

Project:	Managing risk: a business preservation strategy for corporate digital assets
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Contents

1	Introduction	<i>Page 3</i>
2	Background	<i>Page 4</i>
3	Approach	<i>Page 5</i>
4	Consultancy work and findings	<i>Page 7</i>
5	Options and implications	<i>Page 10</i>
6	Communication and progress	<i>Page 13</i>
7	Lessons	<i>Page 16</i>
8	Conclusion	<i>Page 20</i>
	<i>Appendix 1 – Guide to Digital Preservation</i>	<i>Page 21</i>
	<i>Appendix 2 – Dissemination event</i>	<i>Page 27</i>

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1 Introduction

1.1 Between 2004 and 2006 King's College London undertook a JISC supported project to look closely at the issue of corporate digital asset management. Digital assets were taken to include College business records and research data. It was recognised that poor handling of these resources represents a significant risk. Failure to manage them appropriately both whilst they are current and for the longer term raises operational and legal hazards.

1.2 The project was part of JISC's 4/04 Programme *Supporting Digital Preservation and Asset Management in Institutions*¹. This Programme sought to address an identified need within HE for practical support with the complex issues posed by digital assets, especially around their ongoing availability and future accessibility. The Programme was built on three themes:

- Institutional management support
- Digital preservation assessment tools
- Institutional repository infrastructure development

The King's project picked up on the first of these.

1.3 The project centered on a survey of digital assets in a number of College units. Some of these units were administrative and others were academic. The survey was undertaken by the consultants CIMTECH Ltd. CIMTECH submitted an inventory of assets alongside a report that set out the problems that the College faced and pointed the way ahead, recommending options for the future.

1.4 The project director and manager took these findings forwards with two goals in view:

- To reduce the risks associated with poor handling of digital assets.
- To work towards a viable, embedded, long-term College strategy for assets management.

A number of new ventures followed in the wake of the core project and these remain ongoing.

1.5 The King's experience represents a valuable case study since HEIs everywhere are facing similar challenges.

¹ More information about the 4/04 Programme can be found at the JISC web site, www.jisc.ac.uk/index.cfm?name=programme_404.

2 Background

2.1 Uncertainty surrounds the management of digital data assets in Higher Education. King's has particular concerns over two types of material, electronic business records (including meetings' records, student files and office correspondence) and research material in electronic form. The latter group of records takes in data sets, research reports and supporting administrative documents. King's recognises the value of this material but also recognises that it is not always managed rigorously and consistently.

2.2 In particular issues of data longevity are not well understood. As a result the need to identify and retain long-term data that remains both searchable and useable is not being adequately met. This raises a number of interrelated risks:

- Valuable data assets may be lost through poor management. Material degradation, data corruption and hardware or software obsolescence are all serious threats to electronic records.
- Neglect of key information raises business continuity hazards. Unavailability of data could cause major problems for key services at vital times.
- Legal risks arise. Corporate data needs to be managed properly to support compliance with the Data Protection and Freedom of Information Acts. In addition, the management of research data is often subject to a web of contractual agreements. Overlapping duties to research funders, participants, publishers and others all need to be met.

2.3 Given this context the purpose of the project was as follows:

- To find out more about the digital assets that the College holds. To determine the quantity, range and significance of the material.
- To identify the key issues and concerns raised by the way that data is currently managed.
- To examine a range of options to help improve the College's approach.
- To begin crafting a strategy for digital asset management right across King's.
- To pass on any lessons learned to the wider HE sector.

3 Approach

3.1 The project was ambitious given the time-scale and resources allowed. It was always inevitable that the project would be the start of King's journey towards better management of digital assets and not the whole process. It was accepted at the outset that there would be no easy answers to the questions that the project raised. The approach therefore was exploratory and iterative.

It was also recognised from the outset that with electronic records, preservation planning necessarily begins at the start of the records lifecycle. It was decided then to take in the whole picture and look closely at how digital data is handled from creation onwards. This lifecycle perspective informed the entire project.

3.2 The work of the project came in three packages as set out below.

3.2.1 Define project base and identify sites

The project was based on a College-wide survey of digital assets. The survey looked at the records that the College holds and how it manages them.

The following five sites were picked since they maintain a variety of different records and present different problems:

- **Florence Nightingale School of Nursing and Midwifery**
The School faces the major challenge of maintaining numerous and complex student records. It holds current information on at least a thousand students in each cohort. Many Nursing students return to College in successive years, following through on continuing professional development. The School also maintains research data.
- **School of Social Science and Public Policy**
The School's significant digital holdings include research data, often from studies funded under demanding contracts. In addition the School maintains commissioned e-learning materials. These represent a major investment of time and resources by the College.
- **Academic Registry**
Registry maintains core information on students. Some of this is duplicated in schools and all of it is subject to ongoing updates and alterations.
- **Estates Department**
Estates holds all building and building services information for the College including project files, technical manuals, maintenance schedules, drawings, plans and so on. The Department faces issues arising from the legacy of institutional mergers, from building moves and adaptations and

from historically dispersed information sources and systems.

- Department of Facilities and Services
the Department manages core corporate information including the telephone directory, halls of residence data and space allocation information. All of this is vital on a day to day basis but it also plays a key role in the College's disaster and business continuity planning.

3.2.2 Consultancy

It was decided that external consultants would handle the survey. After a tendering process CIMTECH Ltd were chosen. CIMTECH have extensive experience in the area of study and of working for the HE sector. Their job was to review holdings of both structured and unstructured digital assets. Structured assets were databases, including the College's student records system and large research data sets. Unstructured assets were other digital records collections. These included office files stored on shared drives.

CIMTECH were asked to devise a survey method and then follow it through. They were to collate results and prepare a finished assets inventory. After this they were required to present and interpret their findings and recommend options for improving the management of digital assets throughout the lifecycle.

3.2.3 Take findings forwards

Following CIMTECH's report the project director and manager were to disseminate the findings and carry the venture forwards. They would ensure that no momentum was lost and that the issues around digital assets became embedded in corporate thinking and planning. Over time a viable preservation strategy and action plan for the College should be developed.

4 Consultancy work and findings

3.0 Method

CIMTECH gathered information from each of the five survey sites. This included basic data (amount and size of holdings) as well as more detailed information. They asked about the use and usefulness of records, how they were stored and accessed and about data ownership and sharing. The project team supported the consultants throughout by identifying site contacts and maintaining communications.

CIMTECH held workshops at each of the sites to brief survey participants about their aims and methods. They held a number of interviews with key staff too. Otherwise the survey was conducted largely through forms. There were two forms, one for structured assets and another for unstructured ones.

CIMTECH's method had three key goals:

- To maximise responses and minimise misunderstandings. This was the intention of the briefing sessions.
- To simplify the survey process and minimise the impact on regular departmental work. This was the purpose of the forms.
- To properly understand the King's context and add depth and insight to the survey's findings. This was the purpose of the interviews with key staff.

3.0 Deliverables

Three deliverables were written into CIMTECH's specification:

- A set of survey data, including returned forms and interviews' transcriptions.
- Two final inventories of digital assets, one for structured material, one for unstructured.
- A project report summarising findings, analysing risks and setting out technical and strategic options for the future.

3.0 Findings

CIMTECH's findings were explored fully in their final project report. Against the background of a risk analysis they identified the key challenges around digital assets.

CIMTECH's findings can be set out on two levels. The first set are drawn from a department level analysis whilst the second set emerge from a corporate overview:

4.3.1 Local findings

- Paper records continue to be vital at King's.
For instance the definitive student file is still paper-based. It remains common to print out electronic records (especially emails) and save them in hard copy. This persistence of paper may have two explanations. First, working practices are still paper-centric in many areas. A shift towards electronic-only working is under way but is taking time to play out. Second, there is a lack of confidence in the long-term viability of digital records. This is understandable and prudent in many cases.
- Storage space within College is being cut back.
Despite the persistence of paper, departments are moving into new offices with reduced physical storage space.
- Legacy database systems still hold important data.
Although software is regularly upgraded and/or superseded, data isn't always migrated onto new systems. In some cases it continues to be trapped in and accessed through older variants. This notably includes student data.
- Problems with version control and currency in electronic documents.
This was a common complaint across the survey especially in relation to research grant applications and ethics forms. These papers have numerous authors, go through lots of drafts and are sent backwards and forwards. This creates risk and worry.
- Pockets of bad practice in managing electronic records.
The survey found poor practice in a number of areas including the following:
 - A department where backing up was infrequent and inadequate.
 - A team with no central file storage.
 - A number of departments where server folders were named inaccurately and inconsistently.
- Duplication of data.
Data is commonly duplicated in central departments and in schools. This may be appropriate in some cases but in others it leads to dispersed records with no single authoritative source.
- Management of research data sets is inconsistent.
The survey found excellent practice in some areas. Technically adept teams managed their data assets well. In other areas though data management was poor. In one case personal data was being stored carelessly raising a legal compliance risk. In another case backup provision was inadequate, threatening the viability of the whole study.

- Long term retention of research data is an issue. Some data sets have real archival value and they could be retained indefinitely for ongoing research use. This data needs to be identified and appraised early though and at present this is not happening consistently.

4.3.2 College findings

- The transition from paper to electronic record keeping is an ongoing process throughout College. At this stage in the process King's faces two issues: a huge paper legacy on one side and a lack of infrastructure to support reliable electronic-only retention on the other.
- Practices for managing electronic records across College are inconsistent. Different teams take different approaches depending on their local IT set-up and on their level of technical and records management awareness.
- The idea that the same retention rules that apply to paper also apply to electronic records is not well understood. There is a perception that digital data falls outside our existing retention policies. This is driven by the notion that destruction is only necessary when storage space runs out. Since electronic records seem much easier to store, staff feel less obliged to destroy them. This ignores the legal drivers behind the College's retention rules (notably data protection and freedom of information legislation) as well as issues of business efficiency and risk management.
- King's does not always take a strategic approach to archiving long-term data from management information systems.
- In general far more work is needed in identifying the archival needs of electronic records and in supporting their long-term retention and use.

The risks arising from all these findings, both local and corporate include:

- Duplication and dispersal of data
- Lack of authoritative records
- Continued reliance on paper with all the ongoing implications that this carries for storage
- Data loss
- Data inaccuracies
- Legal exposure including non-compliant handling of personal data and failure to respond promptly and fully to legitimate public access requests
- Business continuity threats
- The risk of losing corporate archives of long term historical value

5 Options and implications

5.1 The survey identified problems with the management of business and research records throughout their lifecycles. Risks were apparent at every stage.

5.2 The survey's findings suggested that improvements should be made in two key areas. First, enhancing digital asset management in the current/ semi-current phase. Second, adopting a planned, systematic approach to long-term digital preservation. The key options for progress in both these areas are set out below.

5.2.2 Current/ semi-current management

Corporate approach

- Develop corporate policies and guidance.
Considerable advances have been made here already. King's has a records disposition schedule in place along with a range of useful records management fact sheets². This work could be developed. The disposition schedule in particular should address electronic records specifically.
- Continue working towards a comprehensive register of digital assets.

Unstructured assets

- Enhance the use of current technology.
The management of shared drives could be improved. For instance common files and folders could be better organised and named more accurately and consistently. Security on shared drives could be tightened up as well (password protection for certain files for instance). These enhancements should be made locally at a workgroup level.
- Move towards E(D)RM
The introduction of structures and protocols for data management are a necessary precursor to the implementation of ERM (Electronic Records Management) or EDRM (Electronic Document and Records Management) technology. Over time College will require more E(D)RM-type functionality since it offers the most controlled, stable environment for managing electronic records.

Structured assets

- Manage retention better.
Structured assets include large complex databases like the student records system and some of our bigger research data sets.
Although management of these systems was generally found to be

² All of these documents can be found on the King's records management web pages, <http://www.kcl.ac.uk/depsta/iss/archives/rmindex.html>.

good retention/ disposal handling could be improved. For instance, electronic data isn't always weeded or culled in the way that it would be if it were paper. Inevitably there are technical considerations here but our retention policy should still be applied uniformly to all our records irrespective of their form or format.

5.2.3 Long-term preservation

Unstructured assets

- There are three core risks for unstructured data assets:
 - Media degradation. This is a significant threat to data stored offline. Media should be stored in the best environment possible and should be regularly renewed.
 - Hardware obsolescence. Regular renewals and upgrades will help to counter this risk.
 - Format obsolescence. Emulation and/or migration are the common approaches to dealing with this issue. In addition we should use stable, standard file formats, preferably open ones.
- Hardcopy retention (paper or microfilm) is still a viable option. For some types of long-term records it is actively preferred.

Structured assets

- In addition to the usual risks, databases raise their own complex challenges. Preservation strategies should be built around the following principles:
 - Regular migration of data from older applications to newer ones.
 - Retaining data in neutral formats (ASCII or XML for instance).
 - Outputting data to some other preservation platform when databases can no longer be maintained.

The neglect of structured data poses a serious risk. Information trapped in unsupported legacy databases may become inflexible at first and in time unusable.

External providers

- There are providers that offer to store and manage digital archive assets under contract. The market is not especially mature but options do exist within our own sector, for instance the Arts and Humanities Data Service (AHDS).

5.3 These options offer a way forward and the College has developed them into a co-ordinated programme of work based on key priorities. The core elements of this programme are summarised below:

- Establish a College-wide group to initiate monitor and support ongoing work. The value of such a group lies in bringing stakeholders together to ensure joined-up corporate thinking.

- Develop and expand College policies and guidance, especially around standards (preferred file formats, corporate naming conventions and so on).
- Build a network of local electronic records management champions. This should be an ideal way of cascading good practice through diverse departments.
- Continue the digital assets survey, logging key assets and identifying areas of risk.
- Improve current/ semi-current records management. Initially by using present technology more fully but with a target plan to move closer towards E(D)RM functionality over time.
- Extend corporate retention policies over data held in large complex databases.
- Develop a means of selecting and appraising long-term digital records with ongoing archival value.
- Explore archival storage options for digital data, especially through external providers.

This programme will help the College to begin to maximise the long-term value of digital assets and to minimise the associated risks.

6 Communication and progress

5.0 Good communication was recognised as being crucial to the project's success from the outset. Staff at the project sites were briefed about aims and methods early on and were kept informed and updated thereafter. CIMTECH (the consultants) held briefing sessions at all the sites prior to their survey. Effective communication led to good buy-in from participants and a continued interest in the project after the core tasks were over.

6.2 The consultant's final report was widely disseminated. All the participating sites contributed their views and comments. Corporate committees and groups including the Archives and Corporate Records Steering Group, the Legal Compliance and Business Continuity Group and the Information Strategy Committee also received the report with interest.

Along with the report a brief introductory guide to best practice in digital preservation was sent out. Its intention was to take the discussion beyond the obvious stakeholders (IT staff, archives staff and administrators) into the wider College community (see *Appendix 1*).

6.3 Soon after the report was issued a College-wide Digital Assets Working Party (DAWP) was set up. The group attracted high-level membership featuring the Director of Estates, senior staff from Information Systems, representatives from academic schools and managers from Human Resources and Academic Registry. The Deputy College Secretary (Policy and Planning) chaired the group.

The role of the group was to take the project's findings forwards and its terms of reference were as follows:

- To review and evaluate the digital assets survey and accompanying report. To consider the risks that it exposes and the recommendations that it makes.
- To encourage, initiate and support progressive activities.
- To follow through on a programme of work for improving the management of digital assets both immediately and for the long term.
- To work towards a coherent strategy for the management of corporate digital assets, which will effectively balance and manage risks.

6.4 The work of the group is ongoing. Most significantly it has initiated a number of new ventures. These are drawn from the programme set out in 5.3 above and are as follows:

6.4.1 Developing policies and procedures

Email is a major concern. It is less well managed as a corporate record than paper correspondence. In some areas it is used too informally and matters of risk and liability are not well understood. DAWP prioritised

work on a corporate email policy to clarify issues and responsibilities. This policy is now finished and is being rolled out alongside a training and awareness programme³.

The College Disposition Schedule (our in-house retention guide) is being redrafted to cover electronic corporate records more clearly and specifically⁴.

A protocol is being drawn up for transferring digital records to Archive Services for permanent preservation. Work on drafting new advice for records creators and users is also underway.

6.4.2 Continuing the assets survey

The assets audit will continue and will target specific groups of records and specific risks. The next phase will focus exclusively on research material. Work will be based on CIMTECH's approach but will develop it and build on the lessons learned. The survey should help isolate risks and liabilities and identify collections of long-term archival value.

6.4.3 Exploring E(D)RM options

There is no resource for a College-wide E(D)RM implementation right now. However, the Digital Assets Working Party remains interested in the possibility, at least as a long-term option. DAWP called for a more detailed investigation of costs and options and for incremental moves towards a more actively managed records environment.

6.4.4 Business continuity

The College's provisions for back up and security of digital data at a network level are very sound. However locally, within departments and workgroups, the position is less good and DAWP is committed to improving this. Departments clearly need tools and guidance to explain and support best practice. These are now being developed.

DAWP also stays in touch with the College's corporate business continuity and disaster management strategy. This is currently being reviewed and enhanced. Electronic data will continue to have a high profile here.

6.4.5 Digital archiving

Digitally born records pose a range of new challenges for professional archivists managing institutional collections. Questions about how best to appraise, accession, preserve and retrieve them have yet to be fully

³ The policy can be at: <http://www.kcl.ac.uk/college/policyzone/attachments/Emailpolicy.pdf>

⁴ See the web site as above.

answered. Under DAWP's oversight the College's Archive Services team is carrying out a test-bed project with corporate committee records. The project aims to develop procedures and workflows that will make digital deposit viable.

7 Lessons

7.1 Lessons were learned at every stage of the project and some of the more significant ones are considered below:

7.2 Survey

The assets survey helped to identify holdings more fully and to highlight risks and problems. The process did have some shortcomings though:

- It missed some major groups of assets most notably teaching and learning materials captured in the College VLE (Virtual Learning Environment) and records within email systems.
- The survey methodology needs to be developed for extended use. Despite CIMTECH's initial briefing sessions respondents didn't always understand the forms that they were asked to complete. Results were compromised by the patchy quality of returns.
- The layout, structure and information content of the final inventory document needs to be developed.

All of these lessons can now be carried forwards to inform ongoing survey work. In future we will:

- Carry out a systems overview in advance of each survey.
- Use remote forms much less and rely more on direct data gathering by auditors.
- Develop the inventory format to include a succinct set of key management information alongside the description of each record set. This will include observations on the security of data, on the risks it faces, on its archival value and so on.

7.3 Internal dissemination

One of the most significant impacts of the project was how it raised awareness of digital assets issues across College. It was found that matters of digital longevity were not well understood and to counter this an introduction to the key themes was prepared and circulated (see *Appendix 1*). This helped to broaden and enhance the debate. Similarly the consultant's core report was (inevitably) bulky and technical. To disseminate its useful findings, edited extracts were circulated rather than the whole document.

Discussion and debate is always welcome but to take the project's findings forward decisively institutional engagement was needed. The Digital Assets Working Party (DAWP) has provided this. The group has the right membership to take a strategic overview and ensure that all new work is

coherent and joined-up.

6.3 External dissemination

The project also took its findings outside the College. In July 2006 King's hosted an open dissemination event that attracted sixty delegates. The project manager reported on the College's experiences and on the lessons learned. Further speakers picked up on related themes (see *Appendix 2*).

The event was organised jointly with the UK Records Management Society's Higher and Further Education Group. As a result it reached a community of records and archives professionals that may have otherwise missed the significance of the 4/04 Programme.

6.3 Meeting the project's original aims

Over all, the project met its aims very well. There was some shift in focus over the course of the venture though and inevitably a few original goals moved out of scope notably the aim of addressing the five questions below:

- Should corporate digital assets be managed by the institution or put out to contract?
- If the latter, what model contracts are appropriate for data of varying degrees of sensitivity?
- What are the key issues to be addressed in establishing both an access strategy and a preservation strategy?
- How should risks associated with information security be addressed in this context, including the use of out of London services for the re-establishment of business in the event of disaster?
- What contractual arrangements or protocols need to be in place to ensure a co-ordinated approach to relevant assets including the NHS and PFI contractors?

Following CIMTECH's survey it was recognised that a range of underlying issues had to be addressed before the College could begin to contemplate external contracts in any detail. As a result the questions were set aside.

Despite this both the project and our subsequent work have touched on relevant, related issues and a few observations follow.

6.3.0 In-house or contract?

The first two questions deal with whether to preserve assets in-house or externally. Answers will depend on the nature of the assets and of the preservation services required. The availability of external suppliers and the technical and practical capacity of in-house IT is also relevant.

The project has helped the College to define the extent of its digital asset holdings more clearly. In addition it has helped test the adequacy

of the IT infrastructure in relation to preservation. Although the project's findings do not point decisively towards an in-house or contractual solution right now, they will contribute usefully to future planning.

6.3.0 Access v preservation

This is a question that the College's Archives and Corporate Records Service (ACRS) is considering right now. College committee papers are a vital administrative record with real long-term value. ACRS keeps the records of core committees indefinitely. At the moment this material is retained in paper form though ACRS is currently exploring digital preservation options through a test-bed project. All the material is created electronically and digital storage would save processing time and storage space.

One option is to duplicate the data and create entirely separate access and preservation copies. In this way an access copy could be explored through digital asset management (DAM) software. DAM doesn't offer a preservation platform but it does offer very useful functionality for searching and manipulating data. To preserve archival integrity though a pristine preservation copy of the same data would be kept untouched on a dark server. The option of hosting and maintaining the dark data is being discussed with AHDS and ULCC.

6.3.0 Disaster planning

Digital data storage is increasingly spread across diverse physical locations, some in-house and some outside. Obviously disaster plans need to take account of all storage sites and of the implications of losing access to the data that they house. King's is addressing this issue at a College level through a corporate business continuity and disaster management strategy.

A digital assets survey can help significantly with contingency planning by identifying what data is stored and where it is. A risk analysis can be laid over this to highlight areas of concern.

6.3.0 Mixed ownership

The last question approaches the sharing of data beyond the College and preserving material with mixed ownership. ACRS is presently considering these matters in relation to research collections.

Research archives sometimes contain material with complex ownership and rights issues. This can include third party publications and primary data where subjects hold copyrights and moral rights. Further complications arise when studies are collaborative and involve other individuals and institutions.

At the point of archiving this kind of material two questions arise:

- Who is properly responsible for maintaining the data?
- Does the College have all the rights it needs to preserve it adequately?

These questions aren't always easily answered. Appropriate agreements and consents are sometimes lacking.

With this in view ACRS is working closely with the College Research Ethics Committee to draw up a protocol for researchers. This will ensure that issues of ownership, rights and preservation are dealt with thoroughly at the outset of each study.

8 Conclusion

7.0 Overall the project has been a notable success. Its main achievements have included:

- Effective awareness raising across College.
- Development (and refinement) of a useful assets survey methodology.
- Helpful findings and insights from the consultants that were assembled into a viable work programme.
- Setting up a new cross-College body to oversee further activities.
- Relevant and sustainable follow-up projects that will lead to genuine progress.

8.2 The project was formulated with the notion of risk at its centre. The legal and operational threats posed by the poor management of digital assets are real and significant. At the end of the process King's can now claim to have a more developed and widespread understanding of the hazards. In addition, steps to begin addressing them are in hand.

Appendix 1

Guide to digital preservation

1. Definition

1.1 Digital preservation has been defined as 'the series of managed activities necessary to ensure continued access to digital materials' (Jones and Beagrie 2003, p.10)¹. Digital materials can be diverse and include word-processed documents, emails, databases, web pages, images, sound and video files and so on. Continued access may refer to the short, medium or long term and, in this context, long term may mean forever.

2. Issues

2.1 Any organisation that decides to address the problem of digital preservation in a coherent and consistent way quickly finds itself faced with a host of issues. Some of these issues are matters of records management that apply equally to all types of material irrespective of whether they are electronic or paper. Others though are specific to digital materials and to their unique nature and characteristics. A brief overview of some of these issues follows in three tables below. These tables set out the technological, organisational and legal contexts of digital preservation.

2.2 Technological

Media	Digital storage media is fragile. Optical and magnetic devices are susceptible to damage (from heat or humidity for instance) and also to corruption. <ul style="list-style-type: none">• <i>Refreshment cycles</i> can help here, so media are checked and renewed regularly.
Change	Digital data is machine-dependant. Retrievability and readability of material relies on having an appropriate hardware and software environment in place. <ul style="list-style-type: none">• Standard file and media formats are always recommended though standards aren't entirely immune from change, modification or obsolescence.• Good quality documentation is also important. File format specifications, implementation guides, hardware designs and so on may all be vital to ensuring materials' integrity and longevity.
Authenticity	Digital data is easy to alter almost invisibly. This means that

¹ Jones M and Beagrie N (2003) Preservation Management of Digital Materials: a Handbook London: The British Library

	<p>the authenticity of material in a digital repository can't be taken for granted.</p> <ul style="list-style-type: none"> • Data integrity mechanisms can be applied at the point of ingest. There are a number of standards for the generation of digital signatures for instance including the MD5 algorithm preferred by the UK National Archives (TNA). • Once a record is captured all subsequent interventions may be logged, establishing a full audit trail of activities.
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2.3 Organisational

Cost	<p>It is accepted that digital preservation is difficult to cost accurately. Jones and Beagrie (2003) point out that much preservation work so far has been project-based. It is difficult to extrapolate a long-term strategic budget from project costs. They also note that preservation costs can't be easily isolated from the routine expenses of managing digital materials for current access and use. We do know the following though:</p> <ul style="list-style-type: none"> • Preservation requires an appropriate technical infrastructure and organisational support. This means budgeting for the ongoing costs of technical systems and of the staff who use them. • Decisions about contracting out preservation functions will impact on costs. Also, the development of co-operative ventures within sectors or regions will have an effect.
Staff	<p>Digital preservation calls for a range of skills and expertise. Managing this function will make special demands on organisations and their staff.</p> <ul style="list-style-type: none"> • Staff with appropriate skills need to be employed or developed, however it is difficult to determine the precise skill set required. Recognised training and CPD options are not widely available yet. • Digital preservation requires organisations to join-up their internal processes. Preservation goals are best served by pooling expertise, sharing protocols and co-working effectively across departments and disciplines.
Selection	Digital data proliferates; organisations produce a huge

	<p>amount. The sheer quantity means that selection is vital or we will preserve too much irrelevant information.</p> <p>Important digital data needs to be selected for preservation as early as possible. The risks of deletion, amendment or obsolescence are high unless significant data is identified clearly and managed properly.</p>
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2.4 Legal

IPRs (Intellectual Property Rights)	<p>IPRs in digital resources may extend over content, metadata and software too.</p> <ul style="list-style-type: none"> • Active preservation calls for activities like emulation, migration, encapsulation and refreshment. All of these involve copying and manipulating original materials. It is likely that special permissions will be needed from rights holders. • Numerous rights holders may have varied interests in a single digital resource. They should be identified and logged to ensure that their economic and moral rights are respected over time.
Retention	<p>Traditionally paper retention has been guided partly by legal controls and partly by local organisational factors.</p> <ul style="list-style-type: none"> • As far as legal retention is concerned there is no practical difference between a paper environment and a digital one. It is important to stick to statutory retention periods. We should be guided by the principles of Data Protection and by the Freedom of Information Code of Practice on Records Management. Both encourage timely destruction. • Local retention norms for paper records are often driven by the need to save on storage. Excessive retention has been discouraged because it wastes expensive space. Electronic retention may now make long-term storage more cost-effective and retention times might be revisited and revised. However, retention times still need to be guided by good sense, operational needs and the cost and utility of storage/ retrieval solutions.
Privacy and Security	<ul style="list-style-type: none"> • Storage and use of long term digital records should remain compliant over time. For instance, controls over access and use should be informed by the Data Protection principles. Also, confidential material

	<p>needs to be identified clearly and protected appropriately.</p> <ul style="list-style-type: none"> • The security of systems and data is important, but it must not interfere with preservation activities. Technical features that control access to data and restrict activities might make vital preservation interventions impossible.
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2.5 With these contexts set out, questions about the practical management of digital records now arise. How can digital materials be managed to ensure preservation?

3. A lifecycle approach

3.1 We know from traditional records management that the lifecycle model is a very useful tool. The lifecycle model says that records have a life and that during this life they move through different phases of currency. These phases inform the ways that sources are used, controlled and stored. The lifecycle approach gives structure to the processes of records management and helps us plan our interventions. In this way it serves the goal of effective preservation.

3.2 The lifecycle approach is just as valid in a digital environment as it is in a paper one. However, digital materials do raise their own unique concerns and the table below sets out some of the associated management issues.

Creation	<p>In a digital environment it is important that preservation concerns are acknowledged at the start of the lifecycle when records are created.</p> <ul style="list-style-type: none"> • Scanning paper records to create digital copies for retention is increasingly common. Good practice at creation will assist in the future management of these materials. Effective scanning procedures will address issues of workflows and scanning methods, file and format concerns and quality assurance matters. • Increasingly organisations' core records are created and maintained solely in electronic form. A policy will help clarify the status of electronic records and allocate responsibilities for preservation. Alongside this, an electronic records strategy can address more practical issues like preferred media and formats, authenticity controls and so on.
Metadata	<p>Metadata is a valuable tool that can serve a variety of needs throughout a digital record's lifecycle.</p>

	<ul style="list-style-type: none"> Discovery metadata is important. The structure and content of metadata should serve immediate administrative uses and long term retrieval requirements too. Metadata needs to capture a record's organisational context and its role and function. We're encouraged to look to standard models for content elements and encoding schemas. Also, to standardise vocabulary terms either by referring to external schemes or by developing our own local rules. Preservation metadata is important too. Again we are encouraged to look to standard element sets for defining and structuring content. We may also confirm the technical characteristics and details of files by referring to authoritative external databases like PRONOM.
<p>Review and appraisal</p>	<p>Review and appraisal are key interventions in a record's lifecycle.</p> <ul style="list-style-type: none"> Long-term digital records are usually identified very early. Selection should follow the same best practice that applies in the paper world where value and utility are considered closely. Review can be an ongoing process. Value may decrease over time, a licence or agreement might end, content may be superseded etc. All these events would provoke a further review and a new outcome. An organisation may not have primary responsibility for retaining all the electronic materials that it holds forever. For instance, external publications may be archived by their publishers, certain records should be preserved by the government or by local authorities etc. Through review we can determine where responsibilities begin and end. Transfer of materials from their <i>current</i> environment to an archive repository needs to be structured and managed. What is the repository? Is the <i>current</i> to archive migration a single step? How are issues like the id numbering, validating, re-formatting and cataloguing of materials handled?
<p>Storage and preservation</p>	<p>Careful storage and active preservation management is vital throughout the lifecycle of digital materials.</p>

	<ul style="list-style-type: none">• Safeguarding media, content, software and hardware is important at every stage. This involves a range of scheduled activities including periodic media refreshment and data reformatting. It takes in appropriate environmental controls and proper care and handling of media and equipment too.• A preservation environment should be secure and regular audits should assess the integrity of systems and data. A disaster plan is also important.• For long-term materials hardware and software obsolescence poses the most serious threat of all. Migration and emulation options need to be considered and a strategy needs to be formed.
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4. Conclusion

4.1 This brief exploration of digital preservation has taken in significant contextual matters and a few practical issues associated with lifecycle management. It shows that the apparently simple desire to preserve digital resources raises a number of complex technical and organisational concerns.

Appendix 2

Dissemination event

Challenges of the e-environment for records managers and archivists in Higher Education

A free event at King's College London, July 20th 2006. Hosted jointly by King's and by the Records Management Society's Higher and Further Education Group. Sponsored by the JISC 4/04 Programme, Supporting Digital Preservation and Asset Management.

Programme

- **Morning session** – lifecycle matters (10.30am – 1pm)

A business preservation strategy for corporate digital assets

Jan Booth (Records and Archives Manager, King's College London) reports on a recent JISC funded project at King's. The project aimed to guide King's towards a strategic plan for managing its diverse electronic records for the long-term.

PARADIGM – Personal Archives Accessible in Digital Media

Janette Martin (Digital Archivist, John Rylands University Library of Manchester) reports on an ongoing JISC venture looking at the issues around accessioning and managing digital archive material.

Maps, gaps and overlaps

Andrea Buttle (Consultant, Southern Universities Management Services) discusses the lessons learned from a recent digital assets project at an HEI. She will talk about her methodology and findings and look in detail at the issue of managing electronic committee records.

- **Lunch** – a free buffet lunch is provided
- **Afternoon session** – Case study: research records as digital assets (2pm – 4.00pm)

Patricia Methven (Director of Archives and Information Services, King's College London) leads a panel in an open discussion about the significant challenges posed by research records in electronic form. The discussion will look closely at the ethical and legal framework around research data, at technical issues, at contractual pressures and at the implications for records management.

Speakers

Jan Booth
King's College London

Jan is a qualified archives professional with over ten years experience. He has worked as an archivist in the private sector, as a records manager in local government and as a records and legal compliance manager in higher education. His current role at King's straddles the College's archives, records and compliance functions.

Janette Martin
Digital Archivist, John Rylands University Library of Manchester

Janette Martin is a digital archivist on the Paradigm project, John Rylands Library, The University of Manchester. Prior to joining the Paradigm team she worked for five years at the Manchester-based Labour History Archive and Study Centre. Besides digital preservation, she is particularly interested in political and labour movement archives both in the UK and abroad. Until recently, she was on the Co-ordinating Committee of the International Association of Labour History Institutions.

Andrea Buttle
Consultant, Southern University Management Services (SUMS)

Andrea joined SUMS in 2000. After graduating with a MEng from Imperial College she joined BOC where she became expert in the development of information strategies and systems. She gained her MBA with the Theseus Institute, France. Since joining SUMS Andrea has undertaken a benchmarking review of IT services within the HE sector and is currently undertaking a series of IT Diagnostic Reviews (health-checks) for SUMS members.

Panel

Patricia Methven (Chair)
King's College London

Patricia is Director of Archives and Information Management at King's and currently Acting Director of Information Services and Systems. This integrated department covers the College's libraries, IT and records and compliance functions.

Patricia is a qualified archivist with twenty-eight years experience of working professionally in Higher Education. Her work in the wider archives sector has taken in leadership of the AIM25 consortium.

Anne Barrett
Imperial College London

Anne has served as College Archivist at Imperial since 1989 and as Archivist and Corporate Records Manager since 1999. Her role takes in the management of the College's historical records as well as care of current material.

Anne has worked extensively across the wider records and archives sector. She is a member of the International Council on Archives and a committee member at the British Standards Institute. She has a long-standing professional interest in electronic records.

Alastair Dunning
Arts and Humanities Data Service (AHDS)

Alastair works at King's College London for the AHDS, a digital archive for research resources in the arts and humanities. He has had much experience in the application of standards, particularly in advising museums, universities and individual scholars in building digital resources funded by the New Opportunities Fund and the Arts and Humanities Research Council.

Neil Jacobs
Programme Manager (Information Environment Service Provider Development and Repositories), Joint Information Systems Committee (JISC)

Neil manages the JISC Digital Repositories development programme, a £3.5m public investment in the infrastructure of UK tertiary education. He has previously managed the national database of the UK Economic and Social Research Council, and has conducted research into a wide range of topics including students' and tutors' discourse around online learning, scholarly communication and technology, academic library services, and adolescent body image concerns. He is on the Board of 'euroCRIS', a European organisation concerned with Current Research Information Systems.

Paul Labbett
King's College London Enterprises (KCLE)

Paul is Director of Research Grants and Contracts for KCLE, a post he has held since 2001. Prior to that he was head of the Research Contracts Office at Imperial College for 10 years, and worked in the contractual/legal field of HEIs for over 20 years. He has also worked on EU projects to develop commercial and IP awareness in HEIs in Eastern Europe. His experience involves the legal, intellectual property and commercial aspects of sponsored research

Betty Wilder
JISC Legal

Betty is a Legal Information Specialist with the JISC Legal Information Service based at the University of Strathclyde in Glasgow (www.jisclegal.ac.uk). As well as being a qualified lawyer (Scots law) she also has a masters degree in Information Technology and Telecommunications Law and has previously worked in private practice and in industry.