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Further information on ERPANET and access to its other products is available at <http://www.erpanet.org>.

A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu.int>).

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Table of Contents

Executive Summary.....	2
Chapter 1: The ERPANET Project.....	3
Chapter 2: Scope of the Case Studies.....	4
Chapter 3: Method of Working	6
Chapter 4: the Dutch Kadaster.....	7
Chapter 5: Details and circumstances of the interviews.....	8
Chapter 6: Analysis	9
Perception and Awareness of Digital Preservation.....	9
Preservation Activity.....	10
Compliance Monitoring.....	13
Digital Preservation Costs.....	13
Future Outlook.....	13
Chapter 7: Conclusions	14
Appendix 1: References.....	16

Executive Summary

The Kadaster, the Dutch land registry, is legally obliged to preserve deeds involving plots of land forever. Digital information management at the Kadaster is still young. As with the entire sector the Kadaster's processes and procedures have a long-lasting history, and their workflow is optimised for a non-digital environment. Yet, the Kadaster eagerly adopts digital technology, and they are moving progressively towards an entirely digital workflow taking on organisational paradigm shifts. With their accomplishments in recent years the Kadaster is fairly advanced in the sector. The information technology department has taken the lead role in what is a step-by-step and thoroughly planned development. Yet, despite their thorough planning or perhaps because of their stepwise procedure, the Kadaster still needs to comprehensively address digital preservation. Digital preservation issues have not up until now been considered from the outset when new information management features were designed, and the organisation still lacks a digital preservation policy with clear roles and responsibilities. The Kadaster is aware of this and plans to address digital preservation. At the moment they continue to transfer all their deeds to microfilm to avoid the longevity problem of data storage media. Yet, the major stumbling block for the Kadaster in advancing their preservation approach is legislation, as the Kadaster Act explicitly demands the use of paper and microfilm. There is hope that the Kadaster Act is amended to fit the new digital environment as early as next year, in 2005. Once this is achieved, the Kadaster plans to cease their current processes, which accommodate both traditional and digital means in parallel, to move into an entirely digital workflow. It is then when the Kadaster plans to tackle preservation of their digital deeds. Besides deeds the Kadaster also has an active geographical database, which they need to preserve for primary business reasons. This database is not subject to any legislation and the Kadaster has adopted an ad-hoc migration strategy for its preservation. However, also for this information asset a more formal preservation strategy is needed that considers digital preservation already at an early stage of deployment and controls preservation actions in an ongoing manner.

Chapter 1: The ERPANET Project

The European Commission and Swiss Confederation funded ERPANET Project¹ (Electronic Resource Preservation and Access Network) works to enhance the preservation of cultural and scientific digital objects through raising awareness, providing access to experience, sharing policies and strategies, and improving practices. To achieve these goals ERPANET is building an active community of members and actors, bringing together memory organisations (museums, libraries and archives), ICT and software industry, research institutions, government organisations, entertainment and creative industries, and commercial sectors. ERPANET constructs authoritative information resources on state-of-the-art developments in digital preservation, promotes training, and provides advice and tools.

ERPANET consists of four partners and is directed by a management committee, namely Seamus Ross (HATII, University of Glasgow; principal director), Niklaus Bütikofer (Schweizerisches Bundesarchiv), Hans Hofman (Nationaal Archief/National Archives of the Netherlands), and Maria Guercio (ISTBAL, University of Urbino). At each of these nodes a content editor supports their work, and Peter McKinney serves as a co-coordinator to the project. An Advisory Committee with experts from various organisations, institutions, and companies from all over Europe give advice and support to ERPANET.

¹ ERPANET is a European Commission funded project (IST-2001-32706). See [Hwww.erpanet.org](http://www.erpanet.org) for more details and available products.

Chapter 2: Scope of the Case Studies

While theoretical discussions on best practice call for urgent action to ensure the survival of digital information, it is organisations and institutions that are leading the drive to establish effective digital preservation strategies. In order to understand the processes these organisations are undertaking, ERPANET is conducting a series of case studies in the area of digital preservation. In total, sixty case studies, each of varying size, will investigate awareness, strategies, and technologies used in an array of organisations. The resulting corpus should make a substantial contribution to our knowledge of practice in digital preservation, and form the foundation for theory building and the development of methodological tools. The value of these case studies will come not only from the breadth of companies and institutions included, but also through the depth at which they will explore the issues.

ERPANET is deliberately and systematically approaching disparate companies and institutions from industry and business to facilitate discussion in areas that have traditionally been unconnected. With these case studies ERPANET will broaden the scope and understanding of digital preservation through research and discussion. The case studies will be published to improve the approaches and solutions being developed and to reduce the redundancy of effort. The interviews are identifying current practice not only in-depth within specific sectors, but also cross-sectorally: what can the publishing sector learn from the aeronautical sector? Eventually we aim to use this comparative data to produce intra-sectoral overviews.

This cross-sectoral fertilisation is a main focus of ERPANET as laid out in its Digital Preservation Charter.² It is of primary importance that disparate groups are given a mechanism through which to come together as best practices for digital preservation are established in each sector.

Aims

The principal aims of the study are to:

- build a picture of methods and match against context to produce best practices;
- accumulate and make accessible information about practices;
- identify issues for further research;
- enable cross-sectoral practice comparisons;
- enable the development of assessment tools;
- create material for training seminars and workshops; and,
- develop contacts.

Potential sectors have been selected to represent a wide scope of information production and digital preservation activity. Each sector may present a unique perspective on digital preservation. Organisational and sectoral requirements, awareness of digital preservation, resources available, and the nature of the digital

² The Charter is ERPANET's statement on the principles of digital preservation. It has been drafted in order to achieve a concerted and co-ordinated effort in the area of digital preservation by all organisations and individuals that have an interest and share these concerns.
Hhttp://www.erpanet.org/charter.phpH.

object created place unique and specific demands on organisations. Each of the case studies is being balanced to ensure a range of institutional types, sizes, and locations.

The main areas of investigation included:

- perception and awareness of risk associated with information loss;
- understanding how digital preservation affects the organisation;
- identifying what actions have been taken to prevent data loss;
- the process of monitoring actions; and,
- mechanisms for determining future requirements.

Within each section, the questions were designed to bring organisational perceptions and practices into focus. Questions were aimed at understanding impressions held on digital preservation and the impact that it has had on the respective organisation, exploring the awareness in the sector of the issues and the importance that it was accorded, and how it affected organisational thinking. The participants were asked to describe, what in their views, were the main problems associated with digital preservation and what value information actually had in the sector. Through this the reasons for preserving information as well as the risks associated with not preserving it became clear.

The core of the questionnaire focused on the actions taken at corporate level and sectoral levels in order to uncover policies, strategies, and standards currently employed to tackle digital preservation concerns, including selection, preservation techniques, storage, access, and costs. Questions allowed participants to explore the future commitment from their organisation and sector to digital preservation activities, and where possible to relate their existing or planned activities to those being conducted in other organisations with which they might be familiar.

Three people within each organisation are targeted for each study. In reality this proved to be problematic. Even when organisations are identified and interviews timetabled, targets often withdrew just before we began the interview process. Some withdrew after seeing the data collection instrument, due in part to the time/effort involved, and others (we suspect) dropped out because they realised that the expertise was not available within their organisation to answer the questions. The perception of risks that might arise through contributing to these studies worried some organisations, particularly those from sectors where competitive advantage is imperative, or liability and litigation issues especially worrying. Non-disclosure agreements that stipulated that we would neither name an organisation nor disclose any information that would enable readers to identify them were used to reduce risks associated with contributing to this study. In some cases the risk was still deemed too great and organisations withdrew.

Chapter 3: Method of Working

Initial desk-based sectoral analysis provides ERPANET researchers with essential background knowledge. They then conduct the primary research by interview. In developing the interview instrument, the project directors and editors reviewed other projects that had used interviews to accumulate evidence on issues related to digital preservation. Among these the methodologies used in the Pittsburgh Project and InterPARES I for target selection and data collection were given special attention. The Pittsburgh approach was considered too narrow a focus and provided insufficient breadth to enable full sectoral comparisons. On the other hand, the InterPARES I data collection methodology proved much too detailed and lengthy, which we felt might become an obstacle at the point of interpretation of the data. Moreover, it focused closely on recordkeeping systems within organisations.

The ERPANET interview instrument takes account of the strengths and weaknesses from both, developing a more focused questionnaire designed to be targeted at a range of strategic points in the organisations under examination. The instrument³ was created to explore three main areas of enquiry within an organisation: awareness of digital preservation and the issues surrounding it; digital preservation strategies (both in planning and in practice); and future requirements within the organisation for this field. Within these three themes, distinct layers of questions elicit a detailed discovery of the state of the entire digital preservation process within participants' institutions. Drawing on the experience that the partners of ERPANET have in this method of research, another important detail has been introduced. Within organisations, three categories of employee were identified for interview: an Information Systems or Technology Manager, Business Manager, and Archivist / Records Manager. In practice, this usually involved two members of staff with knowledge of the organisation's digital preservation activities, and a high level manager who provided an overview of business and organisational issues. This methodology has allowed us to discover the extent of knowledge and practice in organisations, to understand the roles of responsibility and problem ownership, and to appreciate where the drive towards digital preservation is initiated within organisations.

The task of selecting the sectors for the case studies and of identifying the respective companies to be studied is incumbent upon the management board. They compiled a first list of sectors at the very beginning of the project. But sector and company selection is an ongoing process, and the list is regularly updated and complemented. The Directors are assisted in this task by an advisory committee.⁴

³ See [Hhttp://www.erpanet.org/studies/index.php](http://www.erpanet.org/studies/index.php). We have posted the questionnaire to encourage comment and in the hope that other groups conducting similar research can use the ideas contained within it to foster comparability between different studies.

⁴ See [Hwww.erpanet.org](http://www.erpanet.org) for the composition of this committee.

Chapter 4: the Dutch Kadaster

The Dutch Land Registry Office, the Kadaster, administers and makes available information about registered properties in the Netherlands. Registered properties include real estate such as houses and apartments, but also moveable properties such as ships and aircraft. The Kadaster is legally obliged to keep these registers. The registers consist of notarial deeds relating to properties that in most cases are deeds of conveyance (when transferring property from the buyer to the vendor) and mortgage deeds. The registers also contain details that indicate the legal status of the registered properties. The preservation of the deeds and provision of information about real estate are the primary tasks of the Kadaster.

The Kadaster was formed in 1832, and became a 'Self-Administering State Body' in 1994. In 2003 more than 2,100 staff worked for the Kadaster. Its main office is in Apeldoorn, and it has fifteen regional offices within the Netherlands. All changes in property and transactions must be notarized and the deeds then have to be transferred to the responsible regional office. The Kadaster regional offices keep a complete history of properties to which they must provide access. The Kadaster main office oversees these processes and it is now in the centre of expanding their digital information infrastructure towards an entirely digital workflow to foster cooperation between the regional offices and to improve efficiency. With digital deeds all offices can access and process deeds accessioned by another regional office instantaneously, which allows capacity sharing throughout the country. Also the digital systems can be designed to be self-describing and easy to use, so that unskilled personnel can be recruited for administrative work in peak times on a temporary basis. The move into a digital workflow bears enormous opportunities for the Kadaster. Currently, however, notaries still transfer deeds as paper documents. Each regional office has scanning facilities to immediately digitise deeds, and they transfer the digital surrogates to the Kadaster main office. Since November 2003 the Kadaster provides an online gateway⁵ that provides access to its digital holdings.

For providing swift information about the current state and ownership of land estate, the Kadaster central office set up a database with geographical information in the late 1980s. This database holds current information about plots of lands, including the current owner and mortgage information.

This case study focuses on the preservation of digital information about land and housing properties at the Kadaster main office in Apeldoorn. This includes the preservation of both the deeds and the geographic database. It is important to note that inherently different preservation approaches as well as their different legal status call for a clear distinction between them in this report and where appropriate, they will be addressed separately.

⁵ Kadaster-on-line. [Hhttps://kadaster-on-line.kadaster.nl/H](https://kadaster-on-line.kadaster.nl/H).

Chapter 5: Details and circumstances of the interviews

Interviews were conducted at the offices of the Dutch Kadaster in Apeldoorn in late April 2004. The interviewees were Wim Boks (Archives), Evert Meiling (Secretary of the Kadaster steering committee), and Peter Stolk (IT Project Manager). Following the interviews, the Kadaster steering committee discussed digital preservation and this case study and they consented to publishing this report.

Chapter 6: Analysis

This section presents an analysis of the data collected during the case study. It is organised to mirror the sequence of topics in the questionnaire.

- Perception and Awareness of Digital Preservation
- Preservation Activity
- Compliance Monitoring
- Digital Preservation Costs
- Future Outlook

Perception and Awareness of Digital Preservation

The preservation of deeds and property information is the Kadaster's primary business. Therefore, all staff are aware of the value of the information the Kadaster holds. However, how this information is stored and preserved is generally considered the responsibility of the information technology (IT) department. Senior management and other staff greatly support the gradual move into digital processes that is being undertaken, yet they have relatively low awareness of digital preservation risks. The IT department considered digital preservation issues when designing the systems and procedures that are being put in place, though more as an afterthought than from the outset.

The main problems

Interviewees consider the short lifespan of data carriers a core preservation challenge. The IT department also addressed the expected lifetime of software formats when choosing suitable formats for their archives. The current legislative framework however, poses the most salient challenge. While the Kadaster eagerly pushes towards an entirely digital workflow, legislation still explicitly demands the use of traditional information carriers. Deeds must be transferred from the notaries to the Kadaster in paper, and the Kadaster has to retain the paper copies through their active life before they may be transferred to microfilm for long-term deposit. The Kadaster already works with digital information, yet still has to administer the paper copies as the legally authentic versions. Legislation unfit for modern information technologies is a considerable obstruction in the Kadaster's aspirations.

Asset value and risk exposure

The Kadaster holds information that is unique in the Netherlands and of central juridical and economical value. If this information were lost, the effort of reconstructing the data to re-establish legal ownership of real estate would be immense.

The Kadaster is legally obliged to preserve any deeds involving a plot of land in perpetuity. However, legislation does not cover the Kadaster's database of geographical information. This database is of primary business importance to the Kadaster, selling more than 100 items a day. While the information in the database is based on the deeds, re-establishing the database would be prohibitively costly and time-consuming.

Regulatory Environment

The Kadaster Act demands the preservation of deeds about plots of land. As mentioned above the Act is fastidious and demands that paper is the information medium as well as the exact form of the deed. The Kadaster steering is working on all fronts to amend the corresponding legislation, and they expect a change in the law by 2005.

As a governmental agency the Kadaster is obliged to additionally transfer its data to the Nationaal Archief, the National Archives of the Netherlands. After an agreement in 1998⁶ to transfer a batch of deeds in microfilm format, the further transfer of information from the Kadaster to the Nationaal Archief is currently under discussion. These discussions will define the scope of the material to be transferred in what time-span and whether it should be transferred as microfilm or in digital form.

Preservation Activity

The Kadaster installed their information management systems itself without external input. When talking to other international land registries, the Kadaster soon found out that they are advanced in this sector and that they could not seek guidance from international peers regarding either digital information management or digital preservation. The Kadaster did not review international developments beyond their sector regarding digital preservation either.

Where consultation and collaboration did take place it was on digitisation, rather than preservation. Some land registries including the Dutch Kadaster and the British Land Registry⁷ embarked on digitisation projects. The British employ a large-scale scanning factory that is capable of scanning even wax seals and they are rushing to scan deeds back to the 17th century. The Kadaster is implementing a more stepwise process in their digitisation activities that displays long-term planning and includes their information management policies.

Policies and Strategies

As noted above, the Kadaster is at the forefront of the movement towards digital processes. Once legislation has been updated to allow deeds in digital form the Kadaster will adopt an entirely digital workflow after only a short period of time. Interviewees expect the notaries to also pick up the new legislative circumstances quickly to transfer only digital deeds to the Kadaster from that time on. The Kadaster cooperates closely with the Dutch Notary Federation KNB⁸ and in 2000 defined the necessary standards to enable the electronic transfer. This framework for digital communication builds on XML forms that are to be used as standard templates for deeds.

The IT department has largely taken the lead in this migration to a digital environment. While the perspectives of other departments at the Kadaster are taken into account for system design, it is the IT department that is the final decision maker. It should also be noted that the work of the traditional archives has drastically changed in recent years

⁶ The source for information about the agreement is the notes from a meeting between the Kadaster and the Nationaal Archief (then called Rijksarchiefdienst) from August 1998: Verslag bespreking overdracht kadastrale bescheiden d.d. 24 aug. 1998.

⁷ Land Registry, England and Wales. Hhttp://www.landreg.gov.uk/H.

⁸ KNB - Koninklijke Notariële Beroepsorganisatie, Royal Dutch Notaries. Hhttp://www.notaris.nl/H.

with the introduction of scanning deeds at point of arrival and much of their work now being conducted via the computer. In their thrust towards a digital information environment for the Kadaster the IT department conducts most of its activities on a project basis in what are thoroughly planned, discrete initiatives.⁹ This stepwise planning was assumed as the most flexible and cost-effective approach.

Despite their eager move into digital processes, the Kadaster has not yet addressed digital preservation exhaustively. They are aware that the issue still needs to be tackled, but they have not yet analysed the risks and implications for the Kadaster. Accordingly, they lack a formal digital preservation policy. However, the Kadaster generally builds on efficient organisational structures and displays tight control mechanisms. As part of this the Kadaster systems have been certified with the ISO Code of Practice for Information Security,¹⁰ which ensures that the necessary management controls for information security are in place. It can thus be expected that once the ongoing reforms in workflow and digital information management have been conducted and digital preservation has been addressed, the necessary mechanisms to ensure a long-term sustainable information management and preservation programme will be implemented.

Selection

Dutch law clearly demands the ongoing preservation of all deeds involving plots of land in the Netherlands. As described in the introduction to the organisation the Kadaster's fifteen branch offices scan all incoming deeds, which yields roughly one million deeds per year. Additionally they are digitising their back holdings and deeds dating back to 1999 have already been scanned. With the last five years now in digital form they have covered the most accessed parts of their information holdings. In a next step the annexes of deeds back to 1920 will be scanned. Annexes are scanned further back than deeds as there are no backup copies of annexes on microfilm. Unlike deeds, annexes are mostly geographical information and maps, and may have exceptional forms.

With each incoming deed the geographical database is updated to hold a comprehensive record of current information. The geographical database holds this spatial information in several layers; the boundaries of plots of land, the boundaries of buildings on it, and descriptions of canals, servitudes and other information. This geographical information is stored in an Oracle¹¹ database designed for spatial applications, which employs a vector format.

Preservation

While the scanning of deeds is distributed between the branches, the digital archive is centralised at the office in Apeldoorn. The IT department chose PDF as their preservation data format.¹² This is a stable and prevalent format and they expect it to be in use for around two more decades. Deeds are scanned at the branch offices in a

⁹ This will also surface when outlining the Kadaster's digitisation activities in the next section on 'Selection'.

¹⁰ Background information to BS 7799 / ISO 17799 - Code of Practice for Information Security Management (CoP) can be found at [Hhttp://www.iso17799-made-easy.com/H](http://www.iso17799-made-easy.com/H).

¹¹ Oracle Corporation. [Hhttp://www.oracle.com/H](http://www.oracle.com/H).

¹² PDF - Portable Document Format, Adobe Inc. [Hhttp://www.adobe.com/products/acrobat/adobepdf.html](http://www.adobe.com/products/acrobat/adobepdf.html).

black and white TIFF¹³ format and then immediately converted to PDF. The IT department also tested OCR¹⁴ to allow for full-text search, but decided against it as OCR is still unreliable in scanning numbers and essential information of deeds including the price is numerical. The decision for PDF was mainly access driven as both TIFF and PDF are considered equally stable formats, yet PDF is preferred by users.

Once scanned and converted to PDF the deeds are transferred to the central archive where they are stored in a UNIX file system. An Oracle database holds about ten metadata fields of a mostly descriptive nature, including the category of the deed, the notary that created it and the branch office where the notary submitted it to. In addition to the descriptive metadata the database holds a unique identifier pointing to the PDF document holding the deed in the file system. Therefore, the database is the central access point to the deeds and it currently holds about 500 megabytes of data. Stored in the UNIX filesystem are currently about six million deeds, which amounts to three terabyte. This data is stored in a SAN¹⁵. The SAN is mirrored to another SAN four kilometers away in a bunker. Additionally the data is written to tapes in a daily incremental backup and stored some sixty kilometres away from the central database.

The Kadaster recognises however, that PDF may become obsolete at some point in time, which they estimate to be in about two decades at the earliest. The Kadaster therefore continues to transfer all their deeds to microfilm for long-term preservation. For this deeds are written to DVD at the central archive and shipped to an external contractor for printing them to microfilm.

Unlike deeds that are transferred to a preservation format, the geographical database contains only active information and is dynamic. The IT department is currently in the process of migrating this database to a new system and an entirely new system structure. The former system was designed in the late 1980s when each regional office had a separate geographical database. In the new system only one central Oracle database will be employed, and the regional offices will be able to interact with the system from their remote locations. The implementation of this new system will be done in a step-by-step process. By early 2004 the central database was already established, but the regional databases still work as a buffer to this central database. The entire migration process and the transfer of data to the database is a massive undertaking that could take up to six years. Joining the formerly separate data will cost the most effort, as there may be consistency problems and all data will undergo a thorough quality check.

Access

For each request on a specific plot of land the entire history of deeds pertaining to this property is delivered. The Kadaster sells some 500,000 copies of deeds a year in both paper and electronic format. An online service has been in operation since November 2003 and has proved a great success. While the Kadaster has not advertised this service, it has become a great success. Rumour about the novel service spread quickly, and now the load on their web server is almost too high to bear. Online access requires a subscription for ten Euros per month, plus an additional per item fee of just over five Euro. To further extend its services the Kadaster IT department plans to

¹³ TIFF - Tagged Image File Format, Adobe Inc. TIFF 6.0 Specification:
[Hhttp://partners.adobe.com/asn/developer/PDFS/TN/TIFF6.pdf](http://partners.adobe.com/asn/developer/PDFS/TN/TIFF6.pdf)H.

¹⁴ OCR - Optical Character Recognition.
[Hhttp://www.wikipedia.org/wiki/Optical_character_recognition](http://www.wikipedia.org/wiki/Optical_character_recognition)H.

¹⁵ SAN - Storage Area Network. [Hhttp://en.wikipedia.org/wiki/Storage_Area_Network](http://en.wikipedia.org/wiki/Storage_Area_Network)H.

combine the information from the deeds with the information in the geographical database.

Compliance Monitoring

In the absence of a digital preservation policy there is currently no auditing of preservation activities, other than in areas such as finance where they have rigid auditing procedures in place. However, the Kadaster installs quality control for each of their projects and activities. This includes their digitisation activities, the migration of the database, as well as microfilming their archives.

Digital Preservation Costs

Digital preservation costs are part of other budgets and cannot be clearly separated from those. Financing of the new Kadaster systems was to a great extent taken from the IT budget, which amounted to 58.9 million Euro in 2003.¹⁶ Generally speaking, interviewees are confident to receive the funds necessary for specific digital preservation activities, if they are sufficiently reasoned and embedded in a well-planned project.

Future Outlook

After the central archive has been established, the next focus is on immersing the Kadaster in a totally digital environment, including the creation as well as delivery of deeds. While digitisation of incoming deeds is ongoing, both the Kadaster and the KNB are lobbying and pushing for a change in legislation so that deeds can be delivered in digital form directly. Some of the necessary technology¹⁷ has already been prepared to take immediate action once the legislation has been amended. The Kadaster Act was under discussion by the House of Representatives of the Dutch parliament as this case study was being conducted. A draft of the new Act¹⁸ demands the preservation of the email messages that convey the deeds for at least twenty years by the Kadaster. The respective system still needs to be constructed. Interviewees from the IT department are also planning to strip the incoming deeds of any digital signatures and to additionally save them in their deeds database along with metadata about the receipt and the signature that was in place. While the Kadaster currently relies on microfilm prints for the long-term preservation of their deeds, they would be glad to preserve them in digital form since the printing of the microfilms is very costly. Interviewees underlined, however, that digital storage media lack the necessary longevity and that long-term preservation in digital form remains an open challenge.

¹⁶ Kadaster: Annual Report 2003 / Jaarverslag 2003. (in Dutch).

Hhttp://www.kadaster.nl/jaarverslag/docs/jaarverslag_kadaster_2003.pdfH.

¹⁷ This refers mainly to the XML forms and communication protocol established by the Kadaster and the KNB as described in the section *Policies and Strategies*.

¹⁸ A draft version of the amended Kadaster Act is available in Dutch via the website of the House of Representatives of the Dutch parliament, the "Tweede Kamer der Staten-Generaal" (<http://www.tweede-kamer.nl/>). Viewed for this case study was the version from 18-6-2004. H<http://parlando.sdu.nl/cgi/showdoc/session=anonymous@3A6254946280/action=doc/pos=0/query=3/KST77243.pdf>H.

Chapter 7: Conclusions

The Kadaster are advanced in their sector with regard to digital information management. In the land registry sector organisations are optimised towards a traditional workflow and the switch to digital processes is no minor feat.¹⁹ While the Kadaster's digital information management is still young, they exert thorough planning before each of their projects that progressively take them towards a digital workflow. This thorough planning may defend the Kadaster from costly and time-consuming revisions. Within this sound foundation for robust and long-term sustainable development the Kadaster still needs to embed a policy framework that will ensure that the preservation of their digital information assets is considered from the outset in all their activities. It is widely recognised in the preservation community that digital preservation unlike traditional preservation demands ongoing commitment and cannot be dealt with *post facto*. Interviewees were interested to learn about this and they certainly will find the most suitable approach for the Kadaster. They were also very open about their experiences and eager to learn about digital preservation approaches at other organisations. Certainly, the wealth of resources brought forth in recent years such as the UNESCO guidelines²⁰ and the Cornell Tutorial²¹ will be valuable to them.

After initial concerns about the restricted media lifetime the Kadaster IT department has recognised that the physical media are not the main challenge in digital preservation. Their mirrored SAN in tandem with tape backup is a robust solution to preserving the bits and bytes. Similar approaches together with ongoing data refreshing or regular media migration are employed by most other organisations. The KNMI²² even found ongoing media migration to be an opportunity to them, after they minimised the physical storage space needed for their tapes considerably when migrating their data to new tapes with higher capacity.

A far bigger challenge is posed by software formats. Formats change relatively quickly and migration from an obsolete to a current format must be conducted regularly. Each migration cycle, however, opens the risk of corrupting essential aspects of the original file. PDF is not the preferred preservation format in the preservation community, as it is relatively unstable and as it does not support future migration from PDF to other formats.²³ The ongoing standardisation of an archival version of PDF called PDF/A promises a more stable and slimmer PDF version.²⁴ However, for images the TIFF format continues to be the most widely recommended archival standard. A number of current preservation initiatives stick to TIFF for images and XML for text and create on-the-fly PDF documents for access convenience.²⁵ As such the XML communication

¹⁹ FIG-Commission 7 working group 1 "Vision Cadastre": Cadastre 2014. Published 1998. [Hhttp://www.swisstopo.ch/fig-wg71/cad2014.htm](http://www.swisstopo.ch/fig-wg71/cad2014.htm)

²⁰ UNESCO (prepared by the National Library of Australia): Guidelines for the Preservation of Digital Heritage. March 2003. [Hhttp://unesdoc.unesco.org/images/0013/001300/130071e.pdf](http://unesdoc.unesco.org/images/0013/001300/130071e.pdf)

²¹ Cornell Tutorial: Digital Preservation Management: Implementing Short-term Strategies for Long-term Problems. [Hhttp://www.library.cornell.edu/iris/tutorial/dpm/H](http://www.library.cornell.edu/iris/tutorial/dpm/H).

²² See the ERPANET case study on the KNMI, the Koninklijk Nederlands Meteorologisch Instituut. [Hwww.erpanet.org/studies/index.php](http://www.erpanet.org/studies/index.php).

²³ See the report of the ERPANET Workshop on "File Formats for Digital Preservation" in Vienna, 10-11 May 2004, available at [Hhttp://www.erpanet.org/events/2004/vienna/H](http://www.erpanet.org/events/2004/vienna/H).

²⁴ PDF-Archive Standards Development Webpage. [Hhttp://www.aiim.org/pdf_a/H](http://www.aiim.org/pdf_a/H).

²⁵ See for example the ERPANET case study on the European Patent Office or the presentation of the European Publications Office at the ERPANET Seminar in Paris, 29-30 January 2003. Access driven portals such as the web development framework Apache Cocoon ([Hhttp://cocoon.apache.org/H](http://cocoon.apache.org/H)) have employed this technique for a number of years.

standards created by the Kadaster in cooperation with the KNB, while not designed with digital preservation in mind, may be a component of a future preservation strategy.

For the preservation of their geographical database the Kadaster intuitively assumed a migration strategy for long-term preservation. While the first migration cycle is only just being planned this migration strategy appears a feasible approach for the Kadaster. In the distant future the database may gain legal authority for cadastral information. For further extending their preservation approach the proceedings of the ERPANET workshop on preserving databases may be a rich source.²⁶ The SIARD initiative of the Swiss National Archives is an outstanding approach for regularly making snapshots of an active, dynamic database and transferring those snapshots to archival storage.²⁷ Also the Oracle spatial database employed for the new geographical database needs to be scrutinised from a preservation perspective; it must be ensured that the specification of the internal vector format is available and that a future migration to other database systems, perhaps to a non-Oracle product is possible.

The Kadaster is progressively moving towards an entirely digital workflow. This move will be stifled if their business environment does not move the same way and at the same speed. Legislation is a major stumbling block for the Kadaster's plans. However, the Kadaster is pushing for new legislation to be passed in the near future, which will legally enable comprehensive reform. Once legislation is cleared the notaries, who are the Kadaster's data suppliers, need to pick up digital processes. In the end a comprehensive and sound preservation strategy for the Kadaster will depend on their cooperation. Also what form the cooperation with the Dutch National Archives will take is still open. Forming an island of digital information management and digital preservation in this still unclear business environment is almost impossible to accomplish. It appears that many organisations experience similar and maybe even more pronounced obstructions on their move to digital processes. With that in mind we have to acknowledge that the true digital revolution is only about to begin.

The Kadaster's voice may gain importance on a national level if it is backed by ongoing developments on a European level. Recent years have seen an increase in international cooperation in the sector. This is also reflected by the formation of the Permanent Committee on Cadastre in the European Union²⁸ in 2002 and the declaration of the "Common Principles on the Cadastre in the European Union"²⁹ in 2003. Preparations are now also being made for cooperation on tools and technology (this includes EULIS project³⁰ that furthers the interoperability of land information systems in the European Union). This increasing cooperation bears opportunities for furthering digital preservation in the cadastral sector on a European level regarding exchange of experiences and also incorporating digital preservation requirements in standards developing activities.

²⁶ ERPANET Workshop: Long-term Preservation of Databases. Bern, 9-11 April 2003. Proceedings are available at [Hwww.erpanet.org/events/2003/bern/index/phpH](http://www.erpanet.org/events/2003/bern/index/phpH).

²⁷ SIARD - Software Invariant Archiving of Relational Databases at the Swiss Federal Archives. See the [erpaWorkshop Berne Proceedings](#) op cit.

²⁸ Permanent Committee on Cadastre in the European Union. [Hhttp://www.eurocadastre.org/H](http://www.eurocadastre.org/H).

²⁹ EuroCadastre: Common Principles on the Cadastre in the European Union. Rome; 3rd December 2003. [Hhttp://www.eurocadastre.org/pdf/Principles%20in%20English.pdfH](http://www.eurocadastre.org/pdf/Principles%20in%20English.pdfH).

³⁰ EULIS - European Land Information Service. [Hhttp://www.eurocadastre.org/pdf/Laarakker%20abstract.pdfH](http://www.eurocadastre.org/pdf/Laarakker%20abstract.pdfH).

Appendix 1: References

the Dutch Kadaster

<http://www.kadaster.nl/>

International Federation of Surveyors

<http://www.fig.net/>

Permanent Committee on Cadastre in the European Union

<http://www.euocadastre.org/>

European Land Information Service (EULIS)

<http://www.euocadastre.org/pdf/Laarakker%20abstract.pdf>

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