tacit knowledge, engineering practice (such as design methods and criteria), specialized testing procedures, goals, and handling and using practice' (Bijker 2012: 164). It comprises the concepts and techniques that a community employs to solve a particular problem or to perform tasks, and provides the grammar for the standards and requirements of problem solving, along with problem recognition. It thus references both the technical and the social factors in improvement or change, stressing their interplay and mutual dependence. The process of moving from analogue ordering to digital

versions of collection management is organized around and in accordance with a technological frame, and the Indian one seemed to be different from that in Chicago. Ghose and her colleagues realized that the equipment and technological infrastructure needed to implement the American CMS in India was not available. The desire to introduce a CMS allowed the inequality in technical standards to surface, but also different social practices to appear.

Ghose was not the only person involved to realize that the computerization of museums involved changes in technical and social realities. Dinesh Katre, the third major player in Jatan, was the lead person involved from the Indian IT side. He has been at C-DAC for more than twenty-five years and is currently the head of the Human-Centred Design and Computing Group (HCDC) at C-DAC, the IT team that developed Jatan. He and his team reprogrammed Jatan from 2012 onwards, and are in charge of its maintenance and further development. Katre and his team would be the people on the Indian side providing the technical parameters for the actual settings and application of a CMS and hence envisioned improvement with very precise technical parameters in mind. Jatan as software in its current form had a predecessor, commissioned by the CSMVS (former Prince of Wales Museum, Mumbai) in the year 2000. This version, also programmed by Katre and his team, had little impact and saw just one deployment per year – not due to any technical fault or insufficiency, but to being outside the average conception of museum work. What was needed was the (outside) introduction of a CMS into the government museum landscape. For Katre's C-DAC department, the Ministry's plan to upgrade and mandatorily introduce Jatan to ten (and later ideally all) government museums was very fortunate. He hence made it a point to have an individually designed CMS:

Often, digitization projects are turnkey projects. But such projects are not bottom-up, not internally decided and carried out. ... At the HCDC Group we have a user-centred approach. For Jatan we needed to look at existing forms and registers and at curator practices to design the features of the software in a way that curators end up using them. (Interview, 2017)

It is highly problematic to term Jatan a bottom-up digitization project, given the nature of its ministerial introduction. But the point Katre tries to make here is that the technological frame needs to be set not only by technical parameters but by the needs and requirements of the Indian museums. Hence, improvement for museums through a new CMS for C-DAC meant programming a piece of software that takes Indian particularities into view, such as an infrastructure still vulnerable to power

cuts or unstable connections. For Katre, it also meant programming the software in India, so that Indian IT experts could better communicate with and understand the needs of Indian curators, directors and museum staff. It was hence decided that C-DAC would programme the software, which admittedly also brought the HCDC group some much-needed recognition. Working at the fringes of IT, other departments at C-DAC (as well as the government itself) sometimes question HCDC's relevance. Programming Jatan and mandatorily introducing it to ten national museums meant extending HCDC's funding, staff numbers and standing. To use an Indian rather than a foreign CMS was also in line with the AIC's and the Ministry's conception of involving national software and Indian engineers.

The three partners furthermore decided that the CMS needed to have some specific characteristics. It should be a single piece of software for all museums; it needed to allow the museums to connect their collections; it should be plain and easy to navigate; it should abstain from designs that require large data sizes. Consequently, Jatan allows for a uniform entry of data across museum classes and types. As the same database is used in all museums, it enables the connection and inter-linking of the museum collections and a thematic retrieval of object information across museums within the database. In its appearance, Jatan is comparatively plain. As Ghose (interview, 2018) explains:

Yes, I mean, so Jatan was at least created in a simplified manner; it doesn't have the sophistication of our [AIC] systems, but it had all the basics for them to know what they have, for them to be able to check on a regular basis – because some of the things that are mandated by the parliament of India is that these museums should know what they have, and that there should be regular checks on their objects from a security point of view. So, this certainly enables them to do all of those things – if it was fully implemented. ... It's enough for what they need right now; at the stage that they're in, even Jatan in the phase that it's in, is okay. It, at least, has all the categories, the nomenclature, all the international standards were used from the nomenclature typology point of view, so those issues that they were having about the modern museum saying that this doesn't have words that we can use; or the archaeology people would be saying: oh, sorry, we need some different things. Well, we were able to go over all of that and explain and create one system whereby everybody could use that; that was us kind of saying: we're encyclopaedic museums, we already have these standards, we don't need to reinvent the wheel; all you have to do is just to get C-DAC to put it in – which they did.

Jatan uses Dublin Core and is in its architecture a CMS that embeds the above-mentioned conventions of contemporary software for museum data management. It comprises a mandatory photo of an object, both dropdown and open entry fields for museum-relevant metadata and tabs for restoration and lending, among other features. It is based on an XML scheme and allows for the data to be migrated. The interface is easy to navigate, and the database did not require unusual semantic web construction, but instead provides a linkage of the objects and their data with regard to the objects' creation time, region, category and so on. This 'less sophisticated' version in general met with approval, even though critical voices were not absent.

Through these technical parameters – a central aspect of C-DAC's understanding of improvement through a CMS – Jatan also validates the fact that visual data and standardized metadata according to Dublin Core are by now well-established elements of CMS construction. Including a photo of the object has even been made a mandatory element of Jatan; it is not possible to create and release entries without uploading an image file. Uploading the entries (after in-house clearance) is done by C-DAC, which also remains responsible for technical maintenance. This reflects an awareness of the fast changes in software and media formats, and the possibility of future redundancy. Migrating data if necessary and further developments of the software also fall within C-DAC's responsibilities. As C-DAC is a government body, it can be assumed that this is a long-term partnership.

The other long-term partner cooperating in the project are the museums, the fourth stakeholder in designing the CMS. They will be able – and to some point obliged – to use Jatan. Between 2016 and 2018, newly hired museum staff and curators (so-called nodal officers for Jatan) were busy digitizing the collections and entering data into the database. One nodal officer, whom I will call Mr Agarwal, a man who had worked as a curator in the same museum for many years, stresses that he has to report to the Ministry on Jatan's progress. Every other week he sends a report to the Ministry directly (not to the Director General of the museum) on how many objects have been uploaded to Jatan and made accessible to the outside world through the internet, and how many objects remain to be photographed and integrated into the database. Mr Agarwal does not do the data entry work himself; the museum has hired staff for the task. Mr Agarwal (private conversation, 2017) also explains that he 'opted for a more sophisticated version of a CMS. I wanted it to comprise more search options and multiple combinations of object details. But these plans were turned down for a more simple software'.

This statement conflicts with Sircar's impression that many museums had little knowledge of digitization. His accounts of the black and white digital photographs of objects indicated that he was confronted with museum personnel needing training in basic technical standards currently set for digitization of heritage material. Mr Agarwal presents it, if not quite the other way around, then at least with a slightly different spin. His statement also undermines the AIC's take on the Indian museums needing something less sophisticated than Western museums.

Hearing another voice from the same Indian museum might help to dissolve this contradiction. The person I will call Ms Rao is a young woman, who was working at the outreach section at the same museum as Mr Agarwal at the time of Jatan's setup. Ms Rao has only recently left the museum for a curator position in a different Indian city. She recalls that Jatan entered the scene at a time when digitization as a means to improve the museum internally and in its outreach was prominent. She describes a setting in which digitization in the museum was introduced and anticipated as a way of improving the museum. '[The ministry] had started [the] Museum Reform Programme, and under that programme digitization was a big hit', Ms Rao (interview, 2018) recalls,

and one of the programmes was to digitize the collections of the Company paintings [i.e. Euro-Indian paintings], Company school paintings, which are in collections of India and the UK. Unfortunately that did not really see the light of day primarily because the Indian partners – mainly the National Gallery of Modern Art, the Victoria Memorial and to some extent the National Museum – didn't really get their act together in getting their collections digitized.

Ms Rao understands this predecessor project as a serious attempt to digitize collections held in India (and abroad) and put them on a common online platform, not least 'so that people stopped endlessly complaining that these collections are in the UK'. The project did not take off due to a 'lack of interest' in the institutions. Around the same time – 2010–12 – Google Arts and Culture entered the Indian museum and gallery landscape, as Ms Rao (*ibid.*) goes on to outline:

One of the things that was happening soon after 2011 was the Google Art Project started making its presence felt here, and many museums signed up; many government museums signed up on the Google Art and Culture platform, and even so, as a pilot, they started allowing Google to digitize their collections and put them online.

The Ministry introduced Jatan to the museums in this threefold context of interest in digitization as part of the reform agenda, an international but not executed digitization project and the digitization attempts introduced by an outside, commercial company. The ground was prepared: the museums were aware of digitization as a current trend and of the reform agenda as an outline for museum development. Yet it would be misleading to reason that recognition of a need to digitize the entire collections as a form of improvement immediately follows from this. When Jatan was introduced in 2013, it was in the context of a general notion of digital technology and improvement. Most of the museum staff had a vague sense of what digitization could entail and how it would be able to enhance the museum and their work practices. Ms Rao (*ibid.*) sees it this way:

Of course, when Jatan came in, it came in as a top-down decision from the Ministry so nobody openly objected to it, but there was, of course, a process: opinions and inputs were taken from the curators. But I have to say these were not informed opinions because none of the curators, at least at the [museum I've been working at], they are not digitally that adept, so the sort of suggestions that they would have given would have been mostly from their angle, you know, their part, the parts that they were to play in uploading material: how the interface was going to work, how friendly it was going to be, how cost-effective it was. All of that was already decided by C-DAC in discussion with the Ministry, with a few representatives from the museum.

One should here consider the museum's take on the CMS as a means of improvement. With Jatan being an Indian programme, it lacks the strong connotation of an international, neocolonial impetus of modernization. Jatan was a form of improvement through technology. Yet the idea of betterment within this improvement was, for the museums, very vague. As Ms Rao outlined, and as Jawhar Sircar hinted at, there was no precise idea in the museums of how exactly digital technology would be beneficial for the museums. There was also hardly a sense here of economic growth and social change for the nation alongside the nationally (or even internationally) determined improvement agenda of ICT4D. It was rather a vague idea that digital means could be good, as they are signs of the time. Mr Agarwal's take on it does not indicate a detailed or programmatic vision of digital improvement, but is more likely a retrospective reflection on practical work with the software.

Jatan also did not provoke open objection to the Ministry's top-down decision of implementing digitization. Jatan rather confirms that

agreeing to the need for improvement is common in contemporary capitalist societies, and the term as well as the broad idea are widely distributed. Installing the digitization scheme at the museum was part and parcel of shaping ambitions and agendas. Consequently, in the aftermath of the CMS's introduction, Mr Agarwal portrayed Jatan as something wanted and needed from the museum's side. Digitizing collections acquired the status of improvement in the museum, at least rhetorically. Mr Agarwal's statement reflects the notion of a need for improvement. Juxtaposing it with Ms Rao's and Sircar's words demonstrates that there was no clear, univocal notion of what betterment would be brought about through digitization, or consequently of the precise technical architecture of the CMS. What was prevalent was instead an indistinct idea of digitization as improvement. Jatan was to some extent entrenched in a techno-optimism, whose groundwork was laid through several digitization attempts in the museums and beyond. Improvement took the form of introducing digital technology, fostering the acceptance of computerization and digitization of cultural heritage in museums and archives. What this digitization entailed in detail was subject to debate.

Jatan's Indian particularities nevertheless share similarities to debates around the development of CMSs in other museum contexts. Technical advancement is hardly ever on a par with the concepts of improvement in the social realm. As Parry comprehensively lays out in his 2007 monograph *Recoding the Museum*, which mostly draws on British (and US-American) museums' experiences, the development of a CMS requires thorough debates about what this improvement would entail in detail, not only of what is technically feasible. Museum staff often met computational means with scepticism. The introduction of computational means – which meant digital cataloguing systems – was often met with a reticence towards automation, as it was perceived as a potential threat to the curator's creativity, his/her authorship or the uniqueness and authenticity of the objects in a collection (Parry 2007). From the very start, the implementation of computational archiving in the UK came with concerns about access rights and loss of authority. Furthermore, practical constraints such as time, money, expertise and political prioritization led to digital media establishing itself in museums rather slowly. Impulses that eventually made the CMS a standard in many Euro-American museums after four decades came from outside museums and archives – from academia, from technology as an actor in itself, and largely also from newly founded museum databank committees (Sully 2006: 30).

The interrelatedness of technological and sociocultural factors led nonetheless to the introduction of the CMS, albeit taking different paths and paces across and within countries. Digital databases are in this regard similar to analogue ones – registers and records have not been identical in all museums; we cannot even assume that they have been kept everywhere. Accession registers, index cards and other formats have been used in museums in freer or more restricted styles, sometimes being standardized within one institution, sometimes not (Parry 2007). Similarly, CMSs are technically available and to some extent standardized, yet their application remains a conscious decision, influenced by both technical and social factors.

The Politics of Improvement Programmed into CMS

The technical and sociocultural aspects of improvement are not just two sides of the same coin when it comes to introducing digital archives in museums. Jatan also demonstrated their intertwinement, how they reciprocally inform each other. The following focus on the politics of this CMS construction process shows that museum routines and power relations have the strength not only to effectively implement a CMS, but also to alter its architecture as programmed into the software.

Jatan was from the offset a digitization project characterized by the museums' questions, doubts and potential loss of authority. Museum staff (curators, directors and keepers) had of course a particular interest in displaying relevant object characteristics in Jatan. Depending on the type of museum, these were sometimes highly specialized, and with the idea of a single CMS for all museums came a fear of technical feasibility. The AIC and C-DAC were able to dispel these doubts, as these two parties brought with them both technical understanding and experience of working with a CMS in an encyclopaedic museum. C-DAC set the engineering frame, relying on the previous version of Jatan and the programming expertise of the HCDC group.

The concerns about loss of sovereignty, however, could not be so easily dispelled. Even though there are studies that demonstrate that with increased access to material, the range and popularity of collections increases (Marty 2008), the fear of losing control over collections through digitization remains a common theme in museums and archives. It also arose during Jatan's setup, but the contestations of power and control of the archive and the collection were in this case eventually met through programming several layers of approval into the database: director,

curator, administrator and operator. This is essentially an elaborate system of checks and balances programmed into Jatan:

Jatan was created in a way that is very different from the way we do this in the West, in that the people who were doing the data entry were not experts over there of the material, so essentially they were just doing data entry; and then the curator had one level of checks, and the director would have another level of checks. [This multitude of checks] was something that they wanted in India ... (Ghose, interview, 2018)

The creation of entries in the database, as Ghose points out, was done by people either hired explicitly for Jatan, or (in case of smaller collections) done along the way, by keepers or other available staff. The person entering the data – called the operator – consequently did not necessarily have the most profound knowledge of the collection. Hence everything needed to go through the curator for approval with regard to content – a common practice in most digitization projects. Jatan technically has two further approval levels, that of the administrator and of the director. The administrator can start an entry by providing a photograph; the director is the person responsible for final approval and consistency.²³ Katre says that this multitude of roles also aims at a collaborative enrichment of the material entered into the database (interview, Katre, 2017). Moreover, integrating four roles (plus C-DAC as the uploader of the material, who technically could check material for data faults but is primarily responsible for the upload as they have larger bandwidth at their disposal than the museums) into Jatan's architecture is also a reflection of the desire for control in the digitization process. Programming four levels of checks and balances into the CMS was a concession to the museums' anxieties and fears of losing power and control over the collections.

Despite this concession, the museums initially did not individually push forward with implementing digitization. The reform agenda compiled the various wishes voiced by the museums, but not all museums saw the need to implement these in practice. The museums responded to Jatan with something between disinterest and active pushback. This reminded Sircar of an experience he had had with a previous digitization project, called Euro-Indian Paintings. Euro-Indian Paintings aimed at digitally recording and gathering all the collections of European painters in India from the eighteenth and nineteenth centuries housed in Indian and British institutions. Under Sircar's direction, plans evolved to create a

complete inventory, with adequate meta data and keywords, that is common to the holdings in the seven major collections, ie, the four museums in India [Victoria Memorial Hall, National Gallery of Modern Art Delhi, Salar Jung Museum, Indian Museum Kolkata] and the three institutions in London [British Library, Victoria & Albert Museum, British Museum]. (Sircar 2017: n.p.)

This would provide the basis for “digitally unit[ing]” these separate standalone India-related paintings and sketches’ and to subsequently tackle research questions such as ‘What exactly did people and places look like in the several centuries before photography arrived and started recording these details?’ (ibid.: n.p.). One stage of this international digitization project consisted of diplomatic encounters, which took the form of memorandums of understanding between the three British museums and the Indian Ministry of Culture (on behalf of the Indian museums), signed in June 2010. Only one month later, the issue was discussed during the Indo-British talks when the then British Prime Minister David Cameron visited New Delhi. In the presence of Prime Ministers Manmohan Singh and Cameron, the two countries signed an agreement ‘to work towards a common pool of digitally archived paintings and copies’ (ibid.: n.p.), hoping to develop a digital repository that would bring together the ten to twenty thousand images housed in India and the UK, to be accessible online for researchers and the wider public.

Nine years after the Ministry of Culture initiated the diplomatic agreements on creating the digital archive of Euro-Indian paintings, no such digital repository exists, let alone an online version of it. Although the British institutions involved used the agreement to obtain funds for completing the digitization of European and Indian paintings,

work [at the Indian museums] has been painfully slow and unenthusiastic, because hardly anyone could see the ‘big picture’. Funds were difficult to procure and no one could be ‘excited’ about the project. Individuals made valiant efforts [but] at least two of the directors were busy spiking the work unless they were permitted to visit London. (Ibid.: n.p.)

What Sircar suggests here – and this needs to be taken seriously when thinking about digitization projects commenced with multiple actors in the government or state institutions – is the dynamics of power and bureaucracy. As S.K. Das (2001) argues, the internal power structures of Indian bureaucracy reflect the entwinement between politicians and

civil servants. Das regards this as the main cause of corruption in large parts of the Indian administration. Other authors argue in similar ways that bureaucracy in India is often rife with corruption, an issue likely to be rooted in self-interest and the desire for personal gain, which includes intrinsic violence and systemic arbitrariness (Gupta 2012; Mathur 2016). Given that the directors of Indian state museums are part of what Das (2001) describes as the routine transfer and posting of a few thousand officers with every change of government, Sircar's description of a request for personal travel by two directors does not come as a big surprise. In the political power game within the Ministry of Culture and its museums, subordinate officers, staff and citizens can to some extent exercise or deny support when dealing with people of higher status.²⁴

The experience with Euro-Indian Paintings informed Jatan. The Ministry consciously tried to tackle resistance in multiple ways. As Ghose (interview, 2018) put it, 'it took a huge amount of effort on both the part of the Art Institute and C-DAC, Pune and the bureaucrats at the Culture Ministry to actually push this into each institution and to even start'. One part of the effort was to conduct several training days and meetings in an atmosphere of prestige, to which the partnership with the AIC has contributed. Another was the concession of programming four administrative roles into Jatan, providing a format to control the digital archive. Third was a tight monitoring process. The appointment of a nodal officer in each of the museums meant ministerial control of the digitization programme, because the nodal officers were obliged to report directly to the Ministry about the proceedings and progress of the digitization on a weekly or biweekly basis. Accepting the introduction of a CMS as a technical improvement in the museum was hence also the result of a decidedly top-down museum development agenda. To a certain extent it stopped the issue of power and control over collections coming to the boil. As both Ms Rao and Sircar explained, a lack of interest led to the abandonment of the earlier Euro-Indian Paintings project. Last but not least, financing also contributed to Jatan's successful implementation, meaning there was money for additional museum staff hired for the project, covering the costs of C-DAC's programming work, and financing the museums' acquisition of computers, SLR cameras and internet connections. The number of staff and contract periods were subject to the museums' requests and subsequent negotiations.

What we find here goes beyond the regular conflict in museum practice, often characterized by innovative concepts and ideas, new museology and improved management clashing with museum realpolitik determined by limited finances, staff, time and equipment.²⁵ What we see in Jatan are the political facets of digitization projects, where

stakeholders invoke conventions of museum practices and control when top-down decision making seems to threaten established conventions. A comparatively stable grammar for problem solving and recognition persists in the handling of museum collections. It has been described as Indian museums generally not having an agenda for improvement (Lord 2011). We clearly see that this is no longer the case; museums in India are very much on the agenda for improvement, and this improvement very clearly takes a digital form. As the British Council India (2014: x) argues, ‘Whatever the current state of museums in India, there is a growing recognition of their importance in the cultural, social and economic life of the country and a consequent desire to build new museums and upgrade existing ones’. Nevertheless, the precise form of improvement comes at the cost of tough negotiations. Persistent parochialism in museums impedes changes and digitization. Even though the ten museums initially chosen for the implementation of Jatan are all government run, they tended to challenge the Ministry and would have preferred to rely on their own boards for decision making (interview, Sircar, 2017), a tendency that can also be observed in the digitization process in museums in other countries.²⁶

Hence, what Parry (2007) described as a perceived threat to the creativity of curators when it comes to the introduction of computer-based technology in museums needs to be extended here to the political realm. There is, due to the numerical representation of ICT (Manovich 2001: 27–30), an inherent discrepancy between databases as ordering instances that need a certain amount of uniformity in order to function, and the independence of decision-making processes within museums (be it in the individual, creative realm, or in the independent administration of museums as institutions). Directors in the aforementioned Indian museums initially resisted, delayed or at least did not actively support the introduction of the CMS, because it was not clear what advantages it would bring or whether it really would be an improvement. Because the uniformity of computerized data management systems stands supposedly in contrast to a certain amount of independent decision making, such decision making is supposedly at stake when the Ministry centrally introduces a CMS. But for Jatan, both the AIC and the Ministry pressed for the introduction of an electronic databank in the museums, and thereby arranged for the opening of the debate in the first place. A notion of improvement eventually prevailed that sees the CMS as an appropriate solution to a perceived lack of modern collection management. Jatan’s custom-built programming reflects the concessions that needed to be made in the process of reaching this final understanding.

Introducing Digitization and Digital Collection Management

Without a doubt, museums (not only) in India are in a condition that leaves room for improvement. The partners involved in Jatan in general agreed on this, and contributed or approved of a fourteen-point reform agenda. Even though this agenda was almost all-encompassing, ranging from security and media installations to training museum staff, the management of collections and the installation of a digital CMS was given high priority. Computerization and digitization of cultural heritage (in other words, the creation of a digital archive) was seen as a big step forward, implying the comprehensive inventory of collections and records as well as advanced access to it. The idea was that curators, keepers and other museum staff could perform workflows around objects and documents more efficiently, know more precisely (or at all) what is kept in the depots, and retrieve ordered information about stored artefacts more quickly.

Situating Jatan between the Ministry of Culture, C-DAC, the AIC and the museums, however, allowed a fine-tuning of the technological frame in place here. In their main features, all CMSs rest on numerical code and on the ICT developed on this basis, on established XML schemes and data-modelling conventions. The technical state-of-the-art of CMSs and international standards framed the process of programming Jatan. As there is no longer a one-size-fits-all CMS, individual programming requires selection and adaptation not only across single museums, but also across cultural settings. For Jatan, this was most obvious regarding the lack of technological infrastructure such as hardware or internet connections. More importantly, the Ministry, C-DAC, the AIC and the Indian museums all brought their own concepts of improvement into the processes of creating this CMS. They set the explicit technological frame for Jatan, in relation to social realities. Jatan was hence programmed and implemented according to visions of improvement, customary (museum) practices, social roles and anticipated outcomes. The Ministry of Culture financed, monitored and eventually pushed the digitization project through. The Art Institute of Chicago supported the Ministry's approach through their expertise and experience, and in practice through offering training. C-DAC became the partner fulfilling the needs of in-house, national and individual programming of the software. However, because digitization comes with a plethora of changes in practical and conceptual archiving, in this particular instance it initially faced some reluctance or resistance. The Ministry, C-DAC and the AIC tried to frame the technological advantages in inventory, ordering and retrieving as an eligible improvement, which concurred with a change

in access to collections. Museum staff disrupted this equation of technological advantage, access alteration and improvement. It needed – among other things – the inclusion of four roles into Jatan as a concession to the museums’ concerns and anxieties, to their understandings of the advantages of digitization, the need for improvement, and their desire for independent decision making. The four roles, essentially an elaborate system of checks and balances, and thereby a continuation of stern regulation of access to writing into the database, was needed to get the museums to stay on board.

Engineering multiple supervisory authorities appeased some reservations, but at the cost of remapping or re-establishing existing access to archives and collections as write access in their digital representations. This is not an annulment of a CMS’s capacity to alter the circulation of knowledge stored and preserved in the form of objects and documents in collections and archives. It is rather a comparatively conventional database model with a strong capacity for internal regulation. Jatan’s approval roles reflect data entry staff structures, but are also a form of architectural database construction conditioned by habit and a ‘disconnect’ between the computer and the museum.

However, CMS models exist with and without strong internal regulation, which furthermore can either reflect the regulatory power of the decision makers in analogue catalogues and ordering systems, or subvert them. It remains up to the institution to decide how they implement these in databank systems or whether they convert established systems in digitization projects. With the advent of the internet’s Web 2.0 interactive options, many museums and similar institutions started to embrace a more inclusive approach to knowledge production in (online) curation and public interfaces, mostly through tagging and commenting options, the development of apps or the use of social media.

In everyday practice, for the most part, digitization in museums and archives is primarily concerned with problems on a more basic level. Both conventional CMS construction as well as alternative versions reflect the technological frame in its technical and social realm, and map conventions, expectations, knowledge and power relations onto the software. Digitizing collections often leads to decisions about standard semantics that allow for a compatibility of cultural heritage objects and their networks. In theory, digital versions of inventories present themselves in comparison to analogue registers as less engrained in established hierarchies and more open to a multitude of voices and ontologies. Creating a digital archive purports to be a novel way of architecturally designing information: whereas the structure of the analogue archive of museum objects usually provides a static list with the inventory number as the top

classificatory marker, digitizing the objects and feeding the available information into a digital database allows for information to be presented in a multitude of ways. Based on numerically coded knowledge components, the ranking structure of classificatory markers can be shifted and rearranged with comparative ease, because these components are usually divided into segments. Combining this segmentation of information with a net structure allows for the mapping of different ontologies and embedding of various prioritizations into the management of this digital information. Technically, linkages and interfaces permit a continual growth of digital archives in various directions and across multiple levels. Furthermore, these characteristics allow for the retrieval of information in potentially infinite variations (Cameron 2003).

However, in practice, the planning and programming of digitization reflects political realities. The choosing and reprogramming of Jatan demonstrates that internal institutional politics are relevant. This CMS was programmed to reflect customary information systems and tried-and-tested visual economies. Social biographies of the museum objects, potentially ambiguous meanings and alternative understandings did not find their way into the heart of the database through external write access. In Jatan's architectural structure, they can only be entered via a feedback form in the database's online version. The Ministry of Culture, introducing and providing the impetus for Jatan, is also not necessarily the kind of partner to encourage database architecture that undermines established economies. It rather had to juggle different in-house conceptions. Such in-house discussions about the architecture of Jatan continue, with alterations to the structure and extension of data entry fields recently required at a point of time when data entry was already well under way.

Overall, Jatan's software is a compromise between different understandings of improvement. It is a manifestation of a certain culture of improvement that takes shape in this particular context. It is not fuelled by economic interest, even though aspects of efficiency and power play a vital role in CMS introduction. Introducing a CMS in museums is a complex interplay of beliefs about what museums and computers can and should do, how the different stakeholders involved exercise power and interference, and, most simply, whether the benefits of using a CMS in a precise social setting actually outweigh the anticipated changes and uncertainties.

Digitizing cultural heritage, which, on the technical side, is based on the variability of digital media, technical parameters and a variety of database construction possibilities, has the potential to modulate visual economies, access policies and target audiences. It allows for a more

inclusive approach that acknowledges the communities from where objects originate as stakeholders with particular expertise. At the same time, the CMS as a technical form of improvement in and for museum collections is embedded in a culture of improvement. The next chapter turns to stakeholders outside the museum who might again have very different views on how the situation of accessing museums and archives needs to be improved.

Notes

1. Extensive lists of collection management systems can be found at <https://web.archive.org/web/20170722163531/http://manyonline.org/professional-development/collections-management-software>.
2. Jatan's planning and programming can be traced back to initial Ministry plans from 2009 and 2010. When I started researching Jatan in 2015, the planning process was as good as finished, and Jatan already contained some data from the ten aforementioned museums. I could therefore see how people worked with the software on site and created content, and I could interview stakeholders involved in planning and outlining the database's structure, demanding features, amendments and changes. The interviews were recorded on tape, and stand alongside more informal conversations on which I took notes during or afterwards. Methodologically, this has the advantage of people being aware of being recorded and hence in a position where their statements must be accurate enough to coincide by and large with what their partners might say. The time shift, i.e. talking about planning after implementation, allows for a retrospective reflection, and an identification of challenges and constraints as well as how they were overcome. However, subsequent interviews also provide options for retroactive alteration or embellishment of processes. As I could not observe negotiation processes, this chapter mostly relies on oral, recorded accounts from people involved in Jatan, and on published statements.
3. http://museumsfindia.gov.in/repository/page/digitization_initiative (accessed 30 December 2019).
4. https://web.archive.org/web/20190606163830/http://www.museumsfindia.gov.in/repository/page/msg_hcm (accessed 11 April 2021).
5. https://web.archive.org/web/20190110113615/http://www.museumsfindia.gov.in/repository/page/msg_secretary (accessed 11 April 2021).
6. An anthropological museum will not need to name a creator, but affiliated communities; a registrar might want to record lending and insurance, but not in the same fields in which the conservator records used chemicals.
7. <http://www.cidoc-crm.org> (accessed 6 June 2020).
8. For example, the Dutch DEN demanded (on the basis that a unanimous application of standards is still not in place) that compliance with the developed digitization standards be made a prerequisite for state funding of digitization. Such a practice is not applicable in other countries, as only a minority of museums in other countries are state owned and run. In Germany, for example, the museum field is defined by a federal system (Witthaut 2004: 98); in the UK, museums are often trust-based rather than state-regulated; and in India quite a few museums are privately owned.

9. Coming up with these standards has been the result of international groups discussing needs and wants that are technically realizable, yet these standards are neither compulsory, nor free of critique (mostly culturally based; see below). Other forms – databases without Dublin Core, ignoring the redundancy of data format or the internet as an access point – are technically possible. But these modes can be understood as being outside the currently prevailing technological frame for digitizing cultural heritage. While such scenarios are interesting regarding the reciprocal relationship and the potential capacity to reset the technological frame, what is of interest here is the interplay between technology and society *within* this prevalent technological framework.
10. This numerical quality of digital media is one of its five core characteristics (see Manovich 2001: 27–48).
11. Other countries, too, have for quite some time lagged behind UK or US development when it comes to computers and CMSs in museums and archives. For example, in Germany almost 60% of museums worked without a PC in 1994. In 1998 the number had reduced to about 50% (Schulze 2001), and to 6.5% in 2004 (Withaut 2004). The 1990s saw the introduction of information and communication technology (ICT) into German museums, in the form of PCs, text processing and first databank models (ibid.: 4, 31), and the Lindenmuseum in Stuttgart was one of the first anthropological museums to develop a digitization strategy (Thiele 1992). However, in general it was to take a few more years for German museums to develop an understanding of the advantages of digital data for their work and the need for a more strategic development of the digital sector. As a recent poll shows, in 2016 only 39% of German museums used electronic databases, 31% worked with digital data, and 13% used both for inventory (Institut für Museumsforschung 2017). On a European level, by 2017 a majority (77%) of museums had a digital collection or were engaged in digitizing strategies (Nauta et al. 2017). However, this does not say whether this digital collection is in the form of a CMS or digital data in another program (93% of European museums held analogue visual collections, and 64% had digital visual collections (ibid.: 22)). Similarly, 84% of European museums held analogue man-made objects in 3D, and 45% could present such objects in a digital format (ibid.: 23), and on average European museums have digitally reproduced about 31% of their collections (ibid.: 28).
12. https://www.cdac.in/index.aspx?id=print_page&print=pk_pr_prs_rl220 (accessed 16 May 2020).
13. In acknowledging the social determination of technological change (as a form of innovation), we also need to go beyond the Marxist idea of capitalism as fuelling progress out of the calculation that effective innovation and/or improvement generates more capital (which could then fund further development). While this attribution to market forces is often correct, it fails to acknowledge coincidence or piecemeal advancement (Green 2002). Marxism is an appropriate approach to explain many instances of improvement, but when solely focusing on central issues of capitalism, class and power, we might overlook reasons for improvement and technological change that lie beyond the Marxist explanation, such as collective activity, philanthropy and aspiration (Tarlow 2007). A purely neo-Marxist understanding of improvement risks ‘reducing the complexities of human action, practices and thoughts to the strategic negotiations of power relationships [whereas improvement] practices

- are about belief, culture, aspiration and ways of understanding the world, as well as about social control' (ibid.: 9–10).
14. And this also distinguishes it from progress, which is not strategic or active, but rather a larger development realized through accumulating multiple improvements and taking rather passive human beings along (Tarlow 2007: 19–20).
 15. At that time the Ministry had no minister, making Sircar *de facto* the head of the Ministry.
 16. <http://namami.gov.in/> (accessed 16 May 2020).
 17. <http://indiaculture.nic.in/scheme-financial-assistance-digitization-museum-collections> (accessed 16 May 2020).
 18. Ibid.
 19. <https://web.archive.org/web/20191228161526/https://www.digitalindia.gov.in/content/about-programme> (accessed 11 April 2021).
 20. The economic liberalization of India in 1991 is one aspect that accounts for the massive advance of high-tech industry, making it one of the world's largest export markets, as well as the high level of skilled labour. Yet, as Sen (2016) and Pradip Ninan Thomas (2012) point out, the Indian government has had an interest and a stake in the development of the country's IT sector since shortly after independence. Nehru's government included modern computer technology into the state's economic planning, relating to research agendas in nuclear technology and cosmonautics; he inaugurated the country's first computer, the TIFRAC, in 1960. Multinationals like IBM were allowed to operate in India, and the training of engineers was strengthened through the founding of the Indian Institutes of Technology. The electronics industry was declared a key resource for the country and in the 1970s there were already numerous experts in software development and programming (Sharma 2014). The liberalization that started the private ICT industry began in the 1980s, with the New Computer Policy (1984) and Software Promotion Policy (1986), allowing the export of data with the help of government-funded, satellite-based data transport, and subsequent tax reductions and subsidies. The economic liberalization of 1991 gave the industry a further push, so that the early 1990s are characterized by expansion in software development for international customers. The outsourcing of service and backroom operations to India started around the turn of the millennium. The Indian IT industry is now dominated by application development, business process outsourcing, research and development and engineering services (ibid.).
 21. The paragraphs on Digital India were published previously in very similar wording in Müller 2019.
 22. <http://indiaculture.nic.in/digitization-museum-collection-minutes> (accessed 16 May 2020).
 23. In practice, the administrator often recruits from the data entry staff. And in practice, against the theory of checks and balances, one person with relevant access can function in multiple roles.
 24. This is particularly evident when support for the Minister or Secretary from the Prime Minister starts to wane, and the positions of higher-ranking officers are in limbo. (These paragraphs on Euro-Indian paintings were first published in almost identical form in Müller 2019a.)
 25. For a discussion of these points as regards the German museum landscape, see Kraus 2015.

26. For example, in the German context, as digitization projects in museums produced strong parochialism (private communication, Manfred Thaller, 2016).

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